

BRIEF REPORT

Overgeneral autobiographical memory in children of depressed mothers

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The goal of this study was to examine overgeneral autobiographical memory in a population at-risk for depression (i.e., children of depressed mothers). We predicted that children of depressed mothers would display less-specific memories than children of non-depressed mothers and that these results would be observed among children with no prior history of depression themselves. Participants in this study were children (age 8–14; 50% girls, 83% Caucasian) of mothers with ($n = 103$) or without ($n = 120$) a history of major depressive disorder during the child's life. Mothers' and children's diagnoses were confirmed with a diagnostic interview, and children completed the Autobiographical Memory Test and a measure of depressive symptoms. We found that children of depressed mothers, compared to children of non-depressed mothers, recalled less-specific memories in response to negative cue words but not positive cue words. Importantly, these results were maintained even when we statistically controlled for the influence of children's current depressive symptom levels and excluded children with currently depressed mothers. These results suggest that overgeneral autobiographical memory for negative events may serve as a marker of depression risk among high-risk children with no prior depression history.

Keywords: Maternal depression; Overgeneral autobiographical memory; Intergenerational transmission; Child depression; Autobiographical Memory Test.

Major depressive disorder (MDD) is a debilitating, recurrent condition associated with significant impairment in quality of life, productivity and

interpersonal functioning (Kessler & Wang, 2009). Although there is a remarkable body of literature examining the psychological correlates of MDD, less

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is known about the mechanisms underlying risk for depression. One of the most robust predictors of the development of MDD is a family history of the disorder. For example, children of depressed mothers are three–four times more likely to be diagnosed with MDD by early adulthood compared to individuals in the general population (for a review, see Goodman, 2007). Therefore, children of depressed mothers may be an ideal population in which to study vulnerability factors for depression. However, in order to distinguish risk factors for depression from correlates or consequences of the disorder, it is essential to determine whether these risk factors are observed in children at high risk for depression, such as children of depressed mothers, who have not yet had a depressive disorder themselves. Therefore, the aim of the current study was to examine one proposed risk factor for depression, overgeneral autobiographical memory, in never-depressed children of mothers with and without a history of MDD.

Autobiographical memory includes recall of personal events and facts, and these recollections range from specific to general. Specific memories recall events that occurred on a particular day at a specific place and time, whereas general memories recall events that occurred repeatedly (generic memories) or events that lasted more than a day (extended memories). Overgeneral memory (OGM) has been observed in individuals with depression (Williams et al., 2007) such that these individuals tend to display less-specific memories in response to cue words compared to non-depressed controls. In addition, OGM has been shown to predict the course of MDD. Specifically, more overgeneral autobiographical memory is associated with a longer time to MDD remission (Raes et al., 2006) and predicts follow-up levels of depressive symptoms, even after statistically controlling for the influence of baseline depression (for a meta-analytic review, see Sumner, Griffith, & Mineka, 2010).

In a review of the literature, Williams concluded that OGM is strongly associated with depressive symptoms and diagnoses but noted that the majority of studies have focused on adult and adolescent samples (Williams et al., 2007). Among studies that examined OGM in child samples, evidence has emerged that depressed

children display more OGM than non-depressed children and that OGM predicts prospective increases in depressive symptoms and diagnoses in children (for a review, see Hitchcock, Nixon, & Weber, *in press*). Although these studies suggest that, similar to the adult and adolescent literature, OGM is associated with depression in children, there have been some unique findings among child populations. For example, there is growing evidence for a unidimensional structure to the specificity of autobiographical memory encompassing memory for both positive and negative events (Griffith et al., 2009; Griffith, Kleim, Sumner, & Ehlers, 2012; Heron et al., 2012). In contrast, there appear to be meaningful differences based on valence in children. Indeed, theorists have proposed that, among at-risk children, OGM first develops in response to negative cues and later generalises to positive cues (Drummond, Dritschel, Astell, O'Carroll, & Dalgleish, 2006; Hitchcock et al., *in press*; Williams et al., 2007), with preliminary evidence supporting this hypothesis (Kuyken & Dalgleish, 2011; Rawal & Rice, 2012). These findings are consistent with research on other forms of cognitive vulnerability to depression (e.g., inferential styles), which suggests that different dimensions consolidate into a unidimensional construct as children age into adulthood (Gibb & Coles, 2005). In the current study, therefore, we explicitly examined memories for positive and negative cues separately.

Given its contribution to depression risk in adults and youth, it may be that OGM is a marker of vulnerability to depression. Several studies have shown that OGM is independent of depressed mood and persists even after depression has remitted (for a review, see Sumner et al., 2010). However, it is unclear if OGM exists as a true marker of future depression risk or is a consequence of prior depression. Therefore, the primary goal of the present study was to examine OGM in never-depressed children of mothers with versus without a history of MDD. We predicted that children of depressed mothers would be more likely to display OGM than children of non-depressed mothers and that this effect would be stronger for memories generated in response to negative cues. Furthermore, we predicted that this

bias would persist even when controlling for children's current levels of depression and excluding children of mothers who are currently depressed, suggesting that OGM represents a trait-like vulnerability factor for depression rather than a consequence of current depression in children or their mothers.

METHOD

Participants

Participants in this study were 223 mothers and their children recruited from the community. To qualify for the study, mothers were required to either meet criteria for MDD during the child's lifetime according to the *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition* (DSM-IV; American Psychiatric Association, 1994) ($n = 103$) or have no lifetime diagnosis of any DSM-IV mood disorder and no current Axis I diagnosis ($n = 120$). Exclusion criteria for both groups included symptoms of schizophrenia, organic mental disorder, alcohol or substance dependence within the last six months, or history of bipolar disorder. To participate in the study, children had to be between the ages of 8 and 14 years and only one child per mother could participate. If more than one child in this age range was available, one child was chosen at random to participate. Children were also excluded from the study if they had a lifetime history of major or minor depression. For children in our sample, the average age was 10.77 years ($SD = 1.86$), 50% were female and 83% were Caucasian. The average age of mothers in our sample was 40.34 years ($SD = 6.79$, Range = 24–55), and 89% were Caucasian. The median annual family income was \$50,001–55,000.

Measures

The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1995) and the Schedule for Affective

Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997) were used to assess for current DSM-IV Axis I disorders in mothers and their children, respectively. The SCID-I and K-SADS-PL were administered by separate interviewers. As noted above, 103 mothers met criteria for MDD during their child's life (17 met criteria for current MDD; 51 met criteria for recurrent MDD during their child's lifetime). For the K-SADS-PL, mothers and children were interviewed separately. Mothers' and children's responses were integrated to assign diagnoses by using best estimate diagnostic procedures incorporating interview data from parents and children as well as children's self-report (questionnaire data). Discrepancies were discussed with a separate interviewer until consensus was achieved. To assess inter-rater reliability, a subset of 20 SCID and K-SADS interviews from this project was coded by a second interviewer and kappa coefficients for MDD diagnoses in mothers and in children were excellent (all κ s = 1.00).

Children's symptoms of depression were assessed using the Children's Depression Inventory (CDI; Kovacs, 1981). The CDI is a 27-item self-report instrument that has demonstrated excellent reliability and validity in previous research (e.g., Kovacs, 1981, 1985; Smucker, Craighead, Craighead, & Green, 1986). The CDI exhibited good internal consistency in the current sample ($\alpha = .84$).

Children's autobiographical memory was assessed using the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986). The AMT task consists of 10 emotional words, 5 positively valenced (happy, surprised, safe, successful and interested) and 5 negatively valenced (sad, lonely, hurt, careless and angry).¹ Words were presented to participants on index cards, alternating between positive and negative words, and participants were asked to retrieve a specific memory for each cue word. To ensure that participants understood the task, all participants completed three practice trials

¹ Given that word characteristics such as concreteness and imageability have been associated with OGM (Williams, Healy, & Ellis, 1999), we examined the valence effects on these characteristics. There were no group differences (valence: positive, negative) on concreteness ($t(8) = 0.74, p = .49$) or imageability ($t(8) = -0.33, p = .75$) ratings as defined by the MRC Psycholinguistic Database (Wilson, 1988).

involving neutral words with feedback. During the practice trials, participants were instructed to not give the same memory for more than one cue word. Participants were given 60 seconds to retrieve a memory. All responses were audiotaped, transcribed and then coded as specific or overgeneral (categoric or extended). A specific memory is defined as a single event lasting less than one day, whereas a categoric memory refers to a generic collection or class of events and extended memory is of a single event lasting more than one day. An example of scoring of a specific response to the cue word "Happy" was, "I was happy when I scored a goal in my game on Saturday". This is a specific memory because the memory is of a particular place and time. As noted, an OGM response to the same cue was, "I am happy when I play with my friends". This was coded as overgeneral because it is a categorical memory. If participants provided a response that included semantic information but no personal memory (i.e., semantic associates), this was coded as a semantic associate. Finally, if participants were unable to retrieve a memory or if they provided the same memory for more than one cue, this was coded as no response. Summary scores were calculated for each participant, reflecting the number of specific memories provided for each cue valence. All responses were coded by two independent raters and interrater reliability was excellent ($\kappa = .86$). Any discrepancies across raters were discussed until consensus was achieved.

Procedure

Potential participants were recruited from the community through a variety of means (e.g., television, newspaper and bus ads and flyers). Mothers responding to the recruitment advertisements were initially screened over the phone to determine potential eligibility. Upon arrival at the

laboratory, mothers were asked to provide informed consent, and children were asked to provide assent to be in the study. Next, a research assistant administered the AMT to the child and then the child completed the CDI. Following this, the mother was administered the K-SADS-PL by a trained interviewer. After completing the K-SADS-PL with the mother, the same interviewer then administered the K-SADS-PL to the child. While children were administered the K-SADS-PL, the mother was administered the SCID-I by a separate interviewer. Families were compensated a total of \$75 and children received a \$10 store gift card for their participation in the study. The project was approved by the university's internal review board.

RESULTS

A preliminary inspection of the data revealed the presence of some missing data, with up to 4% missing for any given variable due to participant non-response. Examining the pattern of missing data, we found that Little's missing completely at random (MCAR) test was non-significant, $\chi^2(91) = 82.17, p = .74$, suggesting the pattern of missing data was missing at random. Given this, multiple imputation was used to generate 20 imputed data-sets, which were used in all subsequent analyses. The results presented reflect the pooled estimates across these data-sets. This approach yields more reliable parameter estimates than other methods of dealing with missing data, including single imputation methods (see Schafer & Graham, 2002). Descriptive statistics of study variables are presented in Table 1.

Preliminary analyses were then conducted to determine if children's age or sex was significantly correlated with any of the study variables.² As seen in Table 2, we found that children's age was

² Given the literature concerning the unidimensional structure for OGM in adults, we re-examined our preliminary and primary analyses with a focus on overall levels of OGM, collapsed across cue valence. We found that children's age was positively correlated with the total number of specific memories, $r = .22, p = .002$. In contrast, there were no significant sex differences in children's number of total specific memories, $r = .05, p = .43$. To examine the influence of maternal MDD history on children's autobiographical memory specificity, we conducted a one-way (mother MDD: yes, no) ANOVA with the total number of specific memories as the dependent variable and children's age as a covariate. The ANOVA revealed no main effect of mother MDD, $F(1, 219) = 2.71, p = .11, \eta_p^2 = .01$.

Table 1. Descriptive statistics for the study variables

Variable	MDD mom	Control mom	R effect size
Age	10.66 (1.91)	10.86 (1.81)	-.05
Girls (%)	47%	53%	-.07
Caucasian (%)	73%	91%	-.24*
CDI	6.47 (5.27)	4.65 (5.14)	-.20*
Specific positive	3.56 (1.30)	3.58 (1.27)	-.01
Specific negative	3.43 (1.24)	3.86 (1.16)	-.20*

MDD mom: mothers' with lifetime history of major depressive disorder; Control mom: mothers with no lifetime history of MDD; CDI: children's depression inventory; Specific positive: number of specific autobiographical memories recalled in response to positive cue words; Specific negative: number of specific autobiographical memories recalled in response to negative cue words.

* $p \leq .01$.

positively correlated with the number of specific memories to negative cues and marginally positively correlated with the number of specific memories to positive cues. In contrast, there were no significant sex differences in children's number of negative or positive specific memories. Given these findings, children's age was included as a covariate in all reported analyses.

To examine the influence of maternal MDD history on children's autobiographical memory specificity, we conducted a 2 (mother's MDD: yes, no) \times 2 (valence: positive vs. negative cues) repeated measures analysis of variance (ANOVA) with the number of specific memories recalled serving as the dependent variable and children's age included as a covariate. Consistent with our preliminary analyses, the ANOVA revealed a significant main effect of age, $F(1, 220) = 11.07$, $p = .001$, $\eta_p^2 = .05$, reflecting the fact that older children recalled more specific memories. There were no main effects of mother's MDD, $F(1, 220) = 2.70$, $p = .11$, $\eta_p^2 = .01$, or valence, $F(1, 220) = 2.39$, $p = .13$, $\eta_p^2 = .01$. However, there was a significant mother's MDD \times valence interaction, $F(1, 220) = 6.63$, $p = .01$, $\eta_p^2 = .03$. To determine the form of the interaction, we examined mother's

Table 2. Correlations among study variables

	1	2	3	4	5
1. Mom MDD	–				
2. Child age	-.05	–			
3. Child sex	-.07	.01	–		
4. Specific positive	-.01	.13	.04	–	
5. Specific negative	-.20*	.26*	.08	.46*	–

Mom MDD: absence (0) or presence (1) of maternal history of major depressive disorder in child's lifetime; Child sex: boys (0) and girls (1); Specific positive: number of specific autobiographical memories recalled in response to positive cue words; Specific negative: number of specific autobiographical memories recalled in response to negative cue words.

* $p \leq .01$.

MDD differences in memory specificity for positive and negative cues separately. We found that children of mothers with a history of MDD during the children's lives reported fewer specific memories for negative cues than did children of control mothers, $F(1, 219) = 8.13$, $p = .01$, $\eta_p^2 = .04$. In contrast, there were no group differences in the number of specific memories recalled for positive cues, $F(1, 219) = .06$, $p = .84$, $\eta_p^2 < .001$.

Next, to evaluate the robustness of this effect, we examined whether it would be maintained even after accounting for the influence of children's or mothers' current depression. Supporting the robustness of these findings, we found that the mother's MDD \times valence interaction remained significant even after statistically controlling for the influence of children's depressive symptoms, $F(1, 220) = 5.64$, $p = .02$, $\eta_p^2 = .03$, and after excluding dyads in which the mother met criteria for current MDD, $F(1, 203) = 4.34$, $p = .04$, $\eta_p^2 = .02$. In addition, the mother's MDD group difference in the number of specific memories generated to negative cues was maintained even after statistically controlling for the influence of children's depressive symptoms, $F(1, 219) = 7.32$, $p = .01$, $\eta_p^2 = .03$, and after excluding dyads in which the mother met criteria for current MDD, $F(1, 203) = 6.72$, $p = .01$, $\eta_p^2 = .03$.

Finally, exploratory analyses were conducted to determine whether any characteristics of mother's depression history (i.e., child's age at first onset,

recurrence during child's life and proportion of child's life mother was in a MDD episode) were related to specificity of children's memories. These analyses focused on 103 children whose mother had a history of MDD. The only significant finding was that children exposed to mothers' MDD for a greater proportion of their lifetime recalled fewer specific autobiographical memories for negative cues ($r = -.23, p = .02$).

DISCUSSION

The primary goal of this study was to examine OGM in a never-depressed sample of children at high risk for depression (i.e., children of depressed mothers). We predicted that children of depressed mothers would display less-specific memories than children of non-depressed mothers and that this effect would be stronger for memories for negative cues. Finally, we predicted that these results would be independent of children's and mothers' current depression. Supporting our hypotheses, we found that children of mothers with a history of MDD during their child's life, compared to children of mothers with no history of depression, recalled less-specific memories in response to negative cue words but not positive cue words. Importantly, these results were maintained even when we statistically controlled for the influence of children's current depressive symptom levels, suggesting that overgeneral autobiographical memory may serve as a marker of depression risk among high-risk children with no prior depression history. The results were also maintained when we excluded mother-child dyads in which the mother met criteria for current MDD, suggesting that the effect is not merely a correlate of mothers' current depression and rather may reflect a more enduring marker of risk.

The current results also add to the literature suggesting important differences between OGM for positive and negative cues among children (see also Hitchcock et al., [in press](#); Kuyken & Dalgleish, 2011; Rawal & Rice, 2012; Williams et al., 2007). Theorists suggest that OGM for negative cues develops first in childhood and then

generalises to positive cues later in adolescence. Therefore, OGM for negative cues in children at high risk for their first episode of depression, such as children of depressed mothers, may serve as an early warning sign of depression risk. Supporting this hypothesis, one study found that among youth with familial risk for depression, greater OGM for negative cues predicted significantly greater depressive symptoms and the onset of new depressive disorders (Rawal & Rice, 2012). Although the precise mechanisms by which OGM for negative cues develop in children with a familial risk for depression are unclear, theory suggests that children with strong negative self-beliefs will have these beliefs triggered in response to negative cues. Once these negative self-beliefs are activated, children are likely to ruminate on their beliefs, which will interfere with memory retrieval for event-specific information. In the context of children of depressed mothers, the repeated exposure to maternal depression may allow for negative self-beliefs to become more engrained and severe (e.g., Goodman, 2007), therefore, triggering more OGM for negative cue words. This hypothesis is supported by the results of our exploratory analyses suggesting that children exposed to mothers' MDD for