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The phenomenological experience of autobiographical memory in postnatally depressed and non-depressed mothers.

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Abstract

Postnatal depression (PND) is a highly prevalent mental health condition, which has debilitating consequences for both maternal and child wellbeing. A number of risk factors for PND have been identified, from each of psychological, socioeconomic and biological backgrounds. The current research aimed to investigate cognitive risk factors for PND, since a majority of women report changes to their memory during the perinatal period. Memory phenomenology, the characteristics experienced when recalling a memory, was assessed using an online questionnaire with forty-eight participants. The Edinburgh Postnatal Depression Scale (EPDS) was administered as a measurement of depression symptoms. The present study compared the experience of these characteristic when recalling parenting-related and unrelated events, as a function of EPDS score. Two significant negative correlations were found, between EPDS score and vividness for parenting-related events, and for EPDS score and negative emotion for events which were unrelated to parenting. A direct comparison of parent-related and unrelated memories revealed significant differences in vividness and emotional intensity between these two memory types. It was concluded that the subjective experience of autobiographical memory recollections is influenced by PND symptoms, which has implications for the identification and treatment of PND. Future research directions are discussed to investigate the extent of these differences.

Risk Factors for Postnatal Depression

All women have an increased risk of developing depression after childbirth, compared to other times of their lives, with estimates of this increase being as high as 50 percent (Vesga-Lopez, Blanco, Keyes, Olfson, Grant & Hasin, 2008). Research which is able to identify further symptoms and risk factors of PND, from which it can be better identified and consequently treated, holds great importance to both maternal and child-wellbeing, due to the high prevalence and serious consequences the disorder can have. The present research aimed to identify further PND risk factors, from a cognitive perspective, through investigation of the phenomenological experience of maternal memory. Phenomenological memory characteristics were compared between depressive and non-depressive mothers, within recalled events which were related to parenting and events which were unrelated. A link between phenomenological memory characteristics and PND, such as reduced vividness for parent-related memories for example, could be useful in the identification of PND sufferers, and could aid treatment. Identifying the maladaptive cognitive processes which develop and maintain PND would allow these to be challenged and improved upon, therefore leading to more adaptive processing and better outcomes for maternal wellbeing. Previous research has proposed a number of vulnerability factors which can influence a mother's risk of developing depression in the perinatal period, which include biological, socioeconomic and psychological factors. These factors will be discussed in turn below.

Psychological factors:

Possibly the most compelling evidence for an increased risk of PND is found within psychological factors. Milgrom, Gemmill, Bilszta, Hayes, Barnett, Brooks et al. (2008) proposed that the two most significant factors in terms of frequency and risk for PND are a history of depression, either personally or within the family, and emotional disturbance during pregnancy. The latter includes the experience of depression and / or anxiety during pregnancy, which is considered to significantly increase the risk of developing depression in the perinatal period (Beck, 2001). Barnett and Parker (1986) reported more anxious mothers

during pregnancy experienced a greater number of depression symptoms, showed less confidence in their ability to cope with the demands of parenting, and had more concern for their child and relationships, than women less anxious in pregnancy. Matthey, Barnett, Howie and Kavanagh (2003) supported these findings reporting previous history of anxiety disorders to have a greater risk for the development of postnatal anxiety and depression, than the more commonly reported history of depressive disorders. Similar findings were reported by Heron, O'Connor, Evans, Golding, Glover and ALSPAC Study Team (2004), who found both antenatal depression and anxiety to predict PND, with anxiety increasing the risk of developing PND, even when antenatal depression was controlled for. Milgrom et al. also reported supporting evidence, as mothers who received high Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987) scores during pregnancy were significantly more likely to obtain a high EPDS score postnatally, increasing the risk of developing PND by eighteen percent, compared to those without a high antenatal EPDS score. These findings suggest that psychological state during pregnancy is of major importance when assessing the risk of PND, and this includes the experience of antenatal anxiety, along with depression.

Alongside a history of PND, personality variables have also been identified as risk factors. These include high neuroticism and introversion (Verkerk, Denollet, Van Heck, Van Son & Pop, 2005), high levels of perfectionism (Milgrom et al., 2008) and low self-esteem (Beck, 2001). Neuroticism was found to be a moderate predictor of PND, with those reporting high levels of self-consciousness and worrying having the greatest increase in depression risk (Johnstone, Boyce, Hickey, Morris-Yates & Harris, 2001).

Psychological vulnerability to the development of PND also encompasses variables such as attributional style, maladaptive maternal attitudes and cognitive distortions about the role of a mother (Whitton, Appleby & Warner, 1996). Dysfunctional attributional styles are associated with an increased risk of developing PND, and have been reported to significantly predict a mother's depression outcome (O'Hara, Rehm, & Campbell, 1982). Depressed

mothers are reported to use different attributional styles to non-depressed mothers, with those experiencing PND predominantly using more irrational cognitions, and feeling like they have less control over their lives (Milgrom & Beatrice, 2003).

Whitton et al. (1996, p.74) also reported an association between symptoms associated with PND and maladaptive maternal attitudes surrounding the 'self, motherhood and role conflict'. Interventions for PND often target these cognitions using cognitive therapy, which seeks to correct maladaptive maternal attitudes and beliefs.

The use of maladaptive coping strategies is also commonly reported among mothers with PND, which could be a causal factor in the development of their depression (Faisal-Cury, Tedesco, Kahhale, Menezes, & Zugaib, 2004). Coping strategies are proposed to influence a woman's ability to adapt to motherhood, with non-depressed mothers using functional coping methods, such as planning and seeking out support, whereas depressive women are proposed to use less functional coping strategies, such as denial, emotional distancing and blame. Support was found for the role of coping strategies in the development of perinatal depression, by de Tychey, Spitz, Briancon, Lighezzolo, Girvan, Rosati et al. (2004). The most frequent coping strategies reported by non-depressed mothers in their research were acceptance of the situation and humour, which are considered to have adaptive value. On the other hand, depressed mothers were found to use distancing, denial, blame and substance abuse most frequently. These techniques are thought to be less functional, as they promote avoidance of the situation, denial of the existence of these problems, feelings of guilt and self-blame, and using maladaptive resources to cope. When tested postnatally, feelings of self-blame and reliance on substance abuse were found to be related to depression risk. Therefore, women relying on maladaptive coping strategies during pregnancy may have an increased risk for depression in the perinatal period and maladaptive transition to parenthood (de Tychey et al., 2004).

The experience of stressful life events, particularly those associated with pregnancy and childbirth, can also increase the risk of developing PND (Eberhard-Gran, Eskild, Tambs,

Samuelsen & Opjordsmoen, 2002). Rubertsson, Waldenström and Wickberg (2003) reported that the experience of two or more stressful events in the year preceding pregnancy, significantly increased the risk of both pre- and postnatal depression. High levels of daily stressors were not found to increase risk of PND, however limited levels of these stressors showed a reduction in risk (Milgrom et al., 2008).

Social support is another significant risk factor in the development of PND, with increased levels of emotional and practical support being found to reduce risk (Robertson, Grace, Wallington & Stewart, 2004). Partner support is considered one of the most important influences of this kind, as a good marital relationship is known to reduce the stresses of new motherhood and the associated lifestyle changes (Robertson, et al., 2004). High levels of partner support are found to significantly reduce the risk of PND, however minimal to no partner support during pregnancy did not yield a significant increase in PND risk (Milgrom et al., 2008). This therefore suggests that support has preventative value, rather than being a direct risk factor. Perceived lack of social support during pregnancy was found to have a strong influence on the risk of developing PND, despite perceived and actual levels of social support having known discrepancies (Nielsen, Videbech, Hedegaard, Dalby & Secher, 2000). Depressed women often tend to view things from a negative perspective, therefore they can underestimate the level of support received (Robertson et al., 2004). The size of a woman's social network was also not found to significantly influence the development of PND (Brugha, Sharp, Cooper, Weisender, Britto, Shinkwin, et al., 1998). Despite the amount of research into psychological risk factors for PND, there is very little consideration of the role of cognition in PND development, including such factors as memory bias and phenomenological qualities of recalled events. This leaves a gap in the literature, which the present research aimed to investigate.

Socioeconomic factors:

Socioeconomic factors were identified to contribute a small but significant influence on the risk of developing depression in the perinatal period, however the extent of this

influence is largely debated (Robertson et al., 2004). Rubertsson et al. (2003) found maternal age to significantly affect PND risk, with women aged twenty-five and under having an increased risk of developing depression symptoms. Despite this, other research has reported no effect of maternal age on PND risk, in women aged sixteen years and over (Tammentie, Tarkka, Åstedt-Kurki & Paavilainen, 2002; Robertson et al., 2004). Low socioeconomic status (Patel et al., 2002; Beck, 2001), unemployment (Warner, Appleby, Whitton & Faragher, 1996) and lower education level (Tammentie et al., 2002), have also been reported as factors which can increase a mother's risk of developing PND.

Biological and obstetric factors:

Various hormonal factors have been investigated in relation to PND risk, due to the great fluctuations which are known to occur during pregnancy. Sichel, Cohen, Robertson, Ruttenberg and Rosenbaum (1995) proposed the rapid fall in oestrogen levels following birth may contribute to the development of postnatal affective disorders. Following the birth of their child, oestrogen was administered to women who had previously suffered from postnatal affective disorders, who did not have a history of affective disorder unrelated to childbirth. This lead to much lower relapse rates than expected by chance.

Similar findings were reported by Bloch, Schmidt, Danaceau, Murphy, Nieman and Rubinow (2000) who also found evidence for the role of hormones oestrogen and progesterone in the development of PND. It is proposed that women who suffer PND are more sensitive to the rapid reduction in oestrogen and progesterone following birth, which contributes towards their predisposition to developing depressive symptoms. Bloch et al. simulated the hormone build-up and withdrawal associated with pregnancy and birth, within non-pregnant mothers who had given birth at least one year previously. Gonadal steroids were administered to mothers over an eight week period, then were stopped and replaced with placebo drugs, causing a rapid drop in hormone levels. Women with a history of PND were found to report depression ratings were significantly higher than those of the no-history group. A significantly greater number of the depression-history group (62.5%), compared to

the no-history group (0%), also developed clinically significant depression symptoms. This difference between groups with and without a history of perinatal affective disorders suggests that sensitivity to the reduction of hormone levels appears to be a trait which is not present in women who have never experienced PND (Bloch et al., 2000). These results provide support for the distinction of PND as a separate affective disorder from major depression, due to the biological trigger significantly related to childbirth, rather than the onset of major depression after childbirth, due to changing responsibilities and increased stress (O'Hara, 2009). Antenatal prolactin levels and postpartum progesterone levels have also been found to correlate significantly with PND risk, supporting the findings of Bloch et al. (Ingram, Greenwood & Woolridge, 2003). Despite this, when life events were controlled for, only the postnatal progesterone remained significant. Therefore, reduced postnatal progesterone levels were found to be significantly associated with an increased risk of developing PND.

Additional research into obstetric risk factors for PND reported that factors such as pregnancy and birth-related complications, previous miscarriage and abortion, contributed to a small increase in the risk of developing depression (Robertson et al., 2004). Despite this, Whitton et al. (1996) reported little evidence had been found to suggest that physiological changes related to childbirth can affect the development of PND. Due to this, further research is needed to clarify the role of obstetric and hormonal factors in the development of PND. However, the present study will not consider the biological risk factors for PND, but will place more focus on psychological factors, which are found to have the larger influence on PND development. Emphasis will be placed upon the role of cognition in PND development, which has received little attention in previous studies.

Aims of the current study

Given the prevalence of PND, research which investigates its causes and symptoms has clear value to mothers and to society in general. PND can have serious consequences for maternal wellbeing, the ability to cope with the demands of parenting and ultimately, their

child's development. Depressed mothers are found to behave in a less warm and sensitive way toward their children, while children of depressed mothers are reported to develop more insecure attachments with their mothers, demonstrate poorer emotional regulation and have poorer cognitive development than children of non-depressed mothers (Cohn & Campbell, 1992; National Inst of Child Health & Human Development, Early Child Care Research Network., 1999; Campbell, Brownell, Hungerford, Spieker, Mohan & Blessing, 2004; Marcus, 2009).

The current thesis addresses this issue from the perspective of cognitive psychology, investigating the effects of motherhood on memory processes that are important for psychological wellbeing. Pregnancy-related impairments in these memory processes could pose as further vulnerability factors in the development of PND, which could be used to target at-risk mothers, and direct them towards preventative interventions. The current thesis therefore reviews the effects of pregnancy on different memory processes, starting with how pregnancy affects memory in general, before moving onto identifying pregnancy-related impairments in other memory systems, and how pregnancy affects the specificity and phenomenological characteristics of memories.

Declarative Memory

Subjective complaints of forgetfulness are frequently reported by pregnant women, with Brett and Baxendale (2001) reporting that almost all studies investigating this have found a majority, ranging between 50-80 percent of women, who perceived their memory to be worse during pregnancy than normal. Despite this, the adverse effects of memory reported by pregnant women may not be reflected in real life, due to frequent reports of subjective memory performance being poorly correlated with objective measures of memory (Cook & Marsiske, 2006). Supporting this, Grut, Jorm, Fratiglioni, Forsell, Viitanen & Winblad (1993) found depressed individuals often overestimate the extent of their memory impairment, due to having a negative outlook on life. Due to this, it is not known whether these widespread reports of pregnancy-related memory deficit reflect a true deficit in

memory functioning, or an inaccuracy in the ability to assess their memory ability. Henry and Rendell (2007) however, found that self-reported memory impairments were highly correlated with objective measures of memory deficit, suggesting that pregnant and postpartum women are not as inaccurate as previously believed, when assessing their memory ability.

Memory is often divided into two key systems: declarative and procedural memory. Declarative memory involves the conscious recollection of facts and events, whereas procedural memory relies on unconscious, automatic processing in the performance of previously learned skills and abilities (Mickes, Wixted, Shapiro & Scarff, 2009). Of these two memory systems, declarative memory appears to be the worst affected by pregnancy-related deficits, with most subjective memory complaints being reported for this component, particularly within recall (Mickes et al., 2009).

Declarative memory is often assessed using recognition and free recall measures. Recognition is considered to be the easier of these two tasks, as participants are shown a mix of previously seen and unseen stimuli, and asked to indicate which of the groups each stimulus belongs to. Free recall, on the other hand, is considered to be much more difficult, as this requires participants to recall a list of previously seen stimuli without any cues or guidance (Mickes et al., 2009).

Previous research has reported that free recall is impaired during pregnancy, as pregnant women, tested within their third trimester, performed significantly worse than postpartum mothers on a test of free recall (Buckwalter, Stanczyk, McCleary, Bluestein, Buckwalter, Rankin, et al., 1999). Similar findings were also reported by de Groot, Vuurman, Hornstra and Jolles (2006) who found pregnant women showed significantly greater impairment than non-pregnant controls on both immediate and delayed recall (20 minutes after stimulus presentation) at four time points during pregnancy.

A recent review of the literature on the effect of pregnancy on memory, carried out by Henry and Rendell (2007), also suggested that a pregnancy-related deficit in declarative memory does exist. From this meta-analysis, no significant difference in memory recognition performance was found between pregnant women and non-pregnant controls. Despite this, free recall and delayed recall tasks both yielded significant impairments in both pregnant and postpartum women. A similar impairment was also observed in both pregnant and postpartum groups on executive functioning and working memory performance, however this result failed to reach significance (Baddeley & Hitch, 1974). These findings suggest that both pregnant and postpartum women experience a similar pattern of memory deficits, which do not affect non-pregnant controls. These pregnancy-related impairments mainly concern free recall and executive functioning, which shows selective impairment to effortful processing, rather than a general declarative memory deficit (Mickes et al., 2009).

The continuity of pregnancy-related memory deficits into the postnatal period has also received inconsistent findings, with some research suggesting the deficits resolve immediately after childbirth, and others providing evidence that the deficits can persist for longer into the postpartum period. Eidelman, Hoffman and Kaitz (1993) reported pregnancy-induced memory deficits were observed at one day postpartum, however by the second day memory performance, tested via the Wechsler Logical Memory Test, was not significantly different to that of non-pregnant controls. Despite this, de Groot et al. (2006) found evidence of the persistence of pregnancy-related memory impairments when tested thirty-two weeks postpartum.

Consistent with the previous findings, Mickes et al. (2009) found free recall performance was significantly worse in pregnant women than those in the postpartum period. Despite this, recognition performance was found to be better in pregnant than postpartum women, however when outliers were taken into account, this finding fell short of significance. Due to this, it can only be concluded that recognition memory was not significantly impaired during pregnancy, as was found for recall. Rates of semantic

clustering, defined as 'the degree to which semantically similar items are recalled together during free recall' (Mickes et al., 2009, p.756), were significantly reduced in pregnancy compared to postpartum rates, which means that pregnant women were significantly less likely to recall words with similar meanings together in the free recall task. No significant differences in free recall or recognition memory were discovered between the women in different trimesters, suggesting gestation did not affect memory impairment.

These findings support those previously reported by Buckwalter et al. (1999), de Groot et al. (2006) and Henry and Rendell (2007), as clear impairments were discovered during recall, but not on recognition tasks. This provides further evidence for the reported memory deficits being specific to recall, rather than being widespread across the whole of the declarative memory system. The differing effects of pregnancy on recall and recognition reported by Mickes et al. (2009) provide evidence counter to a biological theory of declarative memory. The hippocampus is known to serve both recognition and recall, therefore a pregnancy-induced hippocampal deficit should lead to similar impairments being observed on both tests of declarative memory. Instead, the opposing effects discovered by Mickes et al. support an encoding-style approach.

As previously discovered by Engelkamp, Biegelmann, and McDaniel (1998), the technique employed at encoding influences how well the stimuli are both recalled and recognised. This study was based upon the distinction between relational and item-specific encoding, introduced by Hunt and Einstein (1981). Relational encoding was provoked by asking participants to name the semantic category the stimuli belonged to, while pleasantness ratings were used to prompt item-specific encoding. Item-specific encoding was reported to show the same pattern of results as pregnancy in Mickes et al.'s (2009) research, with increased recognition and poorer recall performance, compared to relational encoding. This implies that the encoding which naturally took place in pregnant participants in Mickes et al.'s research may have been more item-specific in nature, rather than relational, due to their reduced semantic clustering and recall performance. The reason

behind this is speculative, however one possible explanation comes from the effects of mood on different encoding styles.

Storbeck and Clore (2005) tested the effects of positive and negative mood induction on relational and item-specific encoding, when using the Dees-Roediger-McDermott (DRM) paradigm (Roediger & McDermott, 1995). This required participants to study a list of semantically similar words, however the most typical word in that category was omitted from the list. For example, participants studied words such as *joy*, *smile*, and *laugh*, which are associates of the word *happy*, which was not presented. This word was referred to as the 'critical lure', and the false retrieval of this as part of the original list was used to distinguish between whether relational or item-specific encoding was employed (Roediger & McDermott, 1995, p.805). Retrieval of the critical lure would be more likely to occur under relational encoding, as participants are more likely to generate associates of the words presented to them. Storbeck and Clore (2005) reported positive moods were more likely to trigger relational encoding, therefore leading to mistaken recall of the critical lure more frequently. Negative mood findings showed much less frequent false recall of the critical lure, implicating that item-specific encoding was more likely when feeling sad. Since pregnant women are at an increased risk of depression (Vesga-Lopez et al., 2008), it is possible that negative mood states experienced during pregnancy could underlie Mickes et al.'s (2009) findings of impaired recall and enhanced recognition, due to mood-altered encoding. This implication however requires further research to be carried out, as no measures of depression were taken either during pregnancy or the postpartum period in Mickes et al.'s (2009) research. Perinatal depression could therefore be a confounding factor within this speculative theory.

Despite this, additional factors which often co-occur with pregnancy, such as increased fatigue, and physical symptoms of pregnancy, for example discomfort and nausea, could be possible causes of the memory-impairments reported by pregnant women. Evidence from Cuttler, Graf, Pawluski and Galea (2011) however, reported that although

pregnant women reported a significantly higher rate of sleep deprivation and physical discomfort that their non-pregnant counterparts, sleep deprivation was not significantly related to performance on the employed memory tasks. Women experiencing more physical symptoms of pregnancy however, were found to report significantly greater memory deficits that those with less negative symptoms, which could be due to their reduced concentration on the task. This could therefore act as a mediating factor between depression and the memory-impairments frequently reported by pregnant women.

Overall, the research on declarative memory suggests that pregnancy-related deficits exist within memory recall, but not recognition. Pregnant women showed significantly impaired recall compared to their non-pregnant counterparts, which suggests that there are differences within the memory processes between pregnant and non-pregnant women. Due to these findings in declarative memory, a review of the literature was carried out into the effects of pregnancy on further 'effortful' memory systems: working memory, emotional memory, prospective memory and autobiographical memory.

Working Memory

Working memory (WM) is a cognitive system responsible for the short-term storage, manipulation and active processing of information (Baddeley, 1992). It proposes that short-term memory is comprised of a number of different stores, rather than one sequential store, as previously proposed by Atkinson and Shiffrin (1968). Research by Baddeley and Hitch (1974) supported this proposal. Participants were required to simultaneously perform two tasks: a digit span task and a verbal reasoning task. As the difficulty of the digit span task increased, it was expected that performance on the reasoning task would decline, and eventually break down. This was due to interference between the two tasks, and capacity being overwhelmed. However, reasoning task performance did not dramatically decrease as expected. This suggests that the two tasks, while being completed simultaneously, drew resources from different memory systems. Due to this, the WM model proposed that short-term memory is not a single system, but has two separate sub-systems, one for processing

visual information and another for verbal information. Each has its own capacity and resources, therefore successful performance can be achieved on two simultaneous tasks, providing they draw resources from separate components of WM (Baddeley, 1992).

The tripartite structure of WM proposes the presence of a central executive, the key component for processing information, and two underlying slave systems: the phonological loop and visuospatial sketchpad, which make up the separate WM sub-systems (Baddeley, 1983). The key functions of the central executive are to direct attention and prioritise resource coordination to particular tasks. These resources are drawn from the slave systems, which are operated by the central executive.

The phonological loop is the slave system which is responsible for the storage and maintenance of verbal and speech-based information. It is of particular importance to the comprehension and acquisition of language, especially when faced with difficult conditions (Baddeley, 1992). Two main sub-components of the phonological loop are proposed: the phonological store and articulatory control process (Baddeley, 1986). While the former temporarily holds phonological information in the memory, allowing perception of spoken words, the articulatory loop is required for the rehearsal of this information, in order to retain the memory. Without the rehearsal process carried out by the articulatory loop, this phonological information would decay and be forgotten (Baddeley, 1986). The phonological loop also serves the function of transforming written or visually presented verbal information into phonological memory traces by 'sub-vocalisation' (Baddeley, 1992, p.558).

The second slave system, the visuospatial sketchpad, serves a similar function to the phonological loop, however it is instead responsible for the storage of visual and spatial information. Its main functions relate to navigation, and the construction and manipulation of visual images and mental maps (Baddeley, 1983). The visuospatial sketchpad is also divided into two sub-components: the visual cache and inner scribe (Logie, 1995). The visual cache is responsible for visual information, holding details about how things look, such as colour and shape information, within the short-term memory. The inner scribe on the other

hand, takes responsibility for spatial and location information, giving details of the spatial relationships between things. The visuospatial sketchpad also communicates with long-term memory, allowing the visual and spatial information stored there to be recalled and displayed within the mind.

