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Emotional memory in pregnant women at risk for postpartum depression

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ABSTRACT

Postpartum depression (PPD) is associated with debilitating effects on mothers and their infants. A previous history of depression is considered the strongest risk factor for PPD. Depressed individuals recall more negative than positive content and higher levels of stress hormones released during encoding are associated with enhanced recall of emotional stimuli. This study examined the impact of a previous history of major depressive disorder (MDD) and pregnancy on emotional memory. Seventy-seven participants completed the study [44 pregnant women in the second trimester of pregnancy with and without a lifetime history of MDD and 33 non-pregnant women with and without a lifetime history of MDD]. All completed an encoding task and provided salivary cortisol (sCORT) and alpha-amylase (sAA) samples. Participants returned one week later for a surprise incidental recognition memory task. Women with a history of MDD had worse recognition than women without a history of MDD for negative, but not positive images; this effect was independent of sCORT and sAA levels. Pregnancy did not affect emotional memory. Considering that several previous studies found enhanced memory bias for negative content during depressive states, our results suggest that clinical remission may be associated with an opposite cognitive processing of negative emotional content.

1. Introduction

Postpartum depression (PPD) is a common and preventable disorder associated with a debilitating effect on mothers and their infants (Wisner et al., 2006). Women have approximately a 50% higher risk of developing depression postnatally than at any other time in their lives (Vesga-Lopez et al., 2008). Longitudinal studies have shown that children born to mothers who suffered from PPD may display elevated cortisol and noradrenaline levels, and developmental deficits in language, intelligence, and memory compared to children of non-depressed mothers (Cogill et al., 1986; Essex et al., 2002; Grace et al., 2003). Moreover, studies examining maternal depression and risk for child psychopathology have consistently found an association between mothers with recurrent depression and co-morbid psychiatric disorders including anxiety or alcohol abuse and heightened risk for future psychiatric illness in offspring (Sellers et al., 2012). A number of psychosocial and environmental risk factors for the mother developing PPD have been identified including poor marital and social support, major stressful life events, low self-esteem, anxiety and depression during pregnancy, and difficult temperament of the child (Milgrom et al., 2008; O'Hara, 2009). In addition, previous history of MDD, especially depression during pregnancy, is considered the strongest risk factor for PPD (Heron et al., 2004; Milgrom et al., 2008). PPD is estimated to affect between 7% and 15% of women in the general population (Gaynes et al., 2005), but this rate increases to 25% among women with previous postpartum episodes, putting pregnant women with a history of MDD at significantly greater risk for PPD (Cooper and Murray, 1995; Wisner et al., 2002; Wisner et al., 2004). Despite increasing awareness of PPD and its debilitating effects on both mother and child, its neurobiology remains unclear.

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1.1. Emotional memory in depression

In humans, emotional information is better remembered than non-emotional information, likely because stimuli that evoke positive or negative emotional and physiological arousal are more crucial and relevant to human survival than neutral stimuli (Pratto and John, 1991). It is well established that individuals with MDD display emotion-related cognitive biases in attention and memory. For instance, depressed individuals have difficulty inhibiting or disengaging attention from negatively valenced information (De Raedt and Koster, 2010; Gotlib and Joormann, 2010) and display better memory for negative than positive content (Watkins et al., 1992; Bradley et al., 1995). In contrast, healthy controls display enhanced memory for positive relative to negative content (Bradley et al., 1995). This mood-congruent memory bias is theorized by some to be a maladaptive cognitive schema that contributes to depressive states (Hasler et al., 2004; Kovacs and Beck, 1978; Ridout et al., 2003; Watkins et al., 1992). Hamilton and Gotlib (2008) examined the neural correlates of enhanced emotional recall for negative content in individuals with MDD. They found that individuals with acute depression displayed a greater memory bias than healthy controls for negative images, but not for positive or neutral images. Enhanced memory for negative images at retrieval was associated with greater amygdalar activation at encoding. In contrast, individuals with no lifetime history of depression recalled positive images more accurately than the negative images (Hamilton and Gotlib, 2008). These results suggest that there is greater activation of the amygdala for content that is emotionally arousing, but not for neutral content, and that this memory effect is selective for individuals with depression when encoding negative content (Hamilton and Gotlib, 2008).

The majority of previous studies on memory biases have investigated individuals who were currently depressed or individuals with remitted depression using a sad mood induction. Less is known about memory biases in individuals with a history of depression who are currently euthymic as previous studies have produced inconsistent results. While some studies have failed to find any differences in memory retrieval of negative content between remitted individuals and healthy controls (Arnold et al., 2011; Gotlib and Cane, 1987; Teasdale and Dent, 1987; Wilkinson and Blackburn, 1981), some studies have found a memory bias for negative content in remitted individuals compared to healthy controls, but only following a sad mood induction (for review see Scher et al., 2005). More recently, Romero et al. (2014) have found that euthymic individuals with a history of MDD displayed increased recall of negative self-referent adjectives and decreased recall of positive self-referent adjectives compared to individuals with no lifetime history of MDD on an incidental recall task.

Using functional magnetic resonance imaging (fMRI), Arnold et al. (2011) provided evidence for a neural bias during encoding of positive words in euthymic individuals with remitted depression. They presented remitted MDD participants and healthy controls with positive, neutral, and negative words in a scanner and subsequently tested their memory for these emotional words using a free recall test. Results showed that there were no differences between healthy controls and remitted individuals in memory performance or neural processing during successful encoding of negative or neutral words. They only found group differences in neural processing during successful encoding and memory for positive words; remitted individuals over-recruited brain regions known to be involved in enhancing emotional memory, including the cingulate gyrus, right inferior- and left-medial-frontal gyrus as well as the right anterior hippocampus/amygdala. The results of this study indicate the presence of a processing bias for positive content and an absence of valence-specific memory biases in currently euthymic MDD individuals. This is in contrast to previous findings of reduced memory for positive content in remitted individuals (Teasdale and Dent, 1987).

Evidence from animal studies suggest that glucocorticoids facilitate memory enhancement of emotional information along with endogenous noradrenergic activation in the basolateral nucleus of the amygdala (BLA) in response to arousing emotional events (Roozendaal, 2000). The amygdala appears to mediate glucocorticoid effects on memory consolidation of emotional experiences via interactions with the hippocampus, which is dense with glucocorticoid receptors (Roozendaal, 2000). In humans, a study by Segal and Cahill (2009) showed that higher levels of salivary adrenergic and glucocorticoid release during encoding of an emotional memory task was correlated with enhanced memory for emotional stimuli at retrieval compared to non-emotional stimuli.

1.2. Memory during pregnancy

Although pregnant women often report memory difficulties including forgetfulness, absentmindedness, difficulty concentrating, and decreased attention (Sharp et al., 1993), empirical studies have yielded inconsistent results. Contrary to this common perception, past research has shown that cognitive performance in the domain of recognition (Mickes et al., 2009) and word list learning (Silber et al., 1990) was actually enhanced during pregnancy. A study investigating recognition for emotional faces in early (7–14 weeks) and late gestation (33–39 weeks) found that pregnant women in late gestation had an enhanced ability to recognize facial expressions displaying fear, disgust, and anger compared to women in early gestation, but no change in the ability to recognize sad or happy facial expressions (Pearson et al., 2009). Overall, studies suggest that there are less objective memory deficits during pregnancy than what is subjectively reported by pregnant women (Crawley, 2002; Crawley et al., 2008). In addition, previous studies that examined the possibility that cortisol, low mood or increased anxiety may account for the memory difficulties reported in pregnancy have not found much evidence to support this theory (Buckwalter et al., 1999).

1.3. Objectives and hypotheses

To the best of our knowledge, no studies have investigated emotional memory in pregnant women at increased risk for PPD (e.g., those with a history of MDD). Thus, the main objectives of the present study were to (1) compare emotional memory between euthymic pregnant women with a history of MDD and pregnant women considered to be at lower risk (those with no lifetime history of MDD), and (2) determine the relation between salivary cortisol (sCORT) and salivary alpha-amylase (sAA) and emotional memory performance in pregnant women. To control for potential pregnancy effects on emotional memory, a group of non-pregnant women with and without a lifetime history of MDD were also recruited. We hypothesized that women with a history of MDD would exhibit enhanced memory for negative stimuli as compared to women with no lifetime history of MDD. We also hypothesized that memory for negative images would significantly correlate with increased sCORT and sAA levels in women with a history of MDD. Based on the above literature (Crawley, 2002; Crawley et al., 2008), we predicted that pregnancy itself would not affect emotional memory performance.