As an extension to the WM model, an episodic buffer was later added by Baddeley (2000). This was proposed to integrate information from each of the phonological loop, visuospatial sketchpad and other memory stores not covered within the WM, such as semantic information. This information is collectively drawn from its respective stores, then combined into a single episodic representation (Baddeley, 2000).

Most research on pregnancy-related memory deficits has focused on declarative, explicit memory and, where WM tests have been incorporated, many only included tests of the passive storage aspect of WM, which involves simply retaining information in its original form for a short period of time. Henry and Rendell's (2007) proposal however, that pregnancy-related memory impairments were more likely to affect cognitively effortful processing, suggests that investigating possible changes in executive WM may be more informative. This involves tests which require the monitoring, updating and manipulation of stored information (Hampson, Phillips, Duff-Canning, Evans, Merrill, Pinsonneault, et al., 2015).

Hampson et al., (2015) investigated the presence of WM deficits in pregnancy, with a specific focus on cognitively effortful processing. The effects of depression, hormones and sleep disruption were also assessed in relation to WM functioning. Pregnant mothers, non-pregnant controls and postpartum controls were all tested on a battery of cognitive tests, and pregnant and postpartum mothers also completed the EPDS (Cox et al., 1987) and Montgomerey-Asperg Depression Rating Scale (MADRAS, Montgomerey & Asperg, 1979), in order to screen for depression. All tests were administered twice, approximately four months apart. The cognitive tests administered included two measures of WM: the Spatial Working Memory test (SPWM, Duff & Hampson, 2000) and Self-Ordered Pointing (SOP,

Petrides & Milner, 1982), along with other measures of explicit memory and cognitive functioning (see Hampson et al., 2015 for details). The SPWM consisted of a matching pairs task, in which coloured tiles were hidden and participants were required to find all ten pairs using as few turns as possible. The SOP involved a series of images, which were presented in pairs. Participants were to point to one of the images per pair, but ensure that each image was only pointed to once during the full set of stimuli. Both of these tasks required continuous updating of the mental record to keep track of which items had already been seen and responded to previously (Hampson et al., 2015). Measures of sleep quality and quantity were also taken, along with serum samples in the pregnant and postpartum groups to assess hormone levels.

A significant pregnancy-related memory deficit was discovered in WM, however only in pregnant mothers who showed signs of depression. Opposing results were reported for the non-depressed pregnant mothers, with no deficit, and even a slight improvement in SPWM performance, compared to non-pregnant controls, being reported. This implies that the observed WM deficit is not typical of all pregnancies, but is specific to those with concurrent depressive symptoms. Therefore, the deficit observed in the pregnant-depressed group is possibly a result of depression, rather than caused by pregnancy itself. No significant differences were observed in any other measures of cognitive functioning. When tested postpartum, the pregnant-depressed group showed significant improvements in both mood state and WM performance, while no significant change was seen in the non-depressed mothers or postpartum controls. Due to this, no significant differences were reported in WM performance between any of these groups. The finding that WM performance increased to normal postpartum levels when depression subsided, suggests the discovered WM deficit was transient during depression, and that the effects are reversible after recovery (Hampson et al., 2015).

Analysis of sleep and hormone findings showed that cortisol and sleep did not significantly predict WM performance, despite these factors being associated with both

depression and pregnancy. Only estradiol level and depression severity were identified as significant predictors of WM, and showed opposite effects on performance. High estradiol significantly predicted better WM performance, while increased depression lead to poorer performance (Hampson et al., 2015).

Similar findings were reported by Kataja, Karlsson, Huizink, Tolvanen, Parsons, Nolvi et al. (2017). Prenatal depression and anxiety levels were established through administration of the EPDS (Cox et al., 1987), the Symptom Checklist-90 anxiety subscale (SCL-90, Derogatis, Lipman & Covi, 1973) and Pregnancy Related Anxiety Questionnaire- Revised 2 (PRAQ-R2, Huizink, Delforterie, Scheinin, Tolvanen, Karlsson & Karlsson, 2015), which were given at 14, 24 and 34 weeks gestation. While the EPDS focused on depression symptoms, the SCL-90 and PRAQ-R2 assessed levels of general anxiety, and pregnancy-related anxiety symptoms, experienced by pregnant mothers, respectively. Cognitive functioning was assessed between 26-30 weeks gestation, via administration of the Cogstate test battery. This was comprised of nine computerised tasks to assess eight aspects of functioning: 'verbal learning and memory, processing speed, visual attention, visual WM, visual recognition memory, spatial WM, visuospatial WM and executive functioning and finally social cognition' (Kataja et al., 2017, p.69).

Results showed no significant relationship between mean cognition score and prenatal stress severity when tested overall. However, when assessed separately, the only measure of cognitive functioning which yielded a significant difference was the Groton Maze Learning (GML) task, which measures executive functioning (Pietrzak, Olver, Norman, Piskulic, Maruff & Snyder, 2009). This task asked participants to follow a series of rules to locate a hidden path, requiring visuospatial attention and WM. The high and moderate prenatal stress groups were both found to perform significantly worse than the low stress group on the GML, suggesting anxiety and depression symptoms have a detrimental effect on visuospatial memory (Kataja et al., 2017).

PND was also discovered to have a greater impact on WM performance than anxiety, as a highly significant correlation was discovered between EPDS score and GML ability, with more errors being made by those who received higher scores on the EPDS. Contrastingly, PRAQ-R2 score only predicted GML performance if concurrent depression symptoms were present. Therefore, women who scored high on both the PND and pregnancy-related anxiety symptoms displayed significant visuospatial WM impairments, while this finding did not reach significance in women who only reported pregnancy-related anxiety symptoms. No relationship was discovered between SCL-90 score and GML performance, suggesting general anxiety does not influence visuospatial WM (Kataja et al., 2017).

These findings support and extend those reported by Hampson et al. (2015), as the observed WM deficit appears to be a function of depressive and anxiety symptoms experienced during pregnancy, rather than pregnancy itself. Collectively, the results suggest that executive dysfunction and WM impairments often occur in pregnant women suffering from prenatal depression and anxiety, and that these are not typical within healthy pregnancies. These results do not support the notion that pregnant and non-pregnant women have differences within their memory processes, as was suggested by the research on declarative memory. Although differences were found between the two groups, depression symptoms were found to have a major influence on the WM impairment found within pregnant women. Therefore WM deficits could be viewed as a vulnerability factor, which increase a mother's risk of developing depression in the perinatal period. A similar pattern of results was also discovered within memory for emotional stimuli.

Memory for Emotional Stimuli

Humans remember emotional information better than non-emotional information, possibly due to the physiological arousal which is triggered when viewing emotional stimuli. Pratto and John (1991) proposed that emotional stimuli, which elicit arousal in the autonomic nervous system, are more relevant to human survival, therefore they are better attended and consequently, retained. While non-depressed individuals tend to show a greater recall for

positive rather than negative stimuli, depressed individuals are reported to show the opposite effect, with better recall for negative rather than positive stimuli (Watkins, Mathews, Williamson & Fuller, 1992; Bradley, Mogg & Williams, 1995). Beck (1976) proposed this pattern was due to depressed individuals displaying biased processing in favour of negative stimuli, due to schemas which reflect negative emotions, such as failure and worthlessness. Information which is relevant to these schemas is selectively attended and remembered better than irrelevant information, therefore leading to priority recall of negative stimuli. This is referred to as a mood-congruent memory bias, a recall advantage for information which is emotionally-relevant to one's mood, which can contribute to the development and maintenance of depression (Watkins et al., 1992).

Within Watkins et al.'s (1992) research, depressed and non-depressed individuals were tested on both implicit and explicit memory tasks. The explicit memory task measured cued-recall, whereas the implicit memory task took the form of a word completion task. Depressed participants were found to recall significantly more depression-related words than positive words, while non-depressed individuals recalled more positive than depression-related words. No significant difference was observed between participant groups on the recall of threat-related words, which suggests that the mood-congruent bias observed was specific to disorder-relevant words, and not negative stimuli in general. Despite this finding, no significant difference was discovered between depressed and control participant groups on the implicit recall task. Both groups were found to successfully complete more of the depression-related words than positive words, suggesting explicit and implicit memory systems are not associated (Watkins et al., 1992).

Similar findings were also reported by Bradley et al. (1995), however this time mood-congruent memory biases were discovered in depressed individuals on both implicit and explicit memory tasks. The implicit memory task used was a lexical decision task, containing both sub- and supra-threshold priming with depression and anxiety-related stimuli, while the explicit task tested recall of self-referenced depression-related, anxiety-related, positive and

neural words. Depressed participants displayed significant priming effects on both sub- and supra-threshold implicit memory tasks for depression-related words, and recalled significantly more depression-related words than anxious and control participants on the explicit memory test. Recall of these words was significantly positively correlated with participant scores on the BDI (Beck, Ward, Mendelson, Mock & Erbaugh, 1961) and the Hospital Anxiety and Depression Scale (HAD; Zigmond & Snaith, 1983). The control group were reported to show the greatest recall for positive words, more than anxiety or depression-related word categories, on the explicit memory test (Bradley, et al., 1995).

Further evidence by Hamilton and Gotlib (2008) supports the existence of mood-congruent memory bias in depressed individuals. Functional magnetic resonance imaging was used to assess amygdala activation during an implicit recognition memory task, in depressed and non-depressed participants. The amygdala is known to play a key role in learning and memory for emotionally-arousing stimuli, through its communications with the hippocampus, caudate nucleus and putamen (Packard, Cahill & McGaugh, 1994). During encoding, negative images were rated as more intense in both depressed and control groups, compared to neutral and negative stimuli. Despite this, depressed participants were discovered to display better memory performance for negative images whereas, in the non-depressed group, positive images were recognised more accurately than negative. Depressed individuals were also reported to display greater levels of activation in the right amygdala during encoding of negative images, which were later successfully recalled, than the control group. This increased responsivity in depressed participants was discovered to be greater for negative images, than positive or neutral stimuli, while no effect of stimulus valence was discovered in the control group. A significant correlation was discovered between the amygdala and putamen for recall of negative images within the depressed group, which was greater than that for positive images. A significant correlation was also discovered between depression severity and amygdala activation in response to negative stimuli, suggesting those with the most severe depression also had the greatest amygdala

activity. This implies that a mood-congruent bias exists in depressed individuals for the encoding and recall of negative stimuli, and suggests that these individuals may have an overactive emotion processing system, due to increased neural activity (Hamilton & Gotlib, 2008).

Williams, Becker, McKinnon, Wong, Cudney, Steiner et al. (2015) aimed to compare memory for emotional stimuli in pregnant and non-pregnant women in remission from previous depression, and those with no history of depression. The relationship between Salivary Cortisol (SCORT) and Salivary Alpha-amylase (SAA) and emotional memory in pregnant women was also investigated. Williams et al. predicted that those with a history of depression would show greater memory recall for negative stimuli than never-depressed women, due to the known memory-congruent bias associated with depression. It was also predicted that pregnancy would have no effect on emotional memory, and that SCORT and SAA levels would be increased with increased memory for negative images.

All participants were screened for depression, anxiety, sleep quality and PND risk at the beginning of the study. Saliva samples were collected at four time points during the testing period: ten minutes before the emotional memory task, immediately before the task, immediately after this task, then ten minutes after. Between the first two samples, participants were presented with instructions and a practice run of the task. After the second sample, the test began. One-hundred-and-forty-four images were displayed in total and, after each image, participants were required to give an emotional intensity rating between one and seven. As this task concluded, the third sample was taken, then the final sample ten minutes later. One week later, a surprise memory test was administered to participants. In this incidental recognition task, two-hundred-and-sixteen images were presented, including the original one-hundred-and-forty-four, plus some novel images. After the presentation of each, participants were asked to rate whether they had seen the image before. The depression, anxiety and sleep quality screens were also re-administered.

Results showed that pregnancy alone did not affect the emotional intensity ratings given, however an interaction was found between pregnancy and history of depression on these ratings, for both positive and negative images. Pregnant women with a history of depression tended to rate images as more emotionally intense than those without depression, while non-pregnant women with a history of depression rated the images as less intense than their non-depressed counterparts (Williams et al., 2015). Pregnant and non-pregnant women were also found to show similar recognition performance for each of the positive, negative and neutral images, suggesting that pregnancy does not influence memory for emotional stimuli. Women with a history of depression were found to perform poorer on the recognition task than the never-depressed group, however this was only seen for negative images. No difference between these groups was reported for the recognition of positive images, indicating that a selective impairment for the recognition of negative images may exist within women with a history of depression. The finding that the depressed-history group performed worse on the recognition of negative stimuli than positive, contrast the predicted results.

Assessing the role of hormones, poor recognition of negative images was significantly predicted by history of depression, and this result occurred independently of SCORT and SAA levels. Pregnancy was not found to influence emotional memory performance, with SCORT and SAA levels again being unrelated to these measures. This suggests that the discovered selective impairment for negative image recognition occurs independently to these salivary measures. Overall, pregnancy was not found to significantly affect memory processing for emotional stimuli, as pregnant and non-pregnant women performed similarly on this memory task. Instead, further support was found for the role of depression on memory, in the form of a mood-congruent memory bias towards negative stimuli.

Prospective Memory

Prospective memory (PM) is defined as the ability to remember to carry out a planned task in the future (McDaniel & Einstein, 2007). To do this, retention and recall of the intention to perform the task, at the required time or context, is vital (Brem, Ran, & Pascual-Leone, 2013). There are two main types of PM: event-based and time-based, which differ according to the triggers required for the completion of a task. For event-based PM, a specific, external cue is required, however for time-based PM, the task must be carried out without the presence of an external cue, instead relying on the time to trigger initiation of the required task. McDaniel and Einstein (2007) proposed that PM tasks require an interval between when an intention is formed and the opportunity in which it should be executed. An ongoing task, separate to the PM task is also necessary in order to test PM ability, removing the intention from immediate awareness, and preventing its maintenance as a current goal. Finally, completion of the task must be achievable in a short period of time, from the time at which the intention is created (McDaniel & Einstein, 2007).

Failures of PM, both time and event-based, can have severe consequences, such as forgetting to take medication and traffic accidents. This demonstrates the importance of PM functioning in daily life. Failures of PM, and the associated consequences, can however be abated by employing techniques such as the use of distinctive, external cues, vocalising the intention to carry out the PM task, and avoiding multi-tasking when performing important tasks (Dismukes, 2012).

Since PM tasks require effortful processing, due to a reliance on the self to remember to perform a task at a set, later time, Henry and Rendell's (2007) findings suggest that PM tests may reveal differences between pregnant and non-pregnant women. Casey, Huntsdale, Angus and Janes (1999) tested PM ability in pregnant women, using a single, call-back method, in which participants were instructed to call the laboratory a week after a testing session, to feedback on their memory performance. Pregnant women were found to have worse performance on this single measure of PM than non-pregnant controls, however this difference between groups failed to reach significance. Later, Crawley (2002) assessed

pregnancy-related PM change using a self-report design. Pregnant participants were asked to rate whether their memory performance had changed since becoming pregnant, and whether this difference was an improvement or decline. Control participants were given the same task but instead were asked to rate memory performance changed after leaving home. A significant difference between pregnant women and controls was discovered by Crawley, with a greater proportion of the pregnant group rating their current memory performance as worse than before, and fewer rating their performance as better than before the change, compared to controls.

Rendell and Henry (2008) also tested pregnant women's PM functioning, over a two-phase experiment, using both laboratory-based and naturalistic methods. 'Virtual week', a board game in which players must complete everyday PM tasks in their journey around the board, was used as the laboratory-based measure. Both 'regular' and 'irregular' PM tasks were included in the game, reflecting tasks which are performed in daily life either often or occasionally, respectively. 'Time-check' tasks were also assessed within the game, which required participants to monitor real time whilst playing, and signal when an arranged amount of time had passed (Rendell & Henry, 2008, p.915). A time-logging task was also administered in the first phase, whereby participants were informed to 'log' the time at pre-arranged times over a seven day period. Both pregnant and non-pregnant groups were tested using both virtual week and time-logging at an initial phase, when pregnant mothers were in their third trimester, then the time-logging task was repeated in the postpartum period.

Results found pregnancy had no effect on virtual week performance, however the time-logging performance was significantly worse in pregnant women. This group were found to be significantly less likely to log 'on time' responses than non-pregnant controls, and missed responses were also more frequent among the pregnant women. These results remained significant after controlling for self-rated sleep quality and number of children. These findings imply that pregnancy is associated with a decline in PM ability for everyday

tasks in a natural environment. The finding that no association was discovered using laboratory-based tasks has important implications, as the naturalistic, time-logging task has more practical significance and ecological validity than virtual week. This suggests that PM impairments are observable in pregnancy, however laboratory-based research might fail to identify the extent of these impairments in real life.

Relative to time-logging responses during pregnancy, postpartum responses were significantly less likely to be missed, and were much more likely to be made late instead. The PM deficit in pregnant women was therefore found to be greater than for postpartum mothers. Despite this, a similar frequency of 'on time' responses were made in both groups. Therefore, postpartum women did not perform better overall compared to pregnant women, but showed a different pattern of PM errors. Postpartum ratings of sleep quality were significantly higher than those in pregnancy. When this was controlled for, results for missed responses and very late responses remained significant (Rendell & Henry, 2008).

Cuttler et al. (2011) also assessed PM in pregnancy using a large battery of tasks, including both laboratory-based and naturalistic tests of PM. These aimed to assess the memory functioning of pregnant and non-pregnant women, and whether this was affected by the environment in which it was measured. Among the questionnaires given were the Prospective Memory Questionnaire (PMQ; Hannon, Adams, Harrington, Fries-Dias, & Gipson, 1995) and the Prospective and Retrospective Memory Questionnaire (PMRQ; Smith, Del Sala, Logie, & Maylor, 2000). These were administered twice. Once in regard to current memory state, and a second time to reflect the women's memory functioning before pregnancy. Non-pregnant controls were also asked to complete the questionnaires twice, reflecting a similar time interval.

Alongside the questionnaires, laboratory-based PM tasks were created. In one, participants were asked to break from the task and press a certain key when an image of fruit was seen. A second, more ecologically-valid task, involved the experimenter unplugging the phone before starting the test, and asking the participant to remind them to plug it in after

the test concluded. Naturalistic measures of PM also involved participants being asked to make two phone calls regarding the experiment: one the day before, confirming their attendance, and another one week after the laboratory visit. An additional questionnaire was also given, under the instruction to complete it at home and post it back then next day. Performance on these tasks was considered to give a measure of PM functioning in a natural, everyday environment.

Results indicated that pregnant women showed a greater deficit in PM than non-pregnant controls, however these objective deficits were only significant on two of the naturalistic tests of PM. The laboratory-based PM tasks found no significant effect of pregnancy on memory. Maternal mood, sleep quality, busyness and physical symptoms associated with pregnancy, were investigated as mediators of the relationship between pregnancy and increased PM errors. Only physical symptoms were found to correlate with worse performance on objective measures of PM. This has the possibility to affect the discrepancy between laboratory-based and naturalistic experiment results, due to the sample attending laboratory-based testing being biased towards women not experiencing physical symptoms associated with pregnancy, as these might be more likely to cancel their testing (Cuttler et al., 2011).

Subjective ratings of previous memory ability were not found to significantly differ between pregnant and non-pregnant groups, however a significant difference was discovered for current PM ratings, with the pregnant group expressing large memory impairments on all of the questionnaires given. For the pregnancy group, self-ratings on the episodic and habitual memory subscales of the PMQ (where the tasks required execution either once, or several times, respectively) were significantly related to performance on PM tasks, including the phone calls and laboratory-based fruit task. This significant correlation between subjective and objective measures of PM suggests that the reported discrepancies between these could be influenced by the environment that testing took place within, and that pregnant women do report genuine deficits.

These findings support those of Rendell and Henry (2008), who also reported a pregnancy-related deficit in PM when tested in a natural, everyday environment, but not within laboratory experiments. The non-significant findings of all laboratory-based objective measures of PM, suggests that reliance on laboratory-based methods may contribute to the inconclusive findings of previous research. The effortful processing required in PM tasks may be easier to achieve in a distraction-free laboratory, where attentional resources have less competition, therefore it is only when removed from this environment that everyday pregnancy-related PM deficits begin to show. Due to this, further research is required in order to investigate the extent of PM impairment in pregnancy and the postpartum, within a more natural testing environment. Despite this, the significant findings for a pregnancy-related PM impairment, discovered when tested in a natural environment, provide partial support to the concept that pregnant and non-pregnant women experience different memory processes. As with the findings for declarative memory, pregnant and non-pregnant women do show significant differences on PM tasks, however due to the potential confound of testing environment on the results, caution must be applied when speculating about this.

Research into the effects of emotion on PM performance also suggest there may be differences in task performance relative to the presence or absence of depressive symptoms within the sample. Research by Rude, Hertel, Jarrold, Covich and Hedlund (1999, p.268) reported that depressed individuals showed a greater PM impairment than non-depressive individuals, when tested with a time-based task which required 'self-initiated processing'. Participants were requested to press the 'F8' key at five-minute intervals throughout a general knowledge task. Following completion of this, participants were asked to confirm the instruction they had been given, in order to ensure any failures within the PM task were due to the forgetting of instructions, rather than misunderstanding. Depressive participants showed significantly poorer performance on both the general knowledge and time monitoring aspects of the PM task, than their non-depressive counterparts. The non-depressed group were also found to check the time more frequently during the task than depressed

individuals, especially when the five-minute target drew closer. A significant relationship was therefore discovered between the frequency with which the time was monitored during the PM task, and the participants' respective performance on this task, in both participant groups.

Similar findings were reported by Jeong and Cranney (2009), studying the effects of motivation and depressed mood on self-initiated PM performance. Participants were instructed to send a text message at an indicated time, on two specific occasions (three and six days following a meeting). One participant group were rewarded for their accuracy on this task, gaining extra course credit for execution of the task within ten minutes of the given target. A control group received no such incentive.

The reward group were found to perform significantly better on the PM task than controls, and showed a different pattern of self-initiated remembering. The rewarded individuals reported more retrievals taking place on target days than other days within the seven day period, while no retrieval difference was observed for the control group. This suggests that motivation increased PM performance. Likewise, a negative correlation was discovered between participants' depression score on the DASS-21 Depression Subscale (Lovibond & Lovibond, 1995) and the timeliness of task performance. These findings suggest that personal motivation increases the desire to perform a task, which as a consequence, improves the controlled processes which drive PM performance. It is perhaps this lack of this motivation in depressive individuals which underlies the marked impairment displayed within PM tasks. Alternatively, it is possible that the over-general memory encoding, often found within depressive individuals, could have led to poorer encoding strategies and consequently, poorer task performance (Williams, Barnhofer, Crane, Herman, Raes, Watkins et al., 2007).

Despite this, contrasting results were reported by Albiński, Kliegel, Sędek, and Kleszczewska-Albińska (2012).Participants took part in both an event and time-based PM task. While depressive individuals were found to perform significantly better than non-

depressives during the certain aspects of the 'ongoing' task, in which the event-based PM task was embedded, no significant difference between mood groups was found for event-based PM performance, or the speed of correct responding on this task. Contrasting previous results however (Jeong & Cranney, 2009; Rude et al., 1999) the time-based PM task showed depressed individual performed significantly better than non-depressed individuals. The depressive group were also reported to check the time more frequently than their non-depressed counterparts, however only when the time grew closer to the target time, at which they were told to stop the task without being prompted. This directly contrasts the findings of Rude et al. (1999), who found non-depressive individuals carried out more time checks than depressed individuals, especially drawing closer to the target time. Albiński at al. (2012) suggested this difference in time-based PM performance however, could be due to the differing findings for lab-based and naturalistic PM tasks. Since Albiński at al.'s (2012) task required reading printed stories at the participants' own pace, it is suggested this is a more naturalistic measure of PM than those which involve a novel computerised task (for example that of Rude et al., 1999). Due to the earlier mentioned debate over the influence of testing environment on PM performance, it is possible that mundane realism, the extent to which the tasks relate to real-life situations, may underlie these contrasting results.

The findings of Li, Weinborn, Loft and Maybery (2013) also support this debate, reporting the effect of depressive symptoms on PM performance differed as a function of the cue type and delay interval given. Participants were tested on the Memory for Intentions Screening Test (MIST; Raskin, Buckheit, & Sherrod, 2010) which involves both time and event-based of PM tasks. Four event-based and four time-based tasks were administered to participants while they engaged in an ongoing distractor task. Delay intervals for the PM tasks were manipulated, as two of the time and event based PM tasks were allocated a two minute interval, and the others a longer fifteen minute delay. Accurate responses were recorded as those given within one minute of the specified time in the short-delay tasks, and

within two minutes for the long-delay tasks. Within the event-based task, participants received an accurate score if they carried out the correct action immediately after the cue was given.

Depressive individuals were found to perform significantly worse than their non-depressed counterparts within the time-based PM tasks, however no significant group differences were reported for the event-based cues. While the two mood groups were not found to differ significantly in PM performance during the short-delay tasks, depressed individuals performed significantly worse than non-depressives on both time and event-based tasks when the delay was longer.

Based on the theory that application to real-life situations can influence PM results, it is unsurprising that a difference was observed on longer delay, but not shorter-delay tasks. These longer intervals resemble real-life PM more closely, as everyday PM tasks for example remembering to take medication at a certain time, often occur require remembering to execute the task over a long interval. Short, two-minute intervals between initial awareness of the task and the time at which it must be performed, are much rarer in everyday PM tasks. Due to this, this data may provide support to the debate that the testing environment, or how closely the experiment resembles every PM functioning, influences the data, with those having greater resemblance to real life situations showing greater deficits of PM.

An explanation for the findings of time-based but not event-based PM deficits in depressed individual could be based on the focus required for each of these tasks. Time-based PM tasks require more self-initiated retrieval than event-based tasks, so are therefore, more demanding on the resources of attention and executive functioning (Li et al., 2013). Since depression is associated with reduced executive functioning (Clark, Chamberlain & Sahakian, 2009), this could explain the differing results for time and event-based PM performance. The findings that depressed individuals performed significantly poorer after a longer interval than a shorter delay supports this theory further, as performing a PM task for

longer periods, whist also performing an ongoing task, imposes a greater use of attentional resources. This reduces executive functioning capacity, as well as reducing the likelihood that attentional resources would be allocated effectively within depressed individuals (Clark et al., 2009).

Li, Loft, Weinborn and Maybery (2014) investigated this resource allocation theory behind the performance of PM in depressive individuals. Participants were screened for depressive symptoms using the BDI-II (Beck, Steer & Brown, 1996), scores from which were used to divide participants into two symptom groups: 'low depressive symptomatology' (LDS) and 'high depressive symptomatology' (HDS; Li et al., 2014, p.577). Tests were also administered on attention and working memory functioning in participants, to rule out any confounds of poor attentional functioning on the PM task results. No significant difference in these tests were found between the HDS and LDS participants.

A lexical decision task was used as the 'ongoing' task, whereby letter strings were presented to participants using a computer program, and participants were asked to indicate whether each letter string was an English word or non-word, by pressing specified keys. An event-based PM task was embedded within this task, which required participants to press the 'F1' key whenever any of five previously learned words appeared on the screen. The importance of directing attentional resources to each of the ongoing and PM tasks was manipulated within participants, with each being tested on two trials: one in which they were explicitly told to focus their attention on completing the ongoing task with accuracy, the other where attention was to be focused upon the PM task.

Lexical decision responding was found to be slower in the test block where PM task importance was stated, compared to the block were the importance of the ongoing lexical decisions task was emphasised. This suggests that all participants focused their attention more on the PM task when the importance of this was stated. No significant difference in performance was found between groups when they were told to focus on the ongoing task. Due to the two depressive-symptom groups showing the same pattern of responding, this

implies that both LDS and HDS groups were able to allocate attention with similar effectiveness, achieving similar event-based PM performance on this task. Importantly, no significant deficit in PM performance was observed for HDS individuals compared to LDS, when attention was focused on the ongoing task.

When the importance of the PM task was increased however, performance accuracy was significantly poorer in the HDS than LDS groups. LDS participants' performance on the PM task significantly increased from the 'ongoing task importance' to the 'PM task importance' blocks, suggesting their attentional focus was redirected from the lexical decision task to the PM task. HDS participants however, failed to show any significant increase in PM accuracy between the two conditions. This implies that individuals with greater symptoms of depression failed to improve their PM performance by effectively redirecting attentional resources from the ongoing task, when importance of the PM task was explicitly stated. This suggests that depressed individuals may have reduced control over their resource allocation, showing an 'attentional resource allocation impairment' (Li et al., 2014, p.584).

Recognition of the target words was also tested following completion of the PM task, which found no significant differences between LDS and HDS individuals. This supports the attentional allocation impairment theory in depressed individuals, suggesting the differences reported between both groups was not due to the HDS individuals forgetting the target words for which they needed to respond. HDS participants also reported greater distractibility than LDS participants during the task, and this reported distractibility correlated with depression scores on the BDI, however not with PM task performance. No significant associations were found between these characteristics for the LDS group. This further supports the theory that HDS participants failed to improve their PM performance due to attentional allocation impairments, rather than due to the distractions caused by ruminative thought patterns often associated with depression (Li et al., 2014).

Overall, the literature concludes that depressive individuals display PM impairments, at least within time-based PM tasks, while further research must be carried out to ascertain the effects of depression on event-based PM. These findings show a similar trend to those for the effects of pregnancy on PM performance, as pregnant and recently postpartum women showed time-based PM deficits (Cuttler et al., 2011; Rendell & Henry, 2008). It is possible that differences in resource allocation underlie this impairment in time-based PM within these groups, as there is a heavier focus on self-initiated remembering within this type of task. Time-based PM requires greater executive functioning and control over attentional resources. Both depression and pregnancy have been found to be associated with reduced executive functioning (Clark et al., 2009; Henry & Rendell, 2007), therefore it is possible that this factor could underlie the similar findings within these groups.

Autobiographical Memory

Although PM is less well understood in terms of how it is affected by emotion, a lot of research has been carried out into autobiographical memory (AM) and its links with emotion, particularly within the effect of depression on this memory type. Autobiographical Memory (AM) is defined as 'the recollection of facts and events that have been interpreted and integrated into a consistent story about one's self' (Buckner & Fivush, 1998, p.407). It is comprised of recollections about the self, which contribute to the experience of self-concept and purpose. AMs can be stored at different levels of specificity, which depend upon the details included within the memory. Specific AMs refer to an event which occurred once, on a single occasion, while general AMs often take the form of either categoric or extended memories. Categoric AMs detail events which are experienced repeatedly, such as visiting the dentist, while extended memories involve the recollection of an event which took place over more than one day, for example recalling a particular holiday (Anderson, Dewhurst & Dean, 2017).

AMs are believed to be stored in a hierarchical manner, with retrieval taking place via two main routes: generative or direct retrieval (Conway & Pleydell-Pearce, 2000).

Generative retrieval is a cognitively effortful process, in which general AMs are recalled earlier than more specific AMs and event-specific knowledge. On the other hand, direct recall is achieved through spontaneous recall of specific memories, which does not require cognitive effort, and bypasses the more general memory retrieval stages (Conway & Pleydell-Pearce, 2000).

The functions of AM mainly cover three categories, fulfilling 'self, social and directive' purposes (Bluck, 2003, p.113). Within the 'self' function, Robinson (1992) proposed two main roles of AM, which cover self-concept and mood regulation. It is proposed that AM plays a role in the construction of a consistent self-concept, giving the experience of an enduring sense of identity. Evidence for this function of AM was provided by Conway (1990), who found that students who performed poorly in an exam distorted their prior predictions of their expected grade, hard work put in during exam preparation and importance of the exam, to be lower. Since the student's AMs did not remain the same before and after the exam, this suggests that AMs were updated and distorted to match their self-image at the time, resulting in a consistent self-concept.

The second 'self' function of AM, proposed by Robinson (1992), postulated that humans tend to retrieve memories in order to change or maintain their current mood, and maximise their self-esteem. Parrott and Sabini (1990) provided evidence of this, when students were asked to recall AMs after receiving exam grades. Results showed students who performed worse on the exam retrieved more positive memories, which boost mood, while students who received high grades retrieved more negative memories. These were proposed to restore emotional equilibrium after the good news, having a humbling effect.

The 'social' functional category of AM, proposed by Robinson (1992) as 'interpersonal', suggested AM is found to play a role in the formation and maintenance of relationships, as well as the self-concept. AMs are exchanged in the development of friendships, and these relationships can be further boosted through referral to past shared AMs and reminiscing (Neisser, 1988).

The final main role of AM, coined as the 'directive' function by Bluck (2003), suggests that AMs are reflected upon, in order to 'inform, guide, motivate and inspire' future behaviour and decisions (Pillemer, 2003, p.193). Cohen (1996) proposed that AM plays a role in social-problem solving, as retrieving AMs of past experiences can help to solve current, similar problems. Evidence for the directive function of AM was provided by Goldsmith and Pillemer (1988) who found that, when asking participants to recall a statement made by a parent, almost half of these (46%) contained instruction or advice to guide future behaviour. This suggests that these memories have the power to influence future decisions.

A strong relationship between negative affect and over-general AM recall has been established in previous research. Increasing evidence reports a bias in depressed individuals to recall general, rather than specific AMs. Williams and Broadbent (1986) developed the Autobiographical Memory Test (AMT) to investigate specific AM retrieval in response to emotional cue words. The names of five positive and five negative emotions were used as cue words, which were presented to participants one at a time. After each, participants were asked to retrieve a specific memory in response to the cue. If general memories were provided, participants were prompted to recall more specific details If no memory had been retrieved after one minute, the researcher moved on to the next item.

In Williams and Broadbent's (1986) research, para-suicide patients who had previously taken an intentional overdose were tested on the Profile of Mood States questionnaire (POMS; McNair, Lorr, &. Droppleman, 1981), Hopelessness Scale (Beck, Weissman, Lester, & Trexler, 1974) and the AMT. Emotional disturbance in para-suicide patients was measured using the POMS questionnaire (McNair, et al., 1981), which assessed the degree to which sensations such as fatigue, depression and anger were experienced. The para-suicide group were found to be significantly more 'disturbed' on all measures of the POMS than the control group. Significant levels of hopelessness were also recorded in the para-suicide group, compared to controls, when tested using the Hopelessness Scale (Beck, et al., 1974).

AMT results showed para-suicide patients demonstrated over-general memory retrieval, despite being given specific memory prompts. Fewer specific memories were retrieved by the overdose group in Williams and Broadbent's (1986) study, as a significantly higher proportion of no-retrieval responses was recorded within this group, compared to controls. The para-suicide group were also found to provide a greater number of non-specific memories to cues than the control group (Williams & Broadbent, 1986). This effect was most prevalent for positive cues than negative, with para-suicide patients providing fewer specific memories of positive AMs, and slower memory retrieval when given a positive cue than for negative cues. The likelihood of the drug overdose confounding the relationship between AM bias and emotional disturbance is reduced, due to the finding of slower retrieval for only the positive cue words in overdose patients. AM recall latencies did not significantly differ between the para-suicide and control groups for negative cues, suggesting that the AM retrieval bias experienced in emotional disturbance is caused by delayed positive memory recall, rather than enhanced and more rapid recall of negative memories (Williams & Broadbent, 1986).

Following this, Williams and Dritschel (1988) investigated whether the over-general recall bias continued into remission from emotional disturbance, using the same procedure as Williams and Broadbent (1986). Para-suicide patients, along with ex-patients, who had previously attempted suicide between three and fourteen months prior to testing, were tested in relation to their AM specificity, and latency when retrieving specific AMs. This was to investigate whether differences would be observed between patients who had attempted suicide recently and those who had done so in the past. Significant emotional disturbance was reported in both the overdose and ex-patient groups from the POMS questionnaire, and hopelessness was also found to be significantly higher in both these groups, compared to the control group, using the Hopelessness Scale. This suggests that no significant improvement in mood was discovered between the para-suicide and ex-patient groups.

On the AMT, no latency differences were found between para-suicide patients and controls, although the para-suicide group were again found to recall significantly less specific AMs in response to cues. This over-general retrieval bias was also observed in the ex-patient group, however no significant difference was found in overall specificity between the para-suicide and ex-patient groups. Despite this, parasuicide and ex-patient groups were found to show opposite patterns of specificity in relation to cue valence. Supporting the effect of valence reported by Williams and Broadbent (1986), recollections of negative events were more specific than positive recollections in the para-suicide group. However, the ex-patient group displayed more specific recall in the direction of positive cues, which was consistent with the healthy control group findings. The persistence of over-general AM retrieval in the ex-patient group, suggests this could be a potential cognitive vulnerability factor for emotional disturbance, rather than a symptom, due to the lack of influence of improved affect levels. Therefore, individuals displaying over-general AM retrieval may have a predisposition towards experiencing negative affect (Williams & Dritschel, 1988).

Brittlebank, Scott, Mark, Williams and Ferrier (1993) provided further evidence of over-general AM retrieval as a risk factor for depression. Depressed individuals were reported to demonstrate over-general AM retrieval at an initial test, with cued positive memories being more over-general than responses to negative cues. This over-general AM recall remained unchanged at the seven-month follow up. Over-general responses to positive cues were found to be highly correlated with Hamilton Rating Scale for Depression (HRSD; Hamilton, 1986) score at both three and seven month follow up sessions, while these over-general recollections to negative cues only correlated with HRSD scores at the later follow up. Over-general responses to positive cues at the initial AM test, significantly predicted HRSD score at the follow up, suggesting that over-general AM recall has predictive power to estimate an individual's depression outcome. Over-general AM recall was found to impact negatively upon recovery from depression, with only eleven percent of the over-general to positive cues group recovering after seven months, compared to eighty

percent of the group who had given specific responses to positive cues. Therefore, over-general AM retrieval was highly negatively correlated with responsiveness to treatment. This finding supports those of Williams and Dritschel (1988) suggesting over-general AM recall is a trait of individuals prone to depression, rather than a symptom of the depression.

Social Problem Solving and Over-general Memory Retrieval

The link between over-general AM retrieval and problem solving deficit has also been investigated in relation to emotional disturbance and depression. Marx, Williams and Claridge (1992) proposed depressed individuals experience problem solving deficits due to negative affect and an over-general cognitive style. The role of specific memories in problem solving is reported to influence both understanding of the problem and the production of solutions. First, specific memories of previous experiences provide more detail than general memories, which could be useful in defining the context of the problem. The better the problem to be solved is understood, the greater the probability of producing an effective solution. Also, by accessing a large number of specific memories, which could be considered as possible solutions to the problem, an individual has a greater chance of producing an appropriate solution, as more alternatives are considered (Evans, Williams, O'Loughlin & Howells, 1992). Therefore, it is proposed that problem solving ability is dependent on the specificity of AM retrieval reached. The inability to retrieve specific AMs is suggested to have a detrimental impact upon an individual's ability to solve problems.

Evans et al. (1992) proposed that AM and problem solving deficits are linked in a cycle, and contribute to the development and maintenance of mood disorders. In emotional crises, access to the database of specific events is impaired, leading to poor recollection. When specific positive memories cannot be accessed, an individual's ability to effectively solve a problem is limited, as these specific memories are useful in the development of coping strategies and solutions (Evans et al., 1992).

Consistent with the findings of Williams and Broadbent (1986) and Williams and Dritschel (1988), Evans et al. (1992) reported para-suicide patients to recall significantly

fewer specific memories in response to emotionally toned cues than controls, and to give more over-general responses. An increased latency was observed for both para-suicide and control groups in response to positive cues compared to negative, however the difference in latency between positive and negative responding was significantly greater in the para-suicide group, suggesting this group were much slower to retrieve positive memories. When tested with the Means-End Problem Solving Procedure (MEPS), the para-suicide group displayed greater deficits, providing significantly fewer solutions and more 'no means' results, where a solution was not provided, than controls (Evans et al., 1992, p.402). Effectiveness ratings also implied that para-suicide individuals were less effective than controls in their problem solving attempts. A significant correlation was found between effectiveness at solving problems and over-general AM recall, with those experiencing the greatest specific AM deficits also demonstrating the most ineffective problem solving. This correlation remained highly significant when controlling for latency of response, suggesting it was not mediated by participant unresponsiveness.

Support for this finding was provided by Goddard, Dritschel and Burton (1996). Consistent with previous findings, depressed participants were found to recall significantly fewer specific memories, and more over-general memories than controls. Significantly slower AM retrieval was also seen in depressives than controls, with the greatest latencies observed for depressed participants in response to positive cues (supporting Evans et al., 1992; Williams & Broadbent, 1986; Williams & Dritschel, 1988). No significant difference in latency was observed for negative memories between depressives and controls.

Consistent with Evans et al. (1992), on the MEPS task, depressed individuals produced fewer solutions, and these responses were less effective than those produced by non-depressed controls. The number of specific memories recalled during the AM task was significantly correlated with the effectiveness of solutions provided in both depressed and non-depressed groups, while this correlation was only significant for number of solutions provided, in the control group. A significant negative correlation between the latency to

retrieve positive memories on the AM task and performance on the MEPS task was found within the depressive group. Those recalling specific memories faster performed the task more effectively.

This was further qualified by a significant correlation between MEPS performance and the types of memory retrieved within this task. A significant negative correlation was reported between categoric retrieval and MEPS performance on both number of solutions provided and effectiveness, in both depressed and control groups, while a positive correlation was reported for specific memory retrieval and MEPS performance. This suggested that successful problem solving was significantly related to access to specific AMs.

Depressed patients performed more poorly than controls on both the AM and problem solving tasks. Over-general AMs were retrieved more than specific AMs, and fewer and less effective solutions were provided to problems. This is consistent with previous findings by Evans et al. (1992). However, the observed relationship between over-general memory retrieval and poor problem solving, although stronger in depressed participants, was also found to be significant within the control group. This suggests that the relationship between over-general AM and problem solving is not dependent on the co-existence of depression / emotional disturbance as previously believed. Williams (1996) proposed that general memory retrieval encourages self-rumination on past problem solving experiences. If those experiences were negative, this self-rumination is proposed to promote negative feelings towards the issue and preoccupation, which decreases the cognitive resources available to solve the problem. If the past experience was positive however, it can lead to a lack of motivation to find a new solution to the problem. Goddard et al.'s (1996) finding that control participants also showed this same relationship between memory specificity and problem solving, supports a resource availability model of problem solving. For non-depressives, it is suggested that detailed solutions are not created due to the great availability of past experiences found in categoric retrieval. This leads to a lack of motivation

to seek a more detailed solution through specific memory recall. This too, shows a reduction in cognitive resource availability, due to motivation rather than rumination taking resources (Goddard et al., 1996).

Overall, Evans et al. (1992) and Goddard et al.'s (1996) collective findings suggest that over-general AM impedes an individual's ability to produce appropriate solutions to problems. Due to the pattern of poor performance displayed by depressed participants on both, it is proposed that specific AM retrieval and developing social problem solving strategies are reliant on the same underlying processes. These are thought to influence one another with poor problem solving showing as another vulnerability factor for depression.

The effect of stress on the relationship between over-general AM recall and depression has also been investigated by Anderson, Goddard and Powell (2010). Non-clinical participants were tested on the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961) and the AMT (Williams & Broadbent, 1986) at an initial session, then a repeat of the BDI alongside the Survey of Recent Life Experiences (SRLE, Kohn & Macdonald, 1992) were administered at a second session.

Tendency to recall categoric memories was reported to significantly predict future symptoms of depression, and this relationship was not affected by the presence or absence of daily hassles. Memory specificity however, was not found to significantly predict depressive symptoms after controlling for stress, but was discovered as a moderator of the relationship between depression and high levels of life stress. Those who reported greater levels of stress over the three months between testing periods were more likely to report greater levels of depression at the second test session, than those reporting lower levels of stress. This supports and extends the previous findings that over-general AM is a risk factor for depression, as the same pattern of results were found within a non-clinical sample of students, as were found for clinically depressed or emotionally distressed participants. This suggests that the same risk factors and cognitive processes which exist in depressives are also present within non-clinical populations.

Reduced AM specificity was found to effectively predict depression in the context of chronic life stress. This finding, along with the previously discovered finding that over-generality inhibits problem solving ability, has significant implications for individuals displaying reduced AM specificity. It is proposed that life stress causes competition for attentional resources, which can reduce the capacity of the working memory (Klein & Boals, 2001). This increases the difficulty of cognitively 'effortful' tasks, such as the retrieval of specific memories and problem solving. This in turn can lead to the observed over-general recall and a decline in effective problem solving, resulting in poorer coping strategies being developed (Klein & Boals, 2001). Therefore, when faced with high life stress, individuals with reduced AM specificity may display poorer coping strategies, due to the detrimental effects of over-general AM on problem solving.

Anderson et al.'s (2010) finding that reduced specificity did not predict future depressive symptoms alone, suggests that its effect may only be seen when accompanied by high levels of life stress. During times of stress, access to specific memories is required to find an effective solution, as proposed by Evans et al. (1992). Experiencing difficulty in this task, due to reduced AM specificity, may cause vulnerability to depressive symptoms, as individuals cannot effectively solve the problem which is causing them stress. Despite this, Anderson et al.'s findings do not support the previous findings of Gibbs and Rude (2004), who reported that greater experience of stressful life events, combined with over-general AM retrieval, increased the risk of experiencing depressive symptoms. Although categoric retrieval significantly predicted depressive symptoms, this relationship was not moderated by the presence of daily hassles.

Overall, these findings imply that depressed and non-depressed individuals experience significant differences in their AM processes, with depressed and even previously depressed individuals experiencing an impaired ability to recall specific AMs. Although not directly relevant to the current research, the AM deficits observed by Williams et al (1986) and others in different subclinical groups, show that measures of AM specificity

can provide insights into the cognitive deficits that might be associated with PND. This, combined with the findings for declarative, working, emotional and prospective memory, collectively suggest that depressive and non-depressive individuals do experience differences within their memory processes, and that these differences could pose as vulnerability factors for the development of depression. The finding of over-general AM recall in depressed individuals has implications on their treatment outcome and social problem solving ability, both of which could influence maternal mental health and ability to parent adequately. Due to this, differences in AM specificity within PND were reviewed.

Autobiographical Memory Specificity in Postnatal Depression

Focussing on the specific topic of PND, Croll and Bryant (2000) compared the accessibility of positive and negative memories in postnatally depressed mothers. Postnatally depressed and control groups were divided using EPDS scores (Cox et al., 1987), with scores less than ten indicating healthy controls and scores greater than thirteen signifying the presence of PND. Significantly fewer specific memories were reported by the PND group than non-depressed participants, with the depressed individuals also being slower to retrieve these specific memories. Severity of PND, as indicated by EPDS score, was found to be significantly negatively correlated with the retrieval of both specific neural and negative memories. This means that as PND severity increased, retrieval of these specific memories decreased.

When specifically asked to recall parent-related memories, more negative specific memories were reported by the PND group than positive, while the reverse of this was seen in the non-depressed participants. This supports the findings of Williams and Dritschel (1988) and Brittlebank et al. (1993) who also found that individuals experiencing negative affect recalled more specific negative than positive memories. Postnatally depressed participants retrieved statistically more specific negative parental memories than non-depressed participants, therefore, disorder-relevant recollections were found to differ in specificity to those unrelated to the condition. The PND group were also found to report

significantly less parent-related specific memories overall than non-depressed participants. Severity of PND was found to be negatively correlated with positive parent-related memory recall, suggesting that those with the severest depression levels had the worst deficit in retrieving positive parental memories.

Statistically slower retrieval of specific memories was observed in all conditions for the PND group compared to controls, with severity of PND being significantly positively correlated with retrieval latency of positive memories. However, when time since birth was controlled for, this effect was lost for the parent-related positive memories. These findings support the established association between over-general AM retrieval and depression, which is replicated widely across the field of emotional disturbance.

Due to memory specificity being consistently reported as a vulnerability factor for depression, Mackinger, Loschin and Leibetseder (2000) investigated whether future affective changes could be predicted based upon specificity of AM retrieval. Pregnant women are considered to have an increased risk of future negative affect than non-depressed controls, due to childbirth being a significant life event which can lead to stress and depressed mood. For AM specificity to be a considered a vulnerability marker, it must be able to predict the development of negative affect in currently non-depressed women (Mackinger et al., 2000).

A sample of pregnant women were tested on the AMT, in order to assess specific memory recall. These women also completed the EPDS (Cox et al., 1987) at the same testing interval as the AMT, to discover a baseline measure of depressive effect. The EPDS was then repeated three months post-partum, in order to see whether the women experienced affective changes after childbirth. Mental speed was measured to control for impairment of automatic processing, due to the unknown effect of such factors as hormones and stress, which could affect each participant differently.

Specific event recollections were found to be the most frequent response, with categoric responses being the next most frequent. This is consistent with findings of non-

depressed groups in previous research (Goddard et al., 1996), whereas depressive participants tend to show a reversed pattern of results, reporting more categoric, and less specific memories (Croll & Bryant, 2000).

AM variables were not significantly correlated with EPDS scores at the first testing period, which suggests that current mood was not affected by level of specificity of AM recall. This supports the proposition that AM specificity is a 'trait-marker' of depression, rather than a symptom which is caused by affective changes (Mackinger et al., 2000, p.53).

Results showed that, controlling for mental speed, only the categoric responses to negative cues were found to significantly contribute to the prediction of affective change. This proposes that faster mental speed, along with a natural bias toward categorical AM responses prenatally, carried the greatest risk of developing negative affect, and to a greater extent, postnatally. Therefore, it was possible to predict future postnatal affective changes in currently non-depressed women, by testing AM response specificity to negative cues, prenatally.

Similar results were also discovered by Hauer, Wessel, Engelhard, Peeters and Dalgleish (2009) who investigated whether prenatal AM specificity would predict postnatal depressive and Post-Traumatic Stress Disorder (PTSD) symptoms, within a sample of hospitalised pregnant women, for whom a complicated delivery was anticipated. The AMT was administered in the same way as Williams and Broadbent (1986), using five positive and five negative cue-words. Women were asked to recall a specific memory of an event which occurred prior to their hospitalisation, in response to each cue-word. Recalled memories were rated for their specificity and relatedness to pregnancy. A number of other questionnaires were also administered, including the BDI-II (Beck, Steer & Brown, 1996) to assess depressive symptoms, the PTSD Symptom Scale – Self-Report version (PSS-SR; Foa, Riggs, Dancu, & Rothbaum, 1993) to measure symptoms of PTSD, and the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) which measured avoidance and intrusion symptoms associated with a specific negative experience. At the baseline testing

period, during pregnancy, women completed the PSS-SR and IES in relation to a previous traumatic experience, which caused emotional distress. The AMT and BDI-II were also administered at this stage. At a follow-up, six weeks postpartum, the PSS-SR, BDI-II and IES were re-administered, this time in relation to the experience of childbirth.

Findings revealed that AM specificity was significantly related to PTSD symptom severity, while the relationship with depression severity just missed significance. Women who gained higher baseline scores on the PSS-SR and BDI-II were found to recall fewer specific memories overall, in response to cue-words. Baseline scores on the PSS-SR and BDI-II, along with the number of specific pregnancy-related positive events recalled at baseline, were significantly correlated with postpartum PTSD symptom severity. Reduced specificity for positive pregnancy-related memories was discovered to predict greater levels of PTSD and depressive symptoms, as indicated by higher scores on the PSS-SR and BDI-II respectively. These findings support those Croll and Bryant (2000), who also found mothers with PND had impaired specific memory recall, especially for positive parenting-related memories. These findings support and extend those for general depression, showing a similar pattern in AM specificity impairment within PND, and a separate deficit for pregnancy / parenting-related memories. Mackinger et al.'s (2000) findings are also supported, as prenatal reduced AM specificity predicted postnatal depressive and stress symptoms, however in response to positive cues, rather than negative. This extends the ability of AM to predict negative affect in non-clinical populations with an increased risk for depression. A stress-diathesis model is proposed, in which childbirth is the stressful life event which, when combined with the vulnerability factor of over-general AM retrieval, can lead to the development of postnatal negative affect in non-clinical individuals (Mackinger et al., 2000). This finding supports the proposal that the same processes are active in both non-clinical and clinical populations, and the 'continuity' hypothesis of depression, whereby clinically depressed individuals display the same traits as non-depressed, just at a higher level on the 'scale'.

Phenomenological Characteristics of Autobiographical Memory

In addition to specificity, other phenomenological characteristics of AM can differ between individuals, such as the vividness and emotional content of a memory. Phenomenological details of memories enable us to experience life-like recollections, as though mentally re-living the recalled event. The phenomenological experience of AM is typically measured using questionnaires, in which ratings are made on the extent to which different characteristics are experienced when recalling the event. There are a number of questionnaires which were designed for this purpose, such as the Autobiographical Memory Questionnaire (AMQ; Talarico, LaBar, & Rubin, 2004), the Memory Experiences Questionnaire (MEQ; Sutin & Robins, 2007) and the Autobiographical Memory Characteristics Questionnaire (AMCQ; Boyacioglu & Akfirat, 2015). Each of these have their own strengths and limitations. The AMQ assessed very few properties of AM, with some only being tested using a single question. Sutin and Robins (2007) developed the highly reliable MEQ to address the AMQs limitations, assessing ten characteristics of memory phenomenology (vividness, coherence, accessibility, time perspective, sensory detail, emotional intensity, visual perspective, sharing, distancing and valence) using 63 items. The AMCQ assessed a further four characteristics of AM (location details, accuracy, preoccupation with emotion and recollection) on top of those included within the MEQ, again with 63 items. Internal consistency and reliability were reported to be very good for the AMCQ (Boyacioglu & Akfirat, 2015). Despite this, rating a memory recollection on 63 items can be time consuming, and is not always practical, for example when these rating need to be made for several different memories in a single testing period. Due to this, some researchers have opted to measure phenomenological characteristics of memory recollections using a subset of the dimensions used within these questionnaires (Anderson & Evans, 2015). This is of particular use when the study involves participants with limited time or concentration span, or if a large number of memory recollections are required.

A relationship between depression and phenomenological characteristics of AM has been proposed, whereby depressed individuals are believed to experience reduced memory phenomenology, particularly when retrieving positive AMs. Evidence exists which proposes such characteristics as vividness influence the risk of developing depression, as the ease of recalling vivid positive events has been negatively correlated with vulnerability to depression (Williams et al., 2007). In this way, memory vividness is found to act as a protective barrier against depression, as the ability to recall vivid positive memories can help bolster mood and restore emotional equilibrium.

Further evidence of this compromised phenomenological experience in depression was found when investigating the visual perspective from which AMs are recalled. Both currently depressed and previously depressed individuals are reported to show impaired phenomenology when recalling positive, but not negative memories, experiencing these recollections from an observer viewpoint, rather than first-person perspective, compared to never-depressed individuals (Lemogne, Piolino, Friszer, Claret, Girault, Jouvent, et al., 2006; Bergouignan, Lemogne, Foucher, Longin, Vistoli, Allilaire, et al., 2008). Lemogne et al. (2006) investigated auto-noetic consciousness, the ability to mentally relive the subjective experience of a memory in its original context, and the visual perspective from which AM recollections are viewed from. Field perspective relates to memory recollections as seen through your own eyes, which focuses on the original context of the event. Contrastingly, observer perspective relates to recollection from an outsider point of view, and tends to focus on the self (Frank & Gilovich, 1989). Visual perspective has previously been linked with self-relevance of AMs, with healthy participants predominantly providing field ratings for AMs which they deem relevant to their current remembering self, and greater observer responses if the AM is no longer relevant to the current self-perspective, but more relevant to the past, remembered self (Libby & Eibach, 2002; Wilson & Ross, 2003). In this way, field perspective reinforces feelings of continuity between the current and past remembered self,

whereas observer perspective supports an inconsistency between the two (Bergouignan et al., 2008).

In Lemogne et al.'s (2006) research, participants were asked to recall a number of specific AMs from different lifetime periods, then details of the memories were recorded. Consciousness during AM retrieval was measured using the 'remember / know' procedure, whereby 'remember' ratings were given if memory details were recalled by remembering the context of the event, 'know' responses were made if this recollection was not required to provide the detail information, or 'guess' responses were made if the certainty of the recollected information was low. These ratings were made for each of the memory details recorded. Visual perspective was measured by asking the participant to identify whether each memory recollection was experienced from either a first-person field perspective or an observer point of view. Finally, for each 'remember' response made, participants were asked to provide specific details, such as emotion, time, and location information. Specificity of recalled memories was decided upon using an inter-rater approach, based on the details provided.

Findings showed that depressed individuals provided significantly fewer specific positive memories than controls, made significantly less 'remember' responses and significantly more observer-perspective ratings for positive recollections, than did controls. Significantly reduced remember scores were also reported by depressive participants, compared to non-depressive, for negative memories. No differences in specificity or visual perspective were found between groups for negative recollections. Post hoc tests revealed depressed individuals gave more remember responses to negative rather than positive events, and more field-perspective ratings for negative memories. Controls showed the opposite pattern, providing more remember scores for positive rather than negative memories, and positive memories were recalled with greater specificity. No difference in specificity was found within the depressed group (Lemogne et al., 2006). These results suggest the subjective experience of positive AMs is compromised in depressed individuals,

who show impairments in auto-noetic consciousness, visual perspective and specificity when recalling positive AMs. The finding that depressed individuals experienced significantly less field-perspective recollections of positive, compared to negative events, suggests they may lack the ability to relate these positive memories to their current self. This is based on previous findings that healthy controls relate more positive memories to their current self through field-perspective, and negative memories to a previous self through observer-perspective (Libby & Eibach, 2002; Wilson & Ross, 2003). It is possible that by manipulating the visual-perspective from which positive AMs are experienced, depressed individuals may find it easier to relate positive AMs to their current self-perspective, reducing the experienced discrepancy (Lemogne et al., 2006).

Bergouignan et al. (2008) conducted similar research using currently remitted individuals, who had a previous history of depression. A similar procedure to that of Lemogne et al. (2006) was employed, whereby semi-structured interviews were administered, in which participants were asked to recall specific positive and negative AMs from numerous lifetime periods. Visual perspective was assessed, providing a rating of either field or observer perspective for each recollected memory, then the 'remember / know' procedure was conducted to assess consciousness when recalling AMs. This was administered in the same way as that of Lemogne et al., and specific contextual details were provided for all 'remember' responses made. Episodic specificity scores were then calculated, summing the specificity, 'remember' and field perspective scores, and dividing this by three. Bergouignan et al. predicted, based on Lemogne et al.'s findings, that remitted participants would show reduced AM specificity, and that this impairment would be most evident in positive recalled events.

Results showed the previously depressed participants experienced significantly lower episodic specificity than controls for positive memories, while no group difference was discovered for negative recollections. Greater episodic specificity was discovered for negative recollections within the depressed-history group, while never-depressed individuals

showed no difference in specificity between positive and negative memories. No significant differences were discovered between either valence or participant groups for memory specificity or 'remember' responses, however visual perspective yielded a significant result. Remitted participants experienced significantly less field perspective recollections for positive events than controls, however no group difference was discovered for negative events. Overall, Bergouignan et al.'s (2008) findings suggest that individuals in remission from depression display impaired episodic specificity of AM, which is based upon differences in the visual perspective from which positive recollections are experienced. Due to the link between visual and self-perspectives, it is possible remitted individuals recalled positive memories from an observer perspective because of the discrepancy in self-perspective between their current and past-remembered selves. Past positive behaviours are experienced at a distance, due to the incongruence between these and their current self-perspective, which remains negative despite remission from depression. This pattern of results supports those discovered within currently depressed individuals (Lemogne et al., 2006), suggesting phenomenological characteristics associated with AM recall are impaired for positive events.

Contrasting findings were reported by Werner-Seidler and Moulds (2011), who investigated phenomenological characteristics of AM in individuals with a previous history of depression, whilst experiencing an induced sad-mood state. Individuals who have an increased risk for depression, such as those with a depressive history, experience increased maladaptive thinking when a sad-mood is triggered. This is known as the Differential Activation Hypothesis, based around the level of negative reactivity triggered following sad mood induction (Teasdale, 1988). Maladaptive thinking can exacerbate an individual's negative mood state from mild to severe, forming a cycle between low mood and increased negative cognitions (Lau, Segal & Williams, 2004). This can lead to the development of depression, and predicts relapse risk among formerly depressed individuals (Werner-Seidler & Moulds, 2011).

Participants were first screened for depressive symptoms, cognitive reactivity to low mood, dysfunctional attitudes and current mood state, then AMs were cued using the AMT (Williams & Broadbent, 1986). Two cue words were presented (one positive and one negative) and after each, participants were required to rate the recalled memory on the MEQ (Sutin & Robins, 2007). This assessed the phenomenological characteristics of each memory, specifically: vividness, coherence, emotional intensity, emotional valence, sensory detail, ease of accessibility and visual perspective. Ratings were made on a five-point scale, with higher ratings indicating a higher level of the measured characteristic. The next day, current mood was re-assessed followed by either neutral or sad mood induction, and a measure of cognitive reactivity. The AMT and MEQ were then re-administered. Results yielded a significant effect of sad mood induction on the vividness of positive memories. Previously-depressed individuals were reported to rate positive memories recalled during an induced sad mood as less vivid than when experiencing neutral mood, however no difference in vividness was observed within the never-depressed group. No differences were discovered amongst the other phenomenological characteristics under these conditions. Dysfunctional attitudes, as measured by the DAS (Weissman, 1979), were significantly affected by depression history and condition (sad vs neutral mood) and an interaction was discovered between time and mood state. In the neutral condition, no significant change in DAS was found between measures before and after mood induction, however a significant increase in dysfunctional attitude was reported after the induction of a sad mood, compared with before. This suggests that cognitive reactivity had taken place following negative mood induction, consistent with the Differential Activation Hypothesis.

Following this, a second study was conducted by Werner-Seidler and Moulds (2011), to further investigate the phenomenological experience of recalled AMs in individuals with a previous history of depression. This research followed a similar procedure, however six positive emotional cue words were employed in this study, to increase the amount of information which could be gathered on features of AM. Due to this, a reduced amount of

characteristic ratings were measured, to ensure the effects of mood induction did not wane before the end of the testing period. The MEQ was still administered following the AMT, however focus was placed on vividness, accessibility and visual perspective. As a baseline measure, three memories were recalled and rated prior to sad mood induction, with the other three being completed afterwards. Results showed only vividness to yield a significant interaction between depression history and mood induction. Previously-depressed and never-depressed groups did not differ in terms of vividness ratings prior to low mood induction, however, afterwards previously-depressed individuals demonstrated significantly lower vividness ratings than before mood was altered. Those without a history of depression experienced no significant difference in vividness ratings before or after induction of a low mood. Accessibility and visual perspective did not significantly differ between previously depressed and never depressed groups. In terms of cognitive reactivity, previously depressed individuals showed significantly higher reactivity in response to sad mood than never-depressed individuals, which is consistent with the Differential Activation Hypothesis. These findings supported those of the first study, as previously depressed individuals experienced less vivid memory recollections than did individuals without a history of depression. This provides further evidence that depressive symptoms are associated with reduced phenomenological characteristics of AM, specifically when retrieving positive memories. Despite this, the lack of evidence for impaired visual perspective in this study contrasts the previous findings of Lemogne et al. (2006) and Bergouignan et al. (2008). This difference however could be caused by methodological differences, or differences in the required criteria for remission to that in Bergouignan et al.'s research.

Strong similarities in phenomenological characteristics, to those experienced when retrieving AMs, are also discovered when investigating imagined future events. This 'mental time travel' into the past, via recollected memories, and the future, through imagined events, is closely related and relies upon similar processes (D'Argembeau & Van der Linden, 2006, p.344). Depressed individuals are reported to have an impaired ability to imagine positive

future events, with reports being less vivid than those imagined by non-depressed individuals (Holmes, Lang, Moulds & Steele, 2008; Morina, Deeprose, Pusowski, Schmid & Holmes, 2011; Szőllősi, Pajkossy & Racsmány 2015; Anderson & Evans, 2015). When assessing the subjective experience of emotion in imagined future events, depressed individuals were discovered to provide lower vividness ratings than non-depressed participants, however only for imagined positive episodes. No difference was discovered between participant groups for negative events (Holmes et al., 2008). These findings support those reported for the phenomenological characteristics of past positive events in depressed individuals, providing further evidence of the similarities between the two temporal directions (Werner-Seidler & Moulds, 2011).

Similar results were reported by Morina et al. (2011). Clinically depressed, clinically anxious and healthy control participants were tested on the Prospective Imagery Task (Stöber, 2000), which assessed mental imagery for positive and negative events. Vividness of the imagery, associated emotional arousal and likelihood of the imagined event to occur in real life were measured. Poorer vividness ratings were reported for positive events by both clinical groups compared to controls. These individuals also provided significantly lower likelihood ratings for positive events to occur, than non-clinical participants. This suggests that individuals suffering from major depression or anxiety experience less vivid positive events, and have diminished beliefs that positive events will occur within their future. Similar to the findings for recalled past positive episodes in depression, this reduced vividness of positive future events can play a role in the development and maintenance of depression, due to its emotion-balancing functions (Roepke & Seligman, 2016). Further, diminished beliefs about the occurrence of positive events may impede an individual's ability to recover from depression and may predict relapse. No differences were discovered between participant groups in vividness ratings for imagined negative events, and only the anxious group demonstrated increased likelihood ratings and emotional arousal associated with

negative episodes. No significant difference was discovered between depressed and control participant groups on these dimensions (Morina et al., 2011).

Szőllősi et al. (2015) replicated and extended the above findings, whilst researching wider phenomenological characteristics of imagined positive and negative events. Participants were presented with ten emotional cue-words (five positive and five negative) and were asked to imagine a future event triggered by each word. These imagined episodes were then rated for the extent of experience of nine phenomenological characteristics: vividness, time and location of the event, feelings at the time, visual details, auditory details, certainty, accessibility of the event and personal importance. The former seven characteristics were taken from the MCQ (Johnson, Foley, Suengas & Raye, 1988), while the latter two were included as differences are known to exist in the accessibility of positive and negative memories in depressed individuals (mood-congruent memory) and this difference, along with personal importance, can influence vividness and other phenomenological characteristics (Cohen & Faulkner, 1988). The BDI (Beck et al., 1961) was administered afterwards as a measure of depression symptom severity. A strong negative correlation was discovered between BDI score and seven memory phenomenology characteristics (vividness, time, location, feelings, accessibility, auditory details and certainty) for imagined positive events, while an opposite, positive correlation was discovered between BDI score and these characteristics for negative events (excluding feelings and location). Therefore, higher phenomenological ratings tended to be made for negative imagined events, and lower ratings for positive events, amongst those who experienced more severe symptoms of depression. Positive events were recalled with reduced vividness, poorer sensory and contextual detail and poorer certainty, and were also rated as less accessible by those with more severe depression symptoms. No correlation was discovered between BDI score and specificity, which suggests that the findings regarding phenomenological characteristics were not confounded by differences in

specificity of the imagined events. These findings imply that depressive symptom severity does influence the phenomenological experience of imagined future events.

Anderson and Evans (2015) also investigated the phenomenological experience of memory and future thinking in a non-clinical sample. Participants were asked to recall and rate phenomenological characteristics of four past and four future events. Instead of administering a lengthy phenomenology questionnaire, Anderson and Evans investigated the characteristics experienced when recalling an event using a subset of eight dimensions: emotional valence, emotional intensity, vividness, coherence, sensory detail, extent of bodily experience, importance of the event to personal identity, and centrality to life story. These ratings were made on a seven-point scale with higher ratings signalling greater experience of that characteristic. While dysphoric individuals displayed a negativity bias for past events, recalling more negative than positive memories, imagined future events were rated as more positive than past, and this observed within both dysphoric and non-dysphoric groups. Significantly reduced phenomenological characteristics were reported for future events, compared to past events, with dysphoric individuals experiencing significantly less vivid, coherent, and emotional future episodes, involving less sensory detail and bodily connection than those imagined by their non-dysphoric counter-parts. Higher ratings were discovered among dysphoric, compared to non-dysphoric individuals regarding coherence, emotion and bodily connection with imagined events. Despite this, no difference was observed between groups for the vividness and sensory detail of past recollections. A difference was also discovered between perceived importance to one's life story and identity, between dysphoric and non-dysphoric groups. Importance ratings were significantly lower in dysphoric individuals than non-dysphoric, however only when imagining future events. No difference was found between groups for the importance to either the self or life story for recollections of previous events. This suggests that dysphoric individuals display reduced phenomenological characteristics when imagining the future, but not when recalling previous events. These findings support those of Szőllősi et al. (2015), however contrast those of

Lemogne et al. (2006) Bergouignan et al. (2008) and Werner-Seidler and Moulds (2011),

who reported reduced phenomenology of past events in depressed individuals.

Specifically investigating memory phenomenology in postnatal mood disorders, research was carried out by Foley, Crawley, Wilkie and Ayers (2014) to assess memory characteristics experienced when recalling memories of childbirth, in mothers experiencing symptoms of PND and post-traumatic stress disorder (PTSD). The Birth Memories and Recall Questionnaire (BirthMARQ) was developed by selecting items from other measures of phenomenological memory characteristics, which were relevant to childbirth. Twenty-three items were found to significantly relate to memories of childbirth assessing: emotional valence, centrality to identity, coherence, reliving, involuntary recall and sensory details. A positive correlation was discovered between EPDS score and negative emotion, centrality to self-identity, involuntary recall and bodily sensations associated with reliving. Women who experienced greater symptoms of PND therefore reported greater levels of these characteristics when recalling memories of childbirth, compared to controls. Similarly, women who scored higher on the Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1995) reported higher ratings of negative emotion, centrality to identity and involuntary recall, however reduced sensory details and coherence were also reported by women experiencing symptoms of PTSD, compared to controls. These findings suggest that women experiencing postnatal mood disorders display a different pattern of phenomenological characteristics to non-symptomatic, healthy mothers, at least in terms of recollections of childbirth. No other studies into memory phenomenology in postnatally depressed mothers have been carried out, to the best of our knowledge. Due to this, the current research aimed to address this gap in the literature, investigating phenomenological experience of memories in PND, without these being limited to childbirth recollections, which may not be generalisable due to the intensity and uniqueness of the experience.

Research questions and hypotheses of the current study

The present study therefore investigated whether the phenomenological experience of recalled AMs differs in relation to the severity of PND symptoms experienced by mothers. This could inform whether depressed mothers have difficulty in recalling positive AMs, and relating these to their self-perspective, which could be detrimental to their recovery. If it is found that reduced specificity and phenomenological experience is a risk factor for the development of PND, these could be used to identify vulnerable women and direct them toward preventative interventions to improve memory specificity, such as Memory Specificity Training MEST (Raes, Williams, & Hermans, 2009). MEST involves attending a 4-5 week programme, in which information is provided on the different levels of autobiographical memory (specific, extended and categoric) and participants are required to practice retrieving each type. Research by Neshat-Doost, Dalgleish, Yule, Kalantari, Ahmadi, Dyregrov, et al. (2013) provided evidence of the success of MEST in depressed individuals. When tested two months following MEST participation, individuals reported lower levels of depression and retrieved more specific memories than a control group who received no intervention.

To the best of our knowledge, this is the first study to investigate phenomenological characteristics in postnatally depressed mothers, other than the specificity of a memory. Therefore, the scope of the present study is original in terms of its hypotheses. This research aimed to extend the research of Croll and Bryant (2000), who reported that mothers experiencing PND symptoms displayed impaired ability to retrieve specific memories. An additional finding of Croll and Bryant (2000) reported postnatally depressed mothers retrieved significantly more negative parenting-related memories that non-depressed mothers, but significantly fewer specific parent-related memories. Due to this, the present study aimed to further investigate the differences between retrieval of parenting-related and non-related AMs, investigating not only the valence of these, but nine additional phenomenological characteristics to better assess the quality of these memories: vividness,

coherence, sensory details, bodily feeling, emotional valence, emotional intensity, importance to self-identity, importance to life story, and visual perspective.

It is hypothesised based on previous research, that mothers with higher EPDS scores will display a negativity bias in AM recall, retrieving more negative events, and less positive events than women with lower EPDS scores, and more negative parent-related memories than parent-unrelated. It is also hypothesised that higher EPDS scorers will demonstrate impaired phenomenological characteristics of positive recollections, with the reduced vividness bias seen in depression extending to the other measured characteristics. Due to this, it is expected that higher EPDS scores will be significantly associated with lower ratings of vividness and other phenomenological characteristics, and with more observer-perspective ratings than field ratings, for positive recollections. As for importance to the self and life story, it is predicted that higher EPDS scores will be significantly correlated with higher ratings than lower EPDS scores (Rubin, Dennis, & Beckham, 2011). Little is known about the differences in parent-related and unrelated memories, therefore it is difficult to predict how the phenomenological characteristics, other than valence, will change as a function of EPDS score, for each memory type. Despite this, it is predicted that higher EPDS scores will be associated with higher phenomenology ratings for parent-related memories and lower ratings for recollections which are unrelated to parenting.

Method

Participants

Forty-eight female participants, aged between 22 and 44 ($M = 31.21$, $SD = 5.45$) took part in this research. All participants were mothers to children aged under forty-eight months ($M = 20.33$, $SD = 15.09$) and had a mean number of 1.54 ($SD = .617$, Mode = 1) children. A volunteer sample was taken, as those who responded to online advertisements and opted to participate, filled in the questionnaire. Recruitment of participants was predominantly conducted via advertisement within online parenting and PND support groups on social

media. Advertisements were also shared by email with the parents of children who attended two private day nurseries, from which permission had been granted by the nursery manager. Mind and PANDAS Foundation mental health charities also shared the research advertisement on their social media pages. Participants were not screened for previous mood disorders. Fifty-four participants originally responded to the survey, however five were removed as outliers on the basis of their youngest child being aged over four years old, and a further two participants were removed as they recalled four memories of the same relatedness type. The final sample therefore involved forty-eight participants.

Design

As the aim of this research was to investigate the association between EPDS score and memory phenomenology, which is a continuous variable, a correlational design was employed. Correlations were calculated between each of the nine memory phenomenology characteristics and participants EPDS scores. Along with this, memories related to parenting and memories unrelated to parenting were compared in terms of their mean ratings on each characteristic.

Materials

An online questionnaire, created using JISC Online Surveys, was used to gather participant responses. The decision to conduct the questionnaire online was reached when considering that mothers of young infants do not have a lot of spare time during daytime hours. It was hoped that by using an online questionnaire, mothers would be more likely to complete the study in their limited free time, rather than having to commit to a set appointment to conduct the questionnaire face-to-face, or going to the effort to post back a questionnaire. It was thought this would optimise participant numbers and reduce attrition rates. Following the participant information, the questionnaire consisted of three main sections: demographic questions, a memory subjectivity ratings task and the Edinburgh Postnatal Depression Scale (EDPS; Cox, et al., 1987). Debriefing information was then

available to download, following the completion of the questionnaire. See Appendix A for the full questionnaire and debriefing information.

Demographics

This section, the smallest of the three, was comprised of just three questions assessing the demographic qualities of respondents. These focused on participant age, time since the birth of the youngest child, and number of children. Eligibility criteria required participants to be over the age of eighteen, and for the time since the birth of their youngest child to be three years or under. A one year cut off was originally decided upon, however this was extended to three years in response to the pilot study. The results of these questions were used to calculate overall means, and to rule out confounds on the results for memory phenomenology.

Memory Phenomenology Rating Task

Written instructions were given which asked participants to recall a specific memory of an event which occurred between one and six months ago. Four of these memory recollections were to be completed, with two recalled memories being directly related to parenting, and the other two being specific events unrelated to motherhood. The time frame for this instruction was decided upon based on two main reasons. First, the lower cut-off of one month ensured that participants recalled events which took place long enough ago, and were significant enough, that they had formed part of the individual's AM. This is standard procedure in research studies which investigate characteristics of AM (D'Argembeau & Van der Linden, 2006; D'Argembeau, Van der Linden, D'Acremont & Mayers, 2006). Memories of events that have occurred less than one month ago may be of trivial, recent events which will not necessarily be integrated into AM. The cut-off of six months was chosen due to the issue of phenomenological details fading over temporal distance. Although previous research has used a cut-off of twelve months (D'Argembeau & Van der Linden, 2006), we decided upon a six month cut-off in order to further minimise the risk of phenomenological

details fading with temporal distance. By limiting the time frame from which recollections can be drawn, we ensured that the recalled events were temporally distant enough to have been integrated into the AM system, but without compromising phenomenological details.

To control for the influence of emotional cue words, which direct participants to retrieve a certain type of AM, the present study asked participants to recall past events which were either parenting-related or unrelated to parenting in nature, without explicitly instructing them to retrieve memories of emotional events. Participants were asked to think of each memory in as much detail as possible, then write down a brief description. Following each description, nine questions were given to assess the phenomenological details experienced when recalling the memory. The choice of characteristics was based on the study by Anderson and Evans (2015), which found a significant difference between dysphoric and non-dysphoric individuals. However an additional characteristic, visual perspective, was also added due to the findings of Lemongne et al. (2006) and Bergouignan et al. (2008), who reported significant differences in this. Therefore, the nine phenomenological characteristics which were investigated in relation to each memory were: vividness, coherence, sensory details, bodily experience, visual perspective, emotional valence, emotional intensity, importance to self-identity and centrality to life story. All ratings were made on a 7-point Likert scale, ranging from -3 to +3, to allow for ratings of positive and negative valence to be differentiated. Scores below zero indicated a negative response (-3, -2 and -1), a rating of zero indicated a neutral response and scores above zero indicated a positive response (+1, +2 and +3). For example, where emotional valence was measured, a score of -3 would indicate 'extremely negative' experiences and +3 would indicate 'extremely positive' experiences. However, if the dimension did not require valence to be measured, such as for vividness, a rating of -3 would mean 'not at all' and +3 would mean 'extremely vivid'.

Edinburgh Postnatal Depression Scale

The EPDS is a self-report questionnaire, designed by Cox et al. (1987), to measure the frequency and severity of PND symptoms experienced by a mother within the past seven days. It has good convergent validity with the BDI, is found to significantly predict future PND risk, and is highly reliable (Teissedre & Chabrol, 2004). The EPDS consists of ten questions which are measured on a 4-point Likert scale, from 0 to 3, with a maximum of 30 points in total. Higher scores indicate more severe symptoms of PND, with a cut-off score of 13 often being used to signal the presence of PND. Scores closer to zero, typically below 10, are considered to show a non-depressed result (Cox et al., 1987; Croll & Bryant, 2000).

Advertisement

The research advertisement consisted of a poster which contained key information of what the research involved, participant eligibility criteria and the link to the questionnaire, where further information and the survey itself could be accessed. The researcher's contact details were also provided for any further questions. Participants were naïve to the aims of the study, and were informed only that the research was to investigate the role of motherhood on memory. They were aware of the method, that subjective characteristics of recalled memories were being investigated, and that there would be a mood questionnaire at the end. Following the questionnaire, debriefing information was provided. This stated that the researcher would compare the relationship between characteristics of memory recollections and the extent of experienced PND symptoms. The researcher's contact details were included within the debrief information, should participants require any further information, or have questions about the research or anticipated findings. See Appendix A for the full debrief.

Pilot Study

A pilot study was conducted, which consisted of an online questionnaire using JISC Online Surveys. This study used a 2 x 2 x 2 mixed design. The three independent variables being manipulated were relatedness to parenting, emotional valence of recalled memories

and depression symptoms. Relatedness referred to whether the recalled memory was either related on unrelated to parenting, and was manipulated within participants. Emotional valence of recalled memories was also manipulated within participants, indicating whether the recalled memory was positive or negative. And finally the independent variable 'depression symptoms' referred to whether participants were classified as experiencing PND, or being non-depressed, based on their score on the EPDS (Cox et al., 1987). This independent variable was realised between participants. The dependent variable in this research was the memory phenomenology ratings associated with each memory, consistent with those of the present study.

Other than the number of AMs to be recalled and rated, and the instruction which specified the memory type to be recalled, (for example 'Please try to recall a memory of a positive event, related to motherhood, which occurred between one and six months ago') the questionnaire took the same form as that described above for the present study (see Appendix B). The same participant information and demographic questions were included at the start of the questionnaire, and the EPDS was completed at the end. The provided debriefing information was also the same as that of the main study (see Appendix A).

Due to the manipulation of two within participants variables (emotional valence and relatedness to parenting), the questionnaire was very lengthy, as participants were required to recall and rate eight AMs (two positive-parenting related, two negative-parenting related, two positive-unrelated and two negative-unrelated). The instruction for recall was also quite complicated, as each memory to be recalled had to meet three criteria (valence, relatedness, and time scale). This study had a very low sign up rate and it was clear that without changes the sample size would be too small, meaning the research would lack statistical power. As a result of this the questionnaire length was halved, by removing the manipulation of emotional valence of recalled AMs. The final version of the online questionnaire therefore required the recall of four AMs (two parent-related events and two events which were unrelated to parenting). It was decided that emotional valence should be the independent variable to be removed in the present research, as this variable was already being measured as one of the

phenomenological characteristics, while none of these characteristics would provide information regarding the relatedness of the memories to parenting. While this caused the loss of the present study's ability to compare the phenomenological characteristics of positive and negative memories, the emotional valence of the parent-related and unrelated memories could still be assessed.

Another change made based from the pilot study was the use of a correlational design. Instead of using a median split of EPDS scores to create the PND and non-depressed participant groups, the present research used correlation between EPDS score and the phenomenological characteristics to assess how these were influenced by the severity of depression symptoms. This avoided the problem of defining cut-off scores for PND and non-depressed groups, and also meant that all participants could be used as part of the analysis, as those who fell between the two cut-offs would have had to be removed. Because of the lacking participant numbers within the pilot study, maximising the number of respondents used within the analyses was of importance, therefore a correlational design was agreed upon.

The eligibility criteria were also adapted as a result of the pilot study. Originally, it was decided that the time since the birth of a participant's youngest child was to be one year or less, due to previous research using this cut-off and obtaining significant findings (Croll & Bryant, 2000; Foley et al., 2014). Despite this, due to the lacking participant numbers, the cut-off for time since the birth of the youngest child was increased to three years and under. This figure was decided upon for pragmatic reasons, in order to be more inclusive and open up the questionnaire to more potential respondents. By increasing the cut-off time since last birth to just two years, there was still a risk that not enough respondents would sign up for the study in the existing time frame, therefore the cut-off was re-set to three years and under. This ensured the children were still young enough to have not hit the four-year-old milestones of starting school et cetera, making the experiences of the respondents with 'older' children more comparable to those with babies. It was not thought that this decision would hamper the findings greatly, due to the set window from which recollections were to

be drawn. Regardless of the child's age, the recalled events could only have occurred a maximum of six months ago, which seemed a more valid comparison than asking women to recall memories of their child being a new-born with the same age cut-offs. Despite this, differences in the recency of events to be recalled, and the time since the birth of the women's youngest child could be established within future research.

Procedure

Ethical approval for this research was granted by the Faculty Research Ethics Committee at the University of Hull, and informed consent was obtained from all participants before the questionnaire began. Failure to provide consent resulted in participants being screened out of the study, preventing access to the questionnaire. Demographic questions were given first, followed by the memory phenomenology ratings task. The order in which motherhood-related and unrelated memories were presented was counterbalanced between participants. All participants completed the EPDS as the final part of the questionnaire, after all memory phenomenology ratings had been completed. At this point, the experiment concluded and debriefing information was provided. This contained contact details for support services, as the recall of negative memories had the potential to cause emotional distress in vulnerable participants. The researchers contact details were also provided, along with links to the previously viewed information sheet and debrief, which were available to print for later reference. Confidentiality was maintained within the research, as no names or identifying information was recorded with the research data.

Results

The focus of the study was to examine the relationship between PND, as measured by the EPDS, and the phenomenology of memory. The data consisted of ratings on the nine phenomenology characteristics for parent-related and unrelated memories, and EPDS scores. The EPDS scores ($M = 10.21$, $SD = 5.60$) were calculated for each participant using the scoring instructions, as per Cox, Holden and Sagovsky (1987). For each memory type, the mean of the two memories produced by each participant was calculated, to create mean

ratings for each of the characteristics. Descriptions of the recalled memories for parent-related and unrelated events are included in full in Appendices C and D, respectively. Mean specificity ratings were calculated as a manipulation check, to ensure participants had followed the given instructions to retrieve specific memories. A memory was recorded as 'specific' if the recalled event took place over less that one day, while memories of events with a longer duration were given a 'non-specific' label. Repeated events were also recorded as specific if the memory recollection referred to a single instance when that event occurred. Raes, Hermans, Williams and Eelen (2007) reported this method of judging specificity to be highly sensitive when measuring over-general memory, and thus lack of memory specificity. This criteria for judging the specificity of recollections has also been used by Dewhurst, Anderson, Berry and Garner (2018) with significant findings. In the present study, ratings of specificity were made by the author and by a second rater, with 100 percent agreement. The proportion of specific memories approached ceiling for both related memories ($M = .94$, $SD = .22$) and unrelated memories ($M = .93$, $SD = .23$). A paired-samples t-test showed that the difference between related and unrelated memories was not significant, $t(47) = 0.33$, $p = .743$, $d = 0.05$.

The main analysis consisted of a series of correlations between the nine phenomenology characteristics for parent-related and unrelated memories and EPDS score. The full correlation matrix, including correlations between the phenomenology characteristics, can be seen in Appendix E. Before the analysis began, the Likert data were rescaled from the form collected in the questionnaire (-3 to +3) into values 0 to 6, with -3 becoming the value 0 and +3 taking the value of 6. This made the data easier to analyse when running statistical tests. All statistical tests used within the analysis were parametric, as the data were able to meet the required criteria for these to be used. There has been some debate over whether Likert data should be measured using Pearson's correlation, or its non-parametric equivalent. However, Carifio and Perla (2007, p.115) investigated this debate, concluding that for Likert data using a five-point scale or above, it is 'perfectly

acceptable and correct' for parametric tests such as Pearson's correlation to be used to analyse these data, and that the results of such analyses are wholly 'interpretable'. Murray (2013) also concluded that the type of correlation used with Likert data, either parametric or non-parametric, did not affect the pattern of results. Due to this, it was decided that Pearson's *r* was appropriate for use with the present Likert data.

Eyeballing of the data was also carried out to check for outliers. Due to the nature of the data, taking the form of a Likert scale, there is also a debate as to whether outliers can occur, as all data points must fit within the set scale. These checks showed all participants used a range of points within the scales, rather than selecting the same extreme scores for each item. Therefore, it was concluded that their responses were genuine, and that parametric tests were suitable for use within the analysis of this data.

Table 1 below shows the correlations between the EPDS scores and the phenomenology characteristics for the parent-related and unrelated memories. As can be seen from the table, there were two significant results. The mean vividness rating of memories related to parenting was discovered to be significantly negatively correlated with EPDS score ($r = -.29$, $p = .013$). This suggests that participants with higher EPDS scores rated their parenting related recollections to be less vivid than those with lower EPDS scores. No significant correlation was observed between the vividness of recollections which were unrelated to parenting and EPDS score ($r = -.15$, $p = .308$).

A second significant correlation was discovered between emotional valence ratings and EPDS score, however only for recollections which were unrelated to parenting ($r = -.36$, $p = .045$). Participants with higher EPDS scores experienced greater negative emotion when recalling events which were unrelated to parenting, than did participants who scored lower on the EPDS. This difference was not found to be significant for the emotional valence of parenting related recollections ($r = -.06$, $p = .712$). No other significant correlations were discovered between the phenomenology characteristics and EPDS scores (all *r*s < .26, *p*s > .05).

Table 1

Correlation between EPDS Score and Phenomenology Characteristics of Parenting-Related and Parenting-Unrelated Memories.

Characteristic	Parenting Related		Parenting Unrelated	
	R	*P*	*r*	*P*
Vividness	-.291*	.045	-.150	.308
Coherence	-.232	.112	-.187	.204
Sensory detail	.019	.896	-.052	.724
Bodily feeling	-.057	.702	-.007	.962
Visual perspective	.005	.974	-.168	.253
Emotional valence	-.055	.712	-.355*	.013
Emotional intensity	-.006	.969	.093	.530
Importance to identity	.251	.085	.057	.701
Centrality to life story	.056	.707	-.077	.601

Note. All *r*-values reflect the correlation of the listed characteristic with EPDS score. The columns on the left refer to recollections related to parenting, while the right refers to parenting-unrelated recollections.

*p < .05

Correlations were also calculated between participant details, EPDS score and phenomenology characteristics. Preliminary analyses revealed no significant correlations between participant details and EPDS score or the memory characteristics (all *r*s < .28, *p*s > .05). However, a highly significant correlation was found between participant age and age of their youngest child ($r = .56$, $p < .001$), and a second significant finding revealed number of children to be significantly correlated to participant age ($r = .29$, $p = .047$).

The mean rating of each of the nine memory characteristics were also compared between parenting-related and unrelated recollections using a series of paired samples t-

tests. In order to compensate for multiple comparisons, the alpha value was reset. Using the Bonferroni adjustment would give an alpha value of .007, however this stringent correction was not deemed to be necessary, due to the assumption that the hypotheses being tested are independent. This was not the case in the current study, as the memory characteristics were highly correlated (see Appendix E). Therefore, a compromise alpha of .01 was used. Table 2 shows the mean ratings of the phenomenology characteristics for related and unrelated memories, plus the results of the t-tests.

Table 2

Mean Ratings of Phenomenology Characteristics for Related and Unrelated Memories

Characteristic	Parenting Related		Parenting Unrelated		*t*	*p*
	M	*SD*	*M*	*SD*		
Vividness	4.73	1.11	4.17	1.38	2.715**	.009
Coherence	4.54	1.31	4.23	1.53	1.195	.238
Sensory detail	3.45	1.47	3.35	1.60	.325	.747
Bodily feeling	4.06	1.55	3.77	1.46	1.141	.260
Visual perspective	2.31	1.88	2.19	1.81	.539	.592
Emotional valence	4.10	1.32	4.19	1.50	-.299	.766
Emotional intensity	4.07	1.48	3.22	1.43	3.552**	.001
Importance to identity	2.92	1.81	2.83	1.55	.284	.778
Centrality to life story	2.75	2.04	2.53	1.64	.637	.528

** $p < .01$

As can be seen in Table 2, the mean ratings of two memory characteristics were discovered to be significantly different between parenting-related and unrelated memories. A significant difference was found in the vividness with which recollections were experienced, with parenting-related events ($M = 4.73$, $SD = 1.11$) receiving significantly greater vividness

ratings than recollections which were unrelated to parenting ($M = 4.17$, $SD = 1.38$), $t(47) =$ 2.72, $p = .009$, $d = 0.45$. This suggests that parenting-related recollections were experienced with significantly greater vividness than unrelated recollections.

The mean rating of emotional intensity experienced when recalling events was also found to significantly differ between parenting-related and unrelated events, $t(47) =$ 3.55, p = .001, $d = 0.59$. Significantly greater ratings of emotional intensity were provided for recollection of parenting related ($M = 4.07$, $SD = 1.48$), compared to unrelated events ($M =$ 3.22, $SD = 1.43$), suggesting more intense emotions were experienced when recalling events which had a parenting theme.

Discussion

The present study aimed to assess whether the phenomenological characteristics of AM would be influenced by the presence of PND symptoms. It was hypothesised that participants experiencing greater symptoms of PND, as indicated by higher EPDS scores, would show impaired phenomenological experience of recalled AMs, indicated by reduced levels of the measured characteristics (vividness, coherence, sensory detail, bodily feeling, visual perspective, emotional valence, emotional intensity, importance to self-identity and centrality to life story). A further aim of this research was to investigate the phenomenological experience associated with the retrieval of parent-related and unrelated AMs, to assess whether there was a difference in the characteristics experienced with the retrieval of each memory type.

The main analysis found a significant difference in two of the phenomenological characteristics: vividness and emotional valence, between women experiencing high and lower levels of postnatal depressed symptoms. Significant negative correlations were found between EPDS score and each of these two characteristics, showing that higher EPDS scores were associated with lower ratings of vividness for the parenting-related memories, and with the emotional valence of memories which were unrelated to parenting. Therefore, impaired vividness and greater experience of negative emotion were found to be significantly

associated with the experience of PND symptoms. The comparison between phenomenological characteristics experienced when recalling parent-related and non-related events also revealed two significant findings. Vividness and emotional intensity were found to significantly differ between these two memory types, with greater levels of both being experienced within parent-related events, compared to events which were unrelated to parenting. No significant differences were found within any other the other measured characteristics for either correlation with EPDS score, or comparison between parent-related and non-related memory types.

PND – does EPDS score influence the experience of phenomenology characteristics?

It was previously hypothesised that postnatally depressed mothers would show a negativity bias in recalled memories, and that greater negative emotion would be experienced when recalling parent-related events, compared to recollections of events which were unrelated to parenting. The former prediction was partially supported by the present research. Although this study was correlational in nature, and we do not have information about how many of the sample had a postnatal depression diagnosis, high EPDS scores were significantly associated with greater ratings of negative emotion, compared to lower EPDS scores. This supports the previous findings of Foley et al. (2014), who found a significant positive correlation between negative emotion and higher EPDS score. Lemogne et al. (2006) and Anderson and Evans (2015) also reported depressed individuals to display a negativity bias, with greater recall of negative than positive AMs. However, this finding was only seen within the present study for recalled events which were unrelated to parenting. No significant correlation was found between EPDS scores and the emotional valence of parenting-related recollections. This refutes the earlier prediction, along with the findings of Croll and Bryant (2000), who found postnatally depressed mothers to report significantly more negative parent-related memories than non-depressed mothers. No significant differences were observed between EPDS score and emotional intensity, suggesting PND

symptom severity does not influence the emotional intensity experienced when recalling either parent-related or unrelated events.

The hypothesis that high EPDS scores would be associated with reduced phenomenological characteristics was also only partially supported by the current research. The present study found significantly lower vividness was reported by women with higher EPDS scores, however only when recalling parenting-related events. No significant difference was found between high and lower-scorers on the EPDS in vividness, for events which were unrelated to parenting. One possibility for these findings is that an interaction may exist between emotional valence of recollected events and their relatedness to parenting. Werner-Seidler and Moulds (2011) reported reduced vividness of positive past events when recalled during an induced sad mood state in previously-depressed women, however this effect was not significant for negative events. Perhaps, within the present study, parent-related events were experienced as more 'positive' than non-parent-related events, as indicated by a significant negative association between EPDS and emotional valence for events unrelated to parenting (higher EPDS scores were associated with greater negative emotion). Despite this, no significant association was found between EPDS score and positive emotion for parent-related memories, therefore this interpretation must be taken with caution. Reduced vividness of positive events has also been consistently reported in relation to imagined future events in depressed individuals (Holmes et al., 2008; Morina et al., 2011; Szőllősi et al., 2015; Anderson & Evans, 2015), while only Szőllősi et al. (2015) reported a significant difference between depressive and non-depressive individuals for negative events. Despite this, no significant difference in the vividness of past events was discovered between dysphoric and non-dysphoric individuals in Anderson and Evans' (2015) research, while the same pattern of reduced vividness was reported for future events in dysphoric participants.

This reduced vividness of parent-related memories has implications for the identification of PND risk factors, and the tailoring of specific treatments. Williams et al.

(2007) reported that vivid recall of positive events significantly reduced the risk of developing depression, due to its role in improving mood and restoring emotional equilibrium. Therefore, reduced vividness poses as a risk factor in the development of depression. The present study's finding of reduced vividness in mothers with high EPDS scores, particularly within potentially 'positive' parent-related memories, suggests that this could be identified as a vulnerability factor in the development of PND. Reduced vividness of positive events has also been linked to poorer prospections of the future (Roepke & Seligman, 2016). As suggested by Morina et al.'s (2011) findings in depression, if mothers cannot vividly recall positive parent-related events, this can impact upon their ability to imagine positive events involving their role as a mother, taking place in the future. Due to this, they may be unable to view future prospections with any positivity, as their view of their future selves and relationships with their children would be clouded by their current depressive self-perspective. Cognitive treatments, such as Cognitive Behavioural Therapy (CBT; Beck, Rush, Shaw & Emery, 1979), aim to identify maladaptive, negative beliefs about one's self and their future, and replace these with more rational beliefs. By introducing direct treatments for PND to this form of therapy, for example training in the recall of vivid parent-related memories, this could improve the outcome of CBT in postnatally depressed women, by not only tackling their negative future views but also their associated impaired phenomenology. This is likely to bolster a mother's positive emotions, increase their confidence in their parenting ability, and consequently improve their perception of their relationship with their children. This would result in more positive outcomes for not only maternal mental health but also their children's development and emotional wellbeing.

Despite these significant findings for memory vividness, the present study found no significant correlations between any of the remaining phenomenology characteristics (coherence, sensory detail, bodily feeling, visual perspective, importance to self-identity and centrality to life story) and EPDS score, suggesting the level to which these were experienced when recalling AMs does not differ between women experiencing symptoms of

PND, and those who are not. This implies that these characteristics are not associated with the experience and severity of PND symptoms, which contrasts the hypothesis.

The present findings support those of Werner-Seidler & Moulds (2011), who found a significant difference in vividness between depressive and non-depressive groups, however no differences were discovered in the other phenomenological characteristics (coherence, emotional intensity, emotional valence, sensory detail, ease of accessibility and visual perspective) between these groups. Anderson and Evans (2015) also reported no significant difference between dysphoric and non-dysphoric individuals in terms of their phenomenological characteristics of recalled past events, excluding emotional valence. This research is therefore also supported by the findings of the present study.

One possible explanation for this pattern of results is that the different phenomenological characteristics may take different lengths of time to reflect upon. Since the phenomenology ratings were requested immediately following retrieval of the memory, participants were not given a lot of time to ponder over the memory, and think in depth about the detail to which they experienced its recollection. To follow this theory, it may be that vividness and emotional valence required less reflection time than did the other measured characteristics. Since the present study only discovered significant findings for vividness and emotional valence, with all seven of the other measured characteristics failing to meet significance for either of parent-related or unrelated events, it is possible that the salience of the characteristic could impact its retrieval speed. The characteristics vividness and emotional valence are more salient and obvious to identify than some of the other measured characteristics, such as such as visual perspective or importance to self-perspective, which require more careful thought and consideration. If sufficient time had not been given for this deeper level of consideration to occur, this could account for the significant findings for emotional valence and vividness, while the other characteristics fell below significance. Due to this, the salience of the characteristics, and the amount of time individuals spent reflecting on the recalled event before moving onto the ratings, could have confounded this data.

Alternatively, another possibility could be that the recency of recalled memories may have affected the pattern of characteristics experienced. Despite restrictions to the recency period from which recollected events were to be drawn, it is possible that memories drawn from the two extremes (one month and six months ago, respectively), could differ in terms of phenomenological characteristics, and the extent to which these were experienced. Different characteristics may fade faster with temporal distance than others, which could explain the differing patterns of experienced characteristics of the present research. However although possible, this is unlikely to be responsible for major differences in the extent to which certain characteristics were experienced, as the specified time frame for recollections was restricted in a way that optimised the experience of these characteristics.

Despite this, the present findings do not support those of previous researchers (Lemogne et al., 2006; Bergouignan et al., 2008; Foley et al., 2014) who found significant differences in the experience of phenomenological characteristics, other than vividness, between depressive and non-depressive individuals. Both Lemogne et al. (2006) and Bergouignan et al. (2008) reported significant differences in the visual perspective of recalled AMs between depressive and non-depressive participants. Significantly fewer field perspective ratings were provided for recalled positive AMs, however negative recollections were not found to differ significantly between depressive and non-depressive participant groups. Foley et al. (2014) also reported significant differences between mothers experiencing PND symptoms, as indicated by high EPDS scores, and those with lower scores on the EPDS, on a number of phenomenological memory characteristics. Higher EPDS scores were significantly associated with negative emotion, greater importance to self-identity, and increased feelings of bodily sensations during recall. Only the findings for negative emotion support those of the present study, while the others contrast the non-significant results found for these characteristics.

The findings of Lemogne et al. (2006), Bergouignan et al. (2008) and Foley et al. (2014), along with those mentioned earlier for vividness and emotional valence, suggest

both currently and previously depressed individuals experience impaired phenomenological characteristics of memory, particularly for positive AMs. The present findings were only able to provide weak support for this, with evidence to suggest only the vividness and emotional valence of recalled AMs differ in relation to the level of PND symptoms experienced. One possible explanation for the failure of the present study to replicate these findings could be due to the absence of a manipulation of emotional valence within this research. Previous research has often used a comparison between positive and negative AMs in order to assess the differences in phenomenological characteristics of memory, between depressive and non-depressed individuals. As the present study focused on PND, the relatedness of recalled memories to parenting was manipulated, rather than the emotional valence of these memories. This meant that the comparison of characteristics associated with each of positive and negative recollections, which was often conducted in previous research, could not be carried out. Since the significant differences reported in previous research are only consistently found within positive AM recall, it is possible that an interaction was present between depression symptoms and emotional valence of recalled memories, which the present study would not have been able to pick up on.

Despite this, the findings of the present study could be viewed in a positive light, as they suggest only a small relationship exists between phenomenological memory characteristics and PND symptoms. Since only the emotional valence and vividness of recalled events were found to significantly correlate with EPDS score, this implies that PND symptoms only minimally affect memory qualities, or perhaps phenomenological memory qualities minimally influence the development of PND symptoms. Given the serious consequences for which poor memory phenomenology is associated, for example poorer recovery outcomes from depression, a minimal relationship between this and PND could be viewed as positive.

Relatedness – does the relatedness of a recalled AM to parenting influence its phenomenological experience?

It was previously predicted that higher ratings of phenomenological characteristics would be provided for parent-related memories, compared to memories of events which were unrelated to parenting. Investigation into the retrieval of parenting-related and non-related AMs found that two of the phenomenological characteristics were experienced to different degrees between these memory types. Vividness and emotional intensity yielded a significant difference when compared between recalled memories which were directly related to parenting, and recollections of unrelated events. For both characteristics, significantly greater levels were reported during recollection of parenting-related events, compared to events which were unrelated to parenting. No significant differences were found between the two memory types for all of the other measured characteristics.

Despite this, a number of significant correlations were found between how participants responded to certain characteristics for parent-related and unrelated memories. Among others, a highly significant positive correlation was discovered between participants' responses to the visual perspective ratings of both parent-related and unrelated memory recollections ($r = .622$, $p < .001$). This suggests participants who gave high ratings for one memory type, also typically gave high ratings for the other. A similarly high correlation was also discovered between participant responding on the emotional valence of parent-related memories and the emotional intensity of memories which were unrelated to parenting ($r = .407$, $p < .01$), while the correlation between emotional intensity of parenting-related memories and of recollections which were unrelated to parenting was significant to a lesser degree ($r = .343$, $p < .05$). The centrality of parent-related memories to an individual's life story was also significantly correlated with the emotional valence rating given to parent-unrelated memories ($r = .381$, $p < .01$). The positive direction of all of these correlations suggests that participants who gave higher ratings for one of the correlated characteristics, also provided higher responses to that of the other correlated characteristic. This implies that participants who gave higher ratings for the emotional intensity of a parent-unrelated memory recollection, also typically gave higher ratings of positive emotion for parent-related

memories, and that those who rated parent-related memories to be more important to their life story provided more positive emotional responses to parent-unrelated recollections. No significant negative correlations were discovered between any of the phenomenology characteristics for parent-related and unrelated memories, suggesting participants did not respond in significantly different ways for any pair of characteristics. Please see Appendix E for the full correlation matrix, including the other significant correlations between characteristics not mentioned here.

The findings of the present study provide partial support to the earlier prediction as, where significant differences were discovered between parent-related and unrelated memories, greater phenomenology was associated with the parent-related events. Since vividness of parent-related events was found to be significantly greater than for unrelated events, this suggests that the impaired vividness of parent-related events in high EPDS mothers, discovered within the present study, is likely to be caused by the presence and severity of PND symptoms, rather than the differences in this characteristics being caused by the relatedness of the event to parenting. This strengthens the above findings, and supports the implications of impaired vividness being identified as a risk factor for PND.

However, it is possible that the different memory types, (parenting-related and unrelated memories), may differ in terms of the recency from which they were recalled. The recency of parent-related and unrelated memories was not examined within the present study, therefore we cannot say for certain that there was no significant difference between these two memory types. As previously mentioned, the specified time frame from which recollections were to be drawn was restricted in a way that minimised the risk of phenomenological characteristics fading. Therefore this should not have majorly impacted the present data. Further exploration into the recency of parent-related and unrelated recollections, in regard to their phenomenological experience, could provide useful information on this.

Memory specificity was also measured for both parenting-related and unrelated memories, and this too was not found to significantly differ between the two memory types. Although little research has been carried out into the relatedness of a memory to parenting, and how this affects the phenomenological experience of AMs, the present findings do not support those of Croll and Bryant (2000), who reported that postnatally depressed mothers retrieved significantly fewer specific parent-related memories than non-depressed mothers. One explanation for this could be that the present study directly asked participants to retrieve specific memories, in as much detail as possible. This could account for the lack of a significant difference in specificity between the two memory types, as specificity rates for both parent-related and non-related memories were very high. Despite this, Croll and Bryant also requested that the participants recalled specific memories, using the AMT to cue memory recall. Therefore, it is possible that these differences could be caused by differences within the methodology of these two studies.

The descriptives of the present study fit quite closely with those of Croll and Bryant's (2000) research, in terms of average EPDS score, taken across both PND and control groups. The present data had a mean EPDS score of 10.21 (*SD* = 5.60), while taking an average over both EPDS and control participant groups in Croll and Bryant's work gave a mean EPDS of 11.31 (*SD* = 7.17). Although the present study used a correlational design, therefore no PND participant group was created, according to Croll and Bryant's (2000) EPDS cut-off, fourteen of the present study's participants would be classified as having PND, with scores of thirteen or greater. Twenty-two of the present participants had an EPDS score of below ten, which would place them into the non-depressed control group, according to these cut-offs. Croll and Bryant (2000) used a sample of twenty six participants (thirteen in each of the PND and control participant groups), therefore a similar amount of depressed individuals were used in both studies, according to this cut-off.

The average number of children was also similar in the present research (*M* = 1.54, *SD* = .617) to that of Croll and Bryant (*M* = 1.73, *SD* = 2.40), however time since birth of the

participants' youngest child was much greater in the present study (M = 20.33, SD = 15.09) than Croll and Bryant's (M = 7.81, SD = 6.95). It is possible that this difference in the participant sample could account for some of the difference in findings, between these two research studies.

Strengths, limitations and directions for future research

To the best of our knowledge, this study was an original contribution to the existing research into PND and AM, exploring the phenomenology experienced when recalling parent-related and unrelated AMs. Due to this, the present research has a number of strengths, for example the current findings have added to the literature on memory deficits in PND, and give great scope for research to build on in the future. Both practical and theoretical implications of the present findings have been highlighted, which could be beneficial to the identification of cognitive risk factors for PND in the future. The findings of this study in terms of AM phenomenology deficits in postnatally depressed women also provide an extension of the knowledge of these deficits in other closely related groups, such as pregnant women and non-pregnant individuals suffering from depression. These initial findings suggest the observed deficits may be generalisable across a broader range of affective mental health disorders.

Despite this, the present study also had a number of limitations which could be improved upon in future research. One such limitation was that the research relied solely on self-report methods to gather information on the presence and severity of participants' PND symptoms. This information was drawn from responses on the EPDS alone. No clinical interviews were carried out to confirm these scores, and clinical diagnoses were not measured within the study. Therefore, it is unknown whether any of the participants had an official diagnosis of PND, or whether comorbid perinatal mental health disorders were present, such as postnatal anxiety.

Additionally, the number of participants receiving treatment for their PND symptoms was also not measured in the present study. This forms a second limitation of the present research as, if some participants were receiving treatment, such as antidepressant medication, it is possible that an unknown confounding relationship between this and memory phenomenology could have taken place. Antidepressant medication is known to influence the processing of emotionally valenced stimuli and AMs, showing reduced neural activation during positive memory processing, compared to that for negative memories (Papadatou-Pastou, Miskowiak, Williams, Harmer & Reinecke, 2012). Retrieval speed was also found to be increased following antidepressant administration compared to a placebo. These changes in neural activation and speed could therefore underlie the differences found within the memory phenomenology of positive and negative AMs. While participants with high EPDS scores are more likely to be taking antidepressant medication than those with lower EPDS scores, the presence of this medication in high scorers could still lead to results which are caused by the effects of the medication, or an interaction between antidepressant medication and PND symptoms, rather than being directly caused by the PND symptoms themselves.

Due to this, future research might wish to consider the effects of antidepressant medication on memory phenomenology, in postnatally depressed mothers and healthy controls. To separate the effects of PND symptoms and antidepressant medication, it may be useful to replicate the present study, however involving two depressive participant groups (one medicated and one non-medicated) and a control group. If it is found that the medicated-depression group show greater impairment in memory phenomenology, with lower ratings on characteristics such as vividness and emotional intensity than the non-medicated depression group, this would suggest that the antidepressant medication has an effect on the phenomenological experience of AM, confounding the influence of PND symptoms on these memory characteristics. The inclusion of a medicated control group could also add to the knowledge of this relationship, as this would allow for the separate

effects of PND symptoms and medication to be untangled, and the presence of an interaction effect between these two factors to be identified. If the medicated control group provide similar phenomenology ratings to the medicated depression group, this would imply that the antidepressant medication is influential in the phenomenological experience of memories, instead of or as well as PND symptoms. This knowledge would have implications for the treatment of PND, as impaired memory phenomenology, particularly for positive parent-related events, can inhibit recovery from depression, which questions the effectiveness of antidepressants for this cause.

A further limitation within the present study, which could be improved upon within future research, is the lack of a comparison between positive and negative AMs. The present study did not specify the emotional valence of memories to be recalled, therefore allowing for a comparison of the number of positive and negative events naturally recalled by depressive and non-depressive mothers, when no instruction was given to indicate which memory type should be recalled. A significant negative correlation was discovered using this design, with higher scores on the EPDS being associated with greater negative emotion in recalled AMs which were unrelated to parenting. This means that the present study showed evidence of a relationship between PND symptoms and the emotional valence of recalled AMs, when this was not set by the researcher.

However, despite this finding, the design of the study meant that comparing the phenomenological characteristics of positive and negative AMs could not be done. Since it is frequently reported in previous research that depressed individuals show impaired phenomenology, specifically for positive AMs (Lemogne et al., 2006; Bergouignan et al., 2008; Werner-Seidler & Moulds, 2011), a useful direction for future research would be to investigate whether this pattern could be replicated within PND. This research could take on a similar design to the present study, however the valence of each memory to be recalled could be manipulated instead of the relatedness to parenting. The inclusion of a manipulation of emotional valence, as well as relatedness to parenting, would increase the

number of AMs to be recalled and rated on the nine phenomenology characteristics. In order to ensure validity, at least two of each memory type would need to be recalled, to reduce the likelihood of the results being caused by a specific memory that may have been particularly salient. This would double the length of the questionnaire and, as a result, the amount of time participants would need to spend on the experiment. Mothers of young children often do not have a lot of spare time, therefore by manipulating only the valence of AM to be recalled, the questionnaire length would be the same as that of the present study, which worked effectively. As the present study has done for the relatedness of a memory to parenting, this would allow for a thorough investigation into the differences between phenomenological characteristics of positive and negative memories, and how each of these characteristics correlates with PND, as measured by EPDS score. Since impaired phenomenology of positive memories is linked to greater vulnerability to the development of depression (Williams et al., 2007), the separation of phenomenological experience for positive and negative memories may reveal a different pattern of findings to that of the present study, which reviewed phenomenology of positive and negative memories together. This would have implications for the identification of relevant risk factors in the development of PND. This design would also allow for a comparison of the spontaneous recall of parent-related and unrelated events within this recall task, which could be compared between mothers with and without PND symptoms.

An additional suggestion which future research may wish to consider would be to investigate the role of depression symptoms on the phenomenological experience of memory in other primary caregiver groups. This could take a similar form to that of the present study, however adapted slightly to include other primary caregivers, such as fathers and adoptive parents. These participant groups are also known to suffer from PND or post adoption depression (Edmondson, Psychogiou, Vlachos, Netsi & Ramchandani, 2010; Payne, Fields, Meuchel, Jaffe & Jha, 2010; Foli, South, Lim, & Hebdon, 2013). If similar findings are discovered to those of the present study, which only included biological mothers,

this would validate and extend the present results, allowing generalisation to other caregiver groups. However, if differing results were found for the different caregiver groups, this would allow memory phenomenology risk factors of PND or post adoption depression to be identified in these groups, which holds implications for the effective identification and treatment of these perinatal mental health conditions.

A final direction for future research would be to investigate the phenomenological characteristics experienced when imagining future events, and how these differ between postnatally depressed and non-depressed mothers. It would be useful to compare the extent to which these characteristics are experienced between positive and negative imagined events, as previous research has consistently reported impaired phenomenology for positive future events in depressed individuals, compared to negative events (Holmes et al, 2008; Morina et al, 2011; Szőllősi et al., 2015; Anderson & Evans, 2015). This impairment, particularly for positive events, has implications for the recovery and relapse rates from depression. Clinically depressed individuals who showed reduced phenomenological characteristics for imagined positive events were also reported to rate these positive events as less likely to happen in their own future (Morina at al., 2011). This relationship between memory phenomenology and diminished beliefs about positive events occurring, plays a key role in the development and maintenance of depression, and also the likelihood of recovery and relapse, due to the emotion-balancing role of these characteristics (Roepke & Seligman, 2016). This has strong implications for the development of techniques to treat depression, as improved phenomenological experience and positive prospections can bolster positive emotions. It would be useful to investigate whether the same results can be applied to PND, which could lead to treatments being directed towards correcting impaired phenomenology and negative beliefs of the future.

Conclusions

This research concludes that the phenomenological experience of recalled AMs is affected by the experience of PND symptoms. The characteristics vividness and emotional

valence were found to differ as a function of EPDS score, with significantly lower vividness and greater negative emotion being reported by mothers with greater EPDS scores. Differences were also found between the phenomenological experience of parenting-related events and events which were unrelated to parenting. However, a characteristic salience interaction may have taken place, which meant that only the most salient characteristics, which took less consideration to assess, gained accurate ratings. As this was the first research to our knowledge, to investigate the phenomenology of parent-related and unrelated memories, further research is required to investigate deeper into the differences between these two memory types. Future research is also necessary in order to assess the full extent of the phenomenological impairment in postnatally depressed mothers, as mentioned above. Through identification of this and other cognitive risk factors for PND, tailored treatments could be developed which fit to an individual's needs. Cognitive therapy which is tailored towards improving the specific cognitive impairments experienced by the individual, may provide a better outcome than antidepressants or general talking therapies, as this works towards correcting their identified maladaptive cognitions.

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Appendix A

Revised Online Surveys questionnaire for the main experiment

I would like to invite you to participate in a research project which forms part of my Master's degree research. This study aims to investigate whether having a baby affects your memory, by looking at how well mothers can recall memories of recent events. This study will also investigate whether ability to recall memories is affected by mothers' mood. Any mother who is over the age of 18 and has given birth in the past three years is welcome to participate.

What will the study involve?
You will be asked to complete a series of memory rating tasks, along with a short questionnaire assessing your mood. For the memory rating task, you will be asked to recall a memory in as much detail as possible, then answer some questions about each memory. These will ask you to rate the degree to which the memory is vivid, coherent, emotional, includes sensory and bodily details, and is related to your personal identity and life story. Once you have completed these ratings for one memory, you will be asked to move onto the next. These ratings will be made for four different memories: two memories that are related to motherhood and two memories that are unrelated to motherhood. You will then be asked to complete a short mood rating questionnaire to assess how you have been feeling over the past seven days.

Some of the memories you will be asked to recall may be negative in nature and may have the potential to cause you discomfort. Please be aware that if you do experience discomfort at any point in the study you are welcome to end your participation by closing the internet browser. If you experience any discomfort from taking part in this research, and feel you would benefit from further support, please contact one of the support services whose details are provided below.

House of Light   **Mind**

01482 580499   0300 123 3393

help@pndsupport.co.uk   info@mind.org.uk

Data handling and confidentiality
This study has been reviewed by the Faculty of Health Sciences Ethics Committee, University of Hull. Your data will be processed in accordance with the General Data Protection Regulation 2016 (GDPR) and all data recorded will be fully anonymised.

You are free to withdraw from the study up until the point of data submission. Once you have submitted your responses, by clicking the 'Finish' button at the end of the questionnaire, your withdrawal will not be possible due to your data being fully

anonymised. However, you will not be identifiable from your data. The results of the study will be summarised anonymously for use in my thesis for my Master's degree.

Who should I contact for further information?
If you have any questions or require more information about this study, please contact the principal researcher using the following contact details: S.S.Parker@2015.hull.ac.uk.

What if I have further questions, or if something goes wrong?
 If you wish to make a complaint about the conduct of the study, you can contact the University of Hull using the details below for further advice and information:

Professor Stephen Dewhurst   Dr Rachel Anderson

Research Supervisor   OR   Co-supervisor

Email: S.Dewhurst@hull.ac.uk   Email: Rachel.Anderson@hull.ac.uk

Tel: 01482 465931   Tel: 01482 465582

Alternatively please contact registrar@hull.ac.uk

Thank you for reading this information and for considering taking part in this research. This information is available for you to print, if you wish, by following the link below:
https://static.onlinesurveys.ac.uk/media/account/141/survey/558084/question/participant_information.pdf

Information and Consent

Please read the following statements:

1. I confirm that I have read the information sheet dated 31/12/2019 version 2.0 for the above study. I have had the opportunity to consider the information, ask questions and have had any questions answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. I understand that once I have submitted my responses, I cannot withdraw my anonymised data as my responses cannot be traced back to me.

3. I understand that the research data, which will be anonymised (not linked to me), will be retained by the researchers and may be shared with others and publicly disseminated to support other research in the future.

4. I understand that my personal data will be kept securely in accordance with data protection guidelines, and will only be available to the immediate research team.

5. I give permission for the collection and use of my data to answer the research question in this study.

I have read and understood the participant information. I agree to the five terms listed above, and consent to take part in this research. (By clicking 'yes', you are stating your agreement and giving consent to participate).

- o   Yes, I consent to take part in the study

- o   No, I do not give my consent

Demographic information

This information will only be used to calculate an average, which will then be reported in the thesis.

What is your age (in years)? …………

How much time has passed since birth of your youngest child (in months)? …………………

How many children do you have? ………………

Please try to recall a memory of an event RELATED TO MOTHERHOOD which occurred between one and six months ago. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

……

……

……

……

In my mind this event is… (-3 = cloudy and imageless, 3 = as clear & vivid as if I'm experiencing it now)	-3	-2	-1	0	1	2	3
The order of events is clear and tells a coherent story (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
My memory for this event contains a lot of sensory details (images, sounds, tastes, smells etc.) (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I think about it I can 'bodily' feel myself in the event (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I recall the event, I primarily see what happened from a perspective as seen through… (-3 = my own eyes, 3 = an observer's eyes)	-3	-2	-1	0	1	2	3
The emotions I have when I recall the event are… (-3 = extremely negative, 3 = extremely positive)	-3	-2	-1	0	1	2	3
When I recall this event, my emotions are intense (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
This event is an important part of my identity (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3
This event is central to my life story (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3

Please try to recall another memory of an event RELATED TO MOTHERHOOD which occurred between one and six months ago. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

……
……
……
……

In my mind this event is... (-3 = cloudy and imageless, 3 = as clear & vivid as if I'm experiencing it now)	-3	-2	-1	0	1	2	3
The order of events is clear and tells a coherent story (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
My memory for this event contains a lot of sensory details (images, sounds, tastes, smells etc.) (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I think about it I can 'bodily' feel myself in the event (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I recall the event, I primarily see what happened from a perspective as seen through... (-3 = my own eyes, 3 = an observer's eyes)	-3	-2	-1	0	1	2	3
The emotions I have when I recall the event are... (-3 = extremely negative, 3 = extremely positive)	-3	-2	-1	0	1	2	3
When I recall this event, my emotions are intense (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
This event is an important part of my identity (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3
This event is central to my life story (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3

Please try to recall a memory of an event UNRELATED TO MOTHERHOOD which occurred between one and six months ago. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

………
………
………
………

In my mind this event is… (-3 = cloudy and imageless, 3 = as clear & vivid as if I'm experiencing it now)	-3	-2	-1	0	1	2	3
The order of events is clear and tells a coherent story (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
My memory for this event contains a lot of sensory details (images, sounds, tastes, smells etc.) (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
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The emotions I have when I recall the event are… (-3 = extremely negative, 3 = extremely positive)	-3	-2	-1	0	1	2	3
When I recall this event, my emotions are intense (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
This event is an important part of my identity (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3
This event is central to my life story (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3

Please try to recall another memory of an event UNRELATED TO MOTHERHOOD which occurred between one and six months ago. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

……

……

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In my mind this event is… (-3 = cloudy and imageless, 3 = as clear & vivid as if I'm experiencing it now)	-3	-2	-1	0	1	2	3
The order of events is clear and tells a coherent story (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
My memory for this event contains a lot of sensory details (images, sounds, tastes, smells etc.) (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I think about it I can 'bodily' feel myself in the event (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I recall the event, I primarily see what happened from a perspective as seen through… (-3 = my own eyes, 3 = an observer's eyes)	-3	-2	-1	0	1	2	3
The emotions I have when I recall the event are… (-3 = extremely negative, 3 = extremely positive)	-3	-2	-1	0	1	2	3
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This event is an important part of my identity (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3
This event is central to my life story (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3

As you have recently had a baby, we would like to know how you are feeling.

Please choose the answer that comes closest to how you have felt <u>IN THE PAST 7 DAYS</u>, not just how you feel today. Here is an example, already completed.

I have felt happy: This would mean: "I have felt happy most of the time" during the past week. Please complete the other questions in the same way.

In the past 7 days:

1. I have been able to laugh and see the funny side of things

- ○ As much as I always could
- ○ Not quite so much now
- ○ Definitely not so much now
- ○ Not at all

2. I have looked forward with enjoyment to things

- ○ As much as I ever did
- ○ Rather less than I used to
- ○ Definitely less than I used to
- ○ Hardly at all

3. I have blamed myself unnecessarily when things went wrong

- ○ Yes, most of the time
- ○ Yes, some of the time
- ○ Not very often
- ○ No, never

4. I have been anxious or worried for no good reason

- ○ No, not at all
- ○ Hardly ever
- ○ Yes, sometimes
- ○ Yes, very often

5. I have felt scared or panicky for no good reason

- ○ Yes, quite a lot
- ○ Yes, sometimes
- ○ No, not much
- ○ No, not at all

6. Things have been getting on top of me

- ○   Yes, most of the time I haven't been able to cope at all
- ○   Yes, sometimes I haven't been coping as well as usual
- ○   No, most of the time I have coped quite well
- ○   No, I have been coping as well as ever

7. I have been so unhappy that I have had difficulty sleeping

- ○   Yes, most of the time
- ○   Yes, sometimes
- ○   Not very often
- ○   No, not at all

8. I have felt sad or miserable

- ○   Yes, most of the time
- ○   Yes, quite often
- ○   Not very often
- ○   No, not at all

9. I have been so unhappy that I have been crying

- ○   Yes, most of the time
- ○   Yes, quite often
- ○   Only occasionally
- ○   No, never

10. The thought of harming myself has occurred to me

- ○   Yes, quite often
- ○   Sometimes
- ○   Hardly ever
- ○   Never

Thank you for taking the time to fill out this survey. If you are still happy for your responses to be submitted please click 'Finish' below. You will then be taken to some further information about this research. If you close this browser without clicking 'Finish', you responses will NOT be submitted.

- ○   Finish

Thank you for taking the time to fill out this questionnaire. Your data have now been saved anonymously.

Now think of a memory that makes you happy. You don't have to rate this. Just enjoy reminiscing! ☺

If you have experienced any discomfort from taking part, and feel you would benefit from further support, please contact one of the support services whose details are provided below.

House of Light   **Mind**

01482 580499   0300 123 3393

help@pndsupport.co.uk   info@mind.org.uk

This information, along with the researcher's contact details, and background information about this study, is available for you to print by following the link below:

https://static.onlinesurveys.ac.uk/media/account/141/survey/558084/question/debriefing_information.docx

DEBRIEFING INFORMATION FOR PARTICIPANTS

How does motherhood affect your memory?

Thank you for taking the time to fill in this questionnaire.

If you have experienced any discomfort from taking part, and feel you would benefit from further support, please contact one of the support services whose details are provided below.

House of Light   **Mind**

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Below you will find additional information regarding the background and anticipated findings of this research.

What is the purpose of this study?

The present research aimed to investigate the subjective experience of mother's memories, and whether this differs between postnatally depressed and non-depressed mothers. Put simply, whether mothers with postnatal depression experience memories which are maybe less vivid, coherent, or emotionally charged than non-depressed mothers, or vice-versa. The

effects of emotion and relatedness of the memories to motherhood were also investigated in relation to the experience of these memories.

Previous research has reported that depressed individuals struggle to retrieve specific memories, instead producing more general recollections, and that this inability impeded their recovery from depression (Brittlebank et al., 1993). Similarly, postnatally depressed mothers have also been found to recall more over-general memories than non-depressed mothers. Negative parental-related memories were also recalled more in postnatally depressed mothers than positive memories relating to being a parent, while the opposite pattern was seen in non-depressed mothers, with positive memories being the most frequent (Croll & Bryant, 2000).

Division of results into postnatally depressed and non-depressed categories was based on the scoring of the mood questionnaire. I'll take the time to remind you that these answers were fully anonymized, cannot be traced back to yourself and will not be used for any other purpose.

Anticipated findings:

Based on the previous research findings, it is predicted that mothers experiencing symptoms associated with postnatal depression will recall negative memories in more detail than positive memories, while non-depressed will show more detailed positive memories. It is anticipated that more over-general memories will be produced by postnatally depressed mothers.

Contacts for further information:

If you require any further information about this study, or have any concerns, please contact either the principal researcher (S.S.Parker@2015.hull.ac.uk) or research supervisor Professor Stephen Dewhurst (S.Dewhurst@hull.ac.uk).

References:

Brittlebank, A. D., Scott, J., Mark, J., Williams, G., & Ferrier, I. N. (1993). Autobiographical memory in depression: State or trait marker?. The British Journal of Psychiatry, 162(1), 118-121.

Croll, S., & Bryant, R. A. (2000). Autobiographical memory in postnatal depression. Cognitive Therapy and Research, 24(4), 419-426.

Appendix B

Online Surveys questionnaire for the pilot study

Information and Consent

Please read the following statements:

1. I confirm that I have read the information sheet dated 31/12/2019 version 2.0 for the above study. I have had the opportunity to consider the information, ask questions and have had any questions answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. I understand that once I have submitted my responses, I cannot withdraw my anonymised data as my responses cannot be traced back to me.

3. I understand that the research data, which will be anonymised (not linked to me), will be retained by the researchers and may be shared with others and publicly disseminated to support other research in the future.

4. I understand that my personal data will be kept securely in accordance with data protection guidelines, and will only be available to the immediate research team.

5. I give permission for the collection and use of my data to answer the research question in this study.

I have read and understood the participant information. I agree to the five terms listed above, and consent to take part in this research. (By clicking 'yes', you are stating your agreement and giving consent to participate).

- o   Yes, I consent to take part in the study

- o   No, I do not give my consent

Demographic information

This information will only be used to calculate an average, which will then be reported in the thesis.

What is your age (in years)? …………

How much time has passed since birth of your youngest child (in months)? …………………

How many children do you have? ………………

Please try to recall a memory of a <u>POSITIVE</u> event <u>RELATED TO MOTHERHOOD</u> which occurred <u>between one and six months ago</u>. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

……
……
……
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In my mind this event is… (-3 = cloudy and imageless, 3 = as clear & vivid as if I'm experiencing it now)	-3	-2	-1	0	1	2	3
The order of events is clear and tells a coherent story (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
My memory for this event contains a lot of sensory details (images, sounds, tastes, smells etc.) (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I think about it I can 'bodily' feel myself in the event (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
When I recall the event, I primarily see what happened from a perspective as seen through… (-3 = my own eyes, 3 = an observer's eyes)	-3	-2	-1	0	1	2	3
The emotions I have when I recall the event are… (-3 = extremely negative, 3 = extremely positive)	-3	-2	-1	0	1	2	3
When I recall this event, my emotions are intense (-3 = not at all, 3 = extremely)	-3	-2	-1	0	1	2	3
This event is an important part of my identity (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3
This event is central to my life story (-3 = totally disagree, 3 = totally agree)	-3	-2	-1	0	1	2	3

Please try to recall a memory of a <u>POSITIVE</u> event <u>RELATED TO MOTHERHOOD</u> which occurred <u>between one and six months ago</u>. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

………

………

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………

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Please try to recall a memory of a <u>NEGATIVE</u> event <u>RELATED TO MOTHERHOOD</u> which occurred <u>between one and six months ago</u>. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

………

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Please try to recall a memory of a <u>POSITIVE</u> event <u>UNRELATED TO MOTHERHOOD</u> which occurred <u>between one and six months ago</u>. The memory must be of an event which occurred on a single day. Please try and think about this event in as much detail as possible, then write a brief description below.

………

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In the past 7 days:

1. I have been able to laugh and see the funny side of things

  - o   As much as I always could
  - o   Not quite so much now
  - o   Definitely not so much now
  - o   Not at all

2. I have looked forward with enjoyment to things

  - o   As much as I ever did
  - o   Rather less than I used to
  - o   Definitely less than I used to
  - o   Hardly at all

3. I have blamed myself unnecessarily when things went wrong

  - o   Yes, most of the time
  - o   Yes, some of the time
  - o   Not very often
  - o   No, never

4. I have been anxious or worried for no good reason

  - o   No, not at all
  - o   Hardly ever
  - o   Yes, sometimes
  - o   Yes, very often

5. I have felt scared or panicky for no good reason

  - o   Yes, quite a lot
  - o   Yes, sometimes
  - o   No, not much
  - o   No, not at all

6. Things have been getting on top of me

- o Yes, most of the time I haven't been able to cope at all
- o Yes, sometimes I haven't been coping as well as usual
- o No, most of the time I have coped quite well
- o No, I have been coping as well as ever

7. I have been so unhappy that I have had difficulty sleeping

- o Yes, most of the time
- o Yes, sometimes
- o Not very often
- o No, not at all

8. I have felt sad or miserable

- o Yes, most of the time
- o Yes, quite often
- o Not very often
- o No, not at all

9. I have been so unhappy that I have been crying

- o Yes, most of the time
- o Yes, quite often
- o Only occasionally
- o No, never

10. The thought of harming myself has occurred to me

- o Yes, quite often
- o Sometimes
- o Hardly ever
- o Never

Thank you for taking the time to fill out this survey. If you are still happy for your responses to be submitted please click 'Finish' below. You will then be taken to some further information about this research. If you close this browser without clicking 'Finish', you responses will NOT be submitted.

- o Finish

Thank you for taking the time to fill out this questionnaire. Your data have now been saved anonymously.

Now think of a memory that makes you happy. You don't have to rate this. Just enjoy reminiscing! ☺

If you have experienced any discomfort from taking part, and feel you would benefit from further support, please contact one of the support services whose details are provided below.

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https://static.onlinesurveys.ac.uk/media/account/141/survey/558084/question/participant
_information.pdf

Appendix C

Parenting-related memories recalled by participants

Once my baby was born, a week after people from my husband's family came over to the house to see him. My mother in law had arranged for them all to come. We had invited over just a few immediate family members but there ended up being 40 people come over. I ended up having to cook and host when I would have rather had spent the day in bed as I was still feeling all the pain from delivery. That day my baby was being passed around to everyone and I hardly had time to hold my own child. He just kept being taken off me. I remember my milk being so full and I asked to get my baby back to feed him and my mother in law said he didn't need a feed as he was fast asleep. Out of all the people who came only three people asked me how I was doing everyone else just wanted to play with the baby. I remember it being chaos having to get food out to give to people and make drinks etc. When I did get my baby to feed him, I got told to give him back straight after the feed. The day ended with people leaving and I was changing my baby's nappy. They didn't even come to say goodbye to me and I was told to go down and say goodbye to them but they had already left. In the evening my husband told his mother that I was feeling uneasy about my baby being passed around and she ended up getting offended and left with an argument. When everyone had gone home I remember sitting and crying.

The day my baby made his first word like sound. I was singing to him and he was looking at me smiling. He listened to the song and once it had finished he smiled at me and said 'agoo' which to me sounded like the word 'again'. It made me so happy that my baby enjoyed me singing to him.

Collected our new puppy as a family

The first moment my son crawled, he did this early as he is one determined baby. He was in the lounge next to the sofa while we were all sat in there relaxing. He was wearing only his long sleeved baby grow (we took trousers and socks to help with grip).

Going out for the day with my daughter for christmas to sundown.

I took my son for an appointment with orthopaedics (mr Davies). It was his second hospital appointment of the day and he was tired and a bit grumpy. Mr Davies was very thorough, and patient with my son. He had 2 trainees in the room with him to whom he was speaking medical jargon, but he took the time to explain to us all of the questions we asked. We were happy that the day was coming to an end because we'd spent many hours in the hospital, and they were running late.

On a day out for my daughter's birthday we stopped to see a sea lion show and watched them balancing, doing impressions, tricks and diving. There was two sea lions and we sat wrapped in a blanket because it was cold and windy.

My son was in hospital after a seizure. He has been sick the night before and we needed to call an ambulance.

Holiday to the Lake District.

When I gave my baby his first bath. I was really excited and my partner was sitting with Isaac on the settee as I filled his bath and got his changing mat, towels, clothes and wash things ready on the living room floor. The bath only lasted around 10 minutes but I loved it. I was very nervous about making sure he was OK and didn't slip but enjoyed waving the water over him. Isaac was really quiet and seemed relaxed as I washed his hair. We then had cuddles on the settee with him wrapped in his towel.

I dropped my children at school/nursery and went to a local tanning shop where I had my nails done and then went on the tanning beds before having to go and collect my son from nursery.

When my baby first smiled it completely took me by surprise. I had him on my lap and was talking to him when he suddenly smiled properly and then kept smiling at me. It was amazing but I felt bad as my husband was at work and missed our son's first smile.

My sons 6th birthday party, held at home with close family. It was minecraft themed and he smiled all day, loving the attention and his favourite things decorated around the house. He especially loved his minecraft lego set.

Christmas Day. Opening presents, the excitement of santa.

Death of a friend.

We took Reggie to see Santa on the steam train in Pickering on 30th Nov.

Xmas day 2019... We had wrapped the living room door in wrapping paper. My toddler came downstairs and was confused as to where the door was. We told him father Christmas needed him to break the door down and he proceeded to then punch his way through the wrapping paper. When he had made a hole big enough to fit his head through he looked inside and got really excited at the sight of the presents.

We went to a child's 3rd birthday party. It was the first proper party that Alfie had been to. He spent the first 30 mins with his eyes closed but once he opened them and joined in, he loved it. Joined in dancing and playing party games.

The traumatic painful birth.

Went with my sister in law while she got a tattoo.

Taking my son to the out of hours hospital when his temperate was high. I felt upset and worried and felt guilty for not checking his temperature earlier.

Bringing my baby home for the first time from hospital. She was just over 30hours old and I just remember feeling fearful all the time.

Pushing my child on a swing for the first time.
Took him on his first holiday to a cottage in Cheshire. We went to his first theme park whilst we were there and went on all the rides.

We took the boys to a lunch with santa the weekend before Christmas. Our eldest hasn't had a positive experience with santa yet and this went really really well. We had a wonderful time.

Friends wedding. Couldn't drink cos was pregnant but boyfriend got wasted.

Visit to the secret village with sob and his grandma. I drove us there, had lemon cake and tea same as grandma. Son played well with other children and enjoyed the place.

Taking my son to a Christmas grotto event with some of my extended family. He was going through a shy/clingy period and screamed the whole time we were in the grotto seeing santa. He enjoyed other parts of the day like riding on a model railway with me.

Went for lunch with friend, her baby and mine.

One day I was walking home from the shops with my son and I had bought him a sweet lollypop. He wanted to run down the street like he always does and I always take his lollypop out of his hand before he does run down the street, I also had to push the push chair and had all my shopping in my hands. On this occasion I forgot to take his lollypop out of his hand before he ran down the street, he ended up falling over so far down the street and smashed all his lollypop to bits on the floor. He was okay but very upset. So then we had to head to another shop to buy him a new lollypop.

Doctors appointment straight after school run worrying if I would make it on time.

Feeling like I had bought too much stuff for Christmas.

We had a surprise 60th birthday party for my mum. We started the day off by prepping all the balloons and presents. We then had to get everything and everyone together, and head over to the restaurant we was having the party at. Once there we got everything laid out on the table and waited for my mum to arrive with her friend. Once she arrived, we all shouted surprise and happy birthday. She was so shocked and overwhelmed she cried. We all sat down whilst she opened her cards and presents. And then began to enjoy the afternoon tea and food we had organised. The children went off to play and we all sat and enjoyed one another's company.

Giving birth to my daughter, my second child. Traumatic but we got there in the end. Deliver at 5.29pm via forceps in theatre.

Giving birth to my daughter.

My little girl said Mama for the first time. We had got up had breakfast as always. I was teaching her phonics. I had been trying previously to say mama but no joy. I tried again and her face was blank.... then I said as she finished her breakfast..... Thank you Mama.... She just looked at me and said... Mama. I picked her up and kissed her cheeks and told her what a good and clever girl she was. That was a great day.

The first day my eldest met my youngest at hospital, he was so excited and a little nervous! Coming home from hospital with my newborn baby at 3 days old. We left the hospital about 1pm, my daughter was at school, we had 3 visitors when we got home and it was strange to realise we were now a family of four. I was annoyed at my husband as he had not cleaned or even hoovered the house before I got home.

A few months ago my Little one fell down 3/4 stairs at my mums house. This affected me as a parent because up until recently she has been terrified of the stairs. It happened so fast but it made me doubt myself as a parent.

The first time he rolled over. It was in January, we were at center parcs with the family and all cheered when he managed to do it.

Midnight shopping. Just being able to look around a shop when there's close to no people in there and not having a tantrum or screaming fit from a baby.

Attending school nativity play.

We went to sundown adventure land. We went as doors opened and left as they were shutting. Zayah walked the whole way round.

Getting back in contact with a close friend on facebook. Having conversations through text messages in October.

Putting my little boy into his own room for the first time.

Took my son to lightwater valley for the day.

Went to a friend's baptism of their little girl and I was holding my little girl whilst the service was happening to rock her to sleep she was in a fabric carrier on me and eventually she went to sleep. My other friend took a video of it or pictures I can't quite remember.

My youngest child did their first wee in the toilet after starting proper toilet training. They were very happy with themselves and so were the rest of the family.

My little boy starting nursery in January. He cried and they had to ring me after an hour to go and pick him up. I've never let him go anywhere without me before. I'm a single mum so always been with me.

Finding out my eldest son age 6 has won a National award for science.
When my son learnt how to do 'how bigs Alfie' (he then raises both arms in the air) and we say "ever so big". We were at Grandma's, she was the one who taught him this.

Taking my daughter to doctor/hospital when she was really unwell.

On Christmas Day we stayed at my mother in laws house. My son woke up around 8 and so we took him downstairs for breakfast. He had Cheerios and raisins (his usual) and didn't want any pork pie (our strange family tradition related to my grandad who was a miner). We then went to see if Santa had been and my son was beyond excited. He sat on his dad's knee for most of the present unwrapping, and was disappointed that he had to keep unwrapping presents instead of playing for half an hour with each one. My parents arrived to join us mid way through and bought a whole huge bag of presents. His favourites were the lion backpack and toys.   I enjoyed hearing his laughter and excitement. It was a brilliant day, even if he got a little cranky at nap time.

We went to my brothers for a boxing day buffet and the children danced to a 'just dance' game and found it hilarious. My daughter got a high score for the little mermaid dance and my son loved a 'squirrels in my pants' song. They used a disco ball and a microphone and my son kept making us all laugh by fake farting whenever there was a pause.

My son told me that he loved me for the first time.

Getting bitten whilst at nursery.

The night we brought our baby home from the hospital. It was very dark when we arrived and the house was cold. Sophie, our dog, came running to greet us as we struggled in the house with all of our things. I suddenly felt very overwhelmed by everything and was frustrated as my partner dumped all of the bags in the middle of the room. Isaac had not enjoyed the ride home and was crying as I rushed to try and make a bottle as quickly as possible. He had is bottle and we settled him in his moses basket, swaddled in his duck blanket. I set to work

trying to organise things but was in a lot of pain from my cesarean so my partner made me sit down and cooked us a pizza for tea as Isaac slept next to us in his basket.

I dropped my children off at school/nursery then went to my best friends salon to have my hair done. We had a catch up whilst she did my hair as it is not very often we get to see each other nowadays.

When I was handed my son after he was born and I couldn't believe that I was a mother. There was an enormous amount of pride and my husband was crying because he was so happy. Our son was absolutely perfect but he wasn't breathing properly so had to go to NICU and have oxygen therapy for an hour. It was worrying but he's a happy healthy boy now.

My childs parent evening, he does very well in school but the class teacher repeatedly referred to him by another childs name and i was disappointed she did not take the time to check which child she was speaking about before i had entered the room. I had to correct her on 3 occasions with my childs name and am not at all convinced she even knows who my child is.

Being in A & E with our youngest daughter with a fever.

Christmas day.

For august bank holiday we stayed for a night a b&b in North Yorkshire, on the Saturday we explored Sutton Bank and had an evening meal in the local pub.

First swimming lesson. Absolutely gated it, screamed and so bed for 25 minutes and refused to go in.

We were playing in the park, Alfie did a poo and I didn't have this things with me so had to head home, he had his toy lawn mower but wouldn't carry it so had to carry him and the mower and head home. I was rushing and struggling a little and on the way out of the park I cockled and we both fell over. I remember Alfie crying and someone stopping to ask if we were ok.

Babys first immunisations.

Went out with cousin for dinner to prezzo and then desert at Kaspas.

Taking Louis to playgroup for the first time by myself and trying to get ready to leave the house by 9am.

The birth of my daughter by planned c-section.

Feeding my child proper food for the first time.

When he learnt how to ride his balance bike and we took him outside for the first time
My youngest son having his first set of immunisations.

Going to Newcastle to watch football. Was raining and horrible and I was heavily pregnant
Christmas day. We started the day at home, son opened presents and played with some. We then visited my brothers and dad before going to partners mums for dinner and stayed the night. It was a nice day.

Taking my son to my friends daughters birthday party. He took a long time to settle and wouldn't leave my lap. Once he did settle he was very excitable and loud compared to the other children but the adults seemed to enjoy watching him run around and play with a balloon.

Bathed my baby at my mum's house.

I was taking my son to nursery and thought I had packed everything in the car. I dropped him off at nursery and then headed off to work like I always do. once I got to work I discovered I had left my work shoes at home, so I had to inform my shift manager that I had to head back home as I had forgotten my work shoes. so I dashed home through road works and traffic lights, dashed into the house leaving my car enginge running, came back out of the house, jumped into my car and dashed back to work . I ended up being twenty minutes late and losing out on twenty minutes pay. The shift manager was all okay about it though and said it was one of those days.

My child took his first steps 6 months ago.

Visiting York for the day.

Bonfire night. The day was just an average day, as the evening drew in, me, my partner and my youngest son, headed to my mums house. Once we got there, we had some food and drink. Once we'd all finished that, we walked to the park to watch the firework display. Once that was finished we walked back to my mums to do sparklers. And then headed home.

My son waking up on Christmas morning. The first Christmas he has known what is going on. We were all very excited.

First day out with daughter- we went for a walk & coffee & I fed her in public for the first time.

It was a cold day and I had taken my little girl out for a walk and bumped into a friend. My little girl had a coat, hat, gloves and a blanket while she was him her buggy. By the time I saw my friend, my little girl had taken off her gloves and hat.   My friend looked at my little girl and said to her.... where's you hat and gloves... doesn't your mummy look after you. I laughed it off and explained she had pulled them off herself. But quickly felt like she was judging me and like I needed to explain what had happened. I quickly started putting them back on my little girl. Then we carried on our walk together with my friend trying to forget about it but it was still on my mind.

Giving birth to my youngest and meeting him for the first time.

My newborns 3 month review. It was in a group setting with about 8 new mums and two nursery nurses who were discussing weaning, safe sleeping and development.

My Eldest Child has recently started experiencing bad behaviour (4 years old) this has ranged from hitting, spitting & shouting. This has made me feel on edge taking her places In case she has a meltdown.

The first time he tried food. It was banana porridge.

Panning the little ones 1st birthday. With 48 days to go its amazing to be able to plan what we will do.

When my son got to bring home the nursery bear.

Zayah needed to attend a hospital appointment and was bit happy to see the doctor.

Potty training for the first time. Started in September and she only wears nappies on a night time.

Taking my children to see "santa".

Walk with my son to a local nature reserve.

Took both our children to soft play for my eldest birthday.

My youngest child seeing Father Christmas for the first time. They were not overawed and were more than happy to approach him and talk.

I took my little boy to the park. He went down the slide, swings, monkey bars. It was windy and a bit cold. There were 2 seagulls in the park and we just sat at the picnic table cuddled up watching them.

Appendix D

Parenting-unrelated memories that were recalled by participants.

During my pregnancy I hadn't been engaging in sports activities. I was told that there is a group of ladies running a badminton club near me. I hadn't played in a while but I remember enjoying it. In the evening I gave my baby a feed and a long cuddle. This was my first time going out without him. I went to the badminton club and met some new people. They all explained how they play competitively and explained the rules to me. The first game I was just getting used to how to play again. The second game I felt like I got into a rhythm and played much better. After the hour was up I rushed out and drove home. I missed my baby and gave him a bug hug.

Death of a close relative. Sat with her whilst she passed and until the private ambulance came.

We went to greece and the first day we were there we had come down stairs from getting ready for tea. We were chatting away (as there were a big group of us) I turned around and my eldest was in the pool without a life vest and he could not swim. I passed my youngest quickly to my partner, jumped into the pool and threw him out. It was the most terrify moment I've ever experienced I literally felt my heart drop and I cried after the event for quite a while.

Went out on a date day/evening with fiance. We went to play board games, escape room and for dinner.

I travelled to London for work. I took the car, and with traffic it took me 4.5 hours to reach my destination. I called my friend mark when I arrived to find where to park and be let into the building. I had several business meetings. In the evening I went for a meal at a Spanish place in Richmond. The hotel messed up my bedding and it took until 1am to get it changed for feather free.

I was working in a lesson when a student with tourettes became stuck while typing the word 'blow' and starting tic-ing inappropriate phases which caused all the other students to laugh and they could not regain focus. I gave the student an alternative word to write ('used') which helped them refocus slightly.

I bought a new car, about a month ago. I got a bus to the train station and then a taxi to go and pick it up. The taxi driver was trying to buy my old car.

Going back to work.

I went for a day out at the Christmas markets with my partner. We got the bus from goole to Leeds. When we got there, we went straight to the markets. It wasnt as busy as we expected and we were able to look at all of the stalls. We went to the food stall and ordered chips and German sausage and we stood under the canopy to eat it as it had started spitting with rain. We then went to sit in one of the pubs and had hot chocolate I decided to treat my kids one weekend, so we went for a walk along our local seafront and harbour, where we decided to have a ride on the local pirate ship. It was an enjoyable time and after it was over we went to a souvenir shop so the children could all lick something each to remind us of the day then we ended it with going to a hot dog stand so the older two children could have hot dogs for lunch whilst I gave the 2yr old his dinner in the pram. Then we headed home.

My husband and I went out for a meal for my birthday. We went to pizza express and I had the rocket, goats cheese and caramelised onion pizza. We then went to Yates for drinks after the meal.

Exactly 6 months ago i took my driving test for the third time and passed. I recall this day as it was a significant event in my life that was not realted to motherhood.

An overnight stay away with just my husband.

Falling out with sister.

Spending the day and evening at a conference for work in Brighton in November.

Out for dinner with all of my sisters and mum, lots of chatter and wine.

Going out to a pottery painting session with my mum, sister and daughter. Went after work, had some food then started painting. We all Painted our items, chatted and had a cup of tea. Then left the items to go in the kiln and went home.

Doing the NHS shop at Tesco during lockdown.

Shopping at morrisons with my nan and aunt.

Christmas Day with my family.

Last day at work before leaving for maternity.

Getting a new car.

Completing the snake lane pass 10 mile run - the longest I have ever run for and believing that I could do the GNR afte.

Cooking Christmas Dinner.

Finding out my dad was dying. Had to drive from York to Leeds without knowing what was happening.

Visit to a spa. I visited the spa on my own, had a coffee on arrival, had a massage and used the pool.

I attended the theatre with my friend to see Hairspray the musical. We went out for tea beforehand to Craft and Dough. I had a meaty pizza.

Went out for dinner with my partner, our friend and his niece. Had a couple of beers and listened to music in the evening.

I had a couple of hours spare one Friday morning so I headed up town to do a bit of shopping. I went to buy loads of birthday cards. I thought I had got them all but returned home that I had missed out one person.

My friends coming to my house for Sunday lunch.

Doctors appointment.

Christmas meal with my work colleagues. We all met at the pub where we sat down with drinks and started chatting. We then started receiving our 3 course meal. We all had a starter, a main and a pudding. Whilst eating we were chatting and laughing throughout the whole night.

Slice girls concert. With my best friend, we drove to Manchester and it rained for the whole journey. We got soaked waiting for the tram but had an ace night and finished it in bed eating chocolate buttons and reminiscing.

Buying 1st house- moving in day.

My little girl looks the double of her dad. On this particular day we went to the library to sing nursery rhymes. The lady who takes it saw my little girl is growing up and her face had changed. She told me she looks the double of me now... I was delighted.
Date night with my partner, a lovely meal out at Ginos restaurant and rare time just the two of us.

I went to a concert with two family members. It was in Leeds in December. We went for drinks beforehand and the Christmas market was open. The concert was brilliant.

I went through a rough patch within my mental health & became someone I didn't know.

Day trip to Leeds with the girls.

Spending Christmas day in hospital is probably the only memory I seem to remember where the child was not involved. Was admitted into local hospital on christmas eve and came home 4 days later.

Going to theatre to watch we will rock you will some friends for a birthday night out. Changing jobs first day.

I went out in November with my old work colleagues. We went for tapas and drinks and had a good catch up with each other.

Went for a meal with old colleagues.

Went for a massage.

Helped mother in law prep vegetables on Christmas Eve. We were laughing and joking in the kitchen and the kids were in the living room.

Getting lost on the way to IKEA and having to rely on people in the car to put me right. I went for breakfast with my mum and sister. We had a fry up and drank tea. We laughed uncontrollably for something really stupid!

Hosted a dinner party to some new friends. We have recently made friends with this couple who have also had a baby boy. Their baby is two weeks older than ours. We invited them over for dinner. I tried a new recipe which went down a hit. The main was a traditional rice dish and cheesecake for dessert. We had a good catch up about life.

Gained a promotion at work following an application and selection process.

When I picked my youngest up from his aunt's house. He was so happy to see me, he crawled straight to me, raised his arms to be picked up then smiled and cuddled me. He then proceeded to nod his head until I copied.

Taking my driving test for the first time.

The day after the previous event (early December) I drove to the office and started to feel unwell. I tried to do work in the morning but could feel I was worsening and decided to drive home. I was worried about the traffic and whether I'd make it home given how ill I was feeling. I bought a sandwich to eat in the car, I remember it had olives in it, and a bag of crisps. Also a large bottle of cold water.   I drove home without stopping (because if I stopped I was concerned I wouldn't be able to continue) and went to bed. I was then I'll with the flu for the rest of the week.

At a training day for work we had an interesting training session on educational tech to use with students. It was run by a man from a business called phoenix, and I learnt about translation apps, visual aid apps that can describe what you are looking at, and ways to tailor presentations so that EAL students can see subtitles in their first language.

I had an evening out with a friend. We went to dinner and then had drinks after.

My friends hen party.

On my birthday, we went on the bus to xscape for a day out. When we got there, we went to play glow in the dark mini golf. Me and my partner were competing with

eachother to see who would win. We were both really bad and kept laughing as we missed the hole over and over again. Afterwards, we went to pizza hut for tea and I had a margheritta pizza. While we waited for the bus, we looked around the shops and Dean bought me a huge pick n mix and we bought a game book to play on the bus on the way home.

I always try and balance my time with the children, so on a Friday I put the youngest to bed then me and the older two have a takeaway and play board games/watch a film or colour. This particular evening we had chinese and then played a game of the beat the parents, I was amazed at how well my two boys answered the trivia questions they did better than me but the challenges we had to do were hilarious we were in stitches most of the evening it was lovely having that time together!

I met up with my friends and visited their new flat and talked to them about their wedding plans. We spent about 2 hours together. The flat was empty as they had just moved in and the only furniture they had was two garden chairs and a beanbag.
I started my teaching degree at university as a mature student, it was a huge step towards the future career I have always dreamt of and something for me as an individual rather than as just a mum.

Being at my sisters house when she got upset over something silly.

Work.

Work Christmas party on Saturday in mid-dec.

Brothers 40th birthday party, spending time with family.

Going to yoga as I do each week, this week I was attempting a hand stand against the wall, after my 3rd attempt I fell into a heap on the floor. I hurt my knee and was embarrassed.

Watching a new series on Netflix.

Going to work to get a new security pass.

Going out with my friends for the first time in a year for drinks and a nice meal. There are 15 of us who have been friends for almost 20 years and we're all very close so this night was something I looked forward to for a very long time.

Going to the opticians for my glasses, roughly 5 months ago.

Getting a new pet.

Grans funeral. Funeral and wake with whole family.

New years eve at my cousins house.

Passing my driving test. Thought I'd failed and was really nervous. Lied afterwards and told everyone I'd failed.

Work. I attended a safeguarding course.

I delivered a training event to my work colleagues. The session was to raise awareness of personality disorder and how to work with individuals with PD. It was delivered as a PowerPoint presentation and took several hours.

Dinner at friends house.

I went to the hair dressers to get my hair cut, coloured, dry and straightened. I arrive on time, everything went well, it got to the end where i had to pay for the services of the hair dresser. I looked in my purse and had no pennies to pay. I then had to dash to the nearset bank and back to the hair dressers to pay my bill.

Going to the hairdresser to have my hair cut and dyed.

First day in new job role.

Boxing Day at the in-laws. We went to the in-laws at around dinner time. We Exchanged gifts and then sat down to enjoy some food. The kids played with their toys whilst we sat talking.

Girls Christmas night. I cooked food, we exchanged gifts, laughed and talked about Christmas and festivities.

Last day at work.

My husband and I had a lovely meal some pudding then a couple of drink then we sang Karaoke into the night until 3 am it was a great evening.

Massage and pedicure spa experience at sessions spa bought for me as a birthday present.

Just before my child was born my husband took me for a meal at a michelin restaurant. Its somewhere we had been wanting to go for a long time. It was beautiful and we look forward to going again.

I can't think of anything else (Ooops).

First date night with my partner since birth. We went to Nando's and then the cinema My nieces 5th birthday party. After not spending a single birthday with her it was amazing to be able to spend the day with her.

Moving house.

I went out with work colleagues for a dinner. It was to celebrate one of the girls leaving for maternity and we went to a restaurant in selby.

Spending the day with my mum and niece in September we went for lunch and did some shopping.

Meeting my new manager to discuss return to work.

Went to hairdressers alone.

Started new job as a care assistant in a nursing home. Very different to my previous jobs. Different hours too working late nights at the weekend.

One of the guinea pigs dying.

I had my first night out in 4 years. I went out with my sister and friends. I drank pop and then had a couple of brandy and cokes. I got home at midnight. I sang on karaoke (badly!)

Appendix E

Correlation matrices including all phenomenology characteristics and EPDS score for related and unrelated memories.

Correlation matrix including all phenomenology characteristics and EPDS score for memories related to parenting.

Phenomenology Characteristics (Related)	EPDS Score (p-value)	Vividness (p-value)	Coherence (p-value)	Sensory Detail (p-value)	Bodily Feeling (p-value)	Visual Perspective (p-value)	Emotional Valence (p-value)	Emotional Intensity (p-value)	Importance to Self-Identity (p-value)	Centrality to Life Story (p-value)
EPDS Score (p-value)	1	-.291* (.045)	-.232 (.112)	.019 (.896)	-.057 (.702)	.005 (.974)	-.055 (.712)	-.006 (.969)	.251 (.085)	.056 (.707)
Vividness (p-value)	-.291* (.045)	1	.685** (.000)	.552** (.000)	.578** (.000)	-.312* (.031)	.219 (.134)	.519** (.000)	.214 (.144)	.438** (.002)
Coherence (p-value)	-.232 (.112)	.685** (.000)	1	.531** (.000)	.529** (.000)	-.211 (.149)	.062 (.676)	.290* (.046)	.302* (.037)	.473** (.001)
Sensory Detail (p-value)	.019 (.896)	.552** (.000)	.531** (.000)	1	.530** (.000)	-.109 (.459)	.085 (.568)	.428** (.002)	.406** (.004)	.329* (.022)
Bodily Feeling (p-value)	-.057 (.702)	.578** (.000)	.529** (.000)	.530** (.000)	1	-.219 (.134)	.170 (.247)	.425** (.003)	.276 (.057)	.398** (.005)
Visual Perspective (p-value)	.005 (.974)	-.312* (.031)	-.211 (.149)	-.109 (.459)	-.219 (.134)	1	.205 (.162)	-.110 (.457)	-.197 (.180)	-.123 (.403)
Emotional Valence (p-value)	-.055 (.712)	.219 (.134)	.062 (.676)	.085 (.568)	.170 (.247)	.205 (.162)	1	.330* (.022)	.079 (.594)	.236 (.107)
Emotional Intensity (p-value)	-.006 (.969)	.519** (.000)	.290* (.046)	.428** (.002)	.425** (.003)	-.110 (.457)	.330* (.022)	1	.452** (.001)	.607** (.000)
Importance to Self-Identity (p-value)	.251 (.085)	.214 (.144)	.302* (.037)	.406** (.004)	.276 (.057)	-.197 (.180)	.079 (.594)	.452** (.001)	1	.706** (.000)
Centrality to Life Story (p-value)	.056 (.707)	.438** (.002)	.473** (.001)	.329* (.022)	.398** (.005)	-.123 (.403)	.236 (.107)	.607** (.000)	.706** (.000)	1

*p < .05, **p < .01

Correlation matrix including all phenomenology characteristics and EPDS score for memories unrelated to parenting.

Phenomenology Characteristics (Unrelated)	EPDS Score (p-value)	Vividness (p-value)	Coherence (p-value)	Sensory Detail (p-value)	Bodily Feeling (p-value)	Visual Perspective (p-value)	Emotional Valence (p-value)	Emotional Intensity (p-value)	Importance to Self-Identity (p-value)	Centrality to Life Story (p-value)
EPDS Score (p-value)	1	-.150 (.308)	-.187 (.204)	-.052 (.724)	-.007 (.962)	-.168 (.253)	-.355* (.013)	.093 (.530)	.057 (.701)	-.077 (.601)
Vividness (p-value)	-.150 (.308)	1	.775** (.000)	.673** (.000)	.694** (.000)	-.265 (.068)	.308* (.033)	.154 (.296)	.150 (.309)	.349* (.015)
Coherence (p-value)	-.187 (.204)	.755** (.000)	1	.631** (.000)	.539** (.000)	-.314* (.030)	.187 (.204)	.079 (.594)	.048 (.747)	.203 (.167)
Sensory Detail (p-value)	-.052 (.724)	.673** (.000)	.631** (.000)	1	.719** (.000)	-.078 (.597)	.211 (.150)	.163 (.267)	.138 (.349)	.424** (.003)
Bodily Feeling (p-value)	-.007 (.962)	.694** (.000)	.539** (.000)	.719** (.000)	1	-.112 (.450)	.2221 (.131)	.310* (.032)	.237 (.106)	.477** (.001)
Visual Perspective (p-value)	-.168 (.253)	-.265 (.068)	-.314* (.030)	-.078 (.597)	-.112 (.450)	1	-.082 (.582)	.235 (.108)	.021 (.888)	-.027 (.855)
Emotional Valence (p-value)	-.355* (.013)	.308* (.033)	.187 (.204)	.211 (.150)	.221 (.131)	-.082 (.582)	1	.232 (.113)	.346* (.016)	.390** (.006)
Emotional Intensity (p-value)	.093 (.530)	.154 (.296)	.079 (.594)	.163 (.267)	.310* (.032)	.235 (.108)	.232 (.113)	1	.646** (.000)	.531** (.000)
Importance to Self-Identity (p-value)	.057 (.701)	.150 (.309)	.048 (.747)	.138 (.349)	.237 (.106)	.021 (.888)	.346* (.016)	.464** (.000)	1	.626** (.000)
Centrality to Life Story (p-value)	-.077 (.601)	.349* (.015)	.203 (.167)	.424** (.003)	.477** (.001)	-.027 (.855)	.390** (.006)	.531** (.000)	.626** (.000)	1

*p < .05, **p < .01

Correlation matrix including all phenomenology characteristics for parenting-related and unrelated memories.

Phenomenology Characteristics (Related and Unrelated)	Unrelated Vividness (*p*-value)	Unrelated Coherence (*p*-value)	Unrelated Sensory Detail (*p*-value)	Unrelated Bodily Feeling (*p*-value)	Unrelated Visual Perspective (*p*-value)	Unrelated Emotional Valence (*p*-value)	Unrelated Emotional Intensity (*p*-value)	Unrelated Importance to Self-Identity (*p*-value)	Unrelated Centrality to Life Story (*p*-value)
Related Vividness (*p*-value)	.351* (.015)	.288* (.047)	.194 (.188)	.050(.738)	.031 (.834)	.227 (.121)	.005 (.975)	-.108 (.466)	.055 (.712)
Related Coherence (*p*-value)	.108 (.465)	.194 (.186)	.115 (.438)	-.006 (.968)	.050 (.734)	.058 (.694)	-.199 (.175)	-.154 (.296)	-.030 (.837)
Related Sensory Detail (*p*-value)	.096 (.517)	.031 (.833)	.157 (.287)	.093 (.529)	.284 (.050)	-.046 (.756)	.140 (.343)	-.071 (.629)	-.026 (.862)
Related Bodily Feeling (*p*-value)	.281 (.053)	.191 (.194)	.229 (.118)	.309* (.032)	.054 (.714)	.057 (.702)	.039 (.790)	-.146 (.321)	.131 (.373)
Related Visual Perspective (*p*-value)	.039 (.792)	-.012 (.933)	.164 (.264)	.252 (.084)	.622** (.000)	.009 (.952)	.274 (.059)	.079 (.595)	.106 (.473)
Related Emotional Valence (*p*-value)	.054 (.714)	.074 (.615)	-.080 (587)	.059 (.689)	.124 (.399)	.070 (.635)	.407** (.004)	.006 (.967)	.138 (.348)
Related Emotional Intensity (*p*-value)	-.040 (.788)	-.099 (.504)	.002 (.987)	.037 (.801)	.224 (.125)	.255 (.081)	.343* (.017)	.019 (.896)	.148 (.314)
Related Importance to Self-Identity (*p*-value)	-.209 (.154)	-.217 (.139)	-.189 (.198)	-.110 (.458)	.052 (.727)	.115 (.435)	.207 (.158)	.275 (.058)	-.028 (.851)
Related Centrality to Life Story (*p*-value)	-.017 (.909)	-.104 (.484)	.010 (.948)	.055 (.710)	.082 (.581)	.381** (.007)	.154 (.295)	.143 (.333)	.177 (.228)

*p < .05, **p < .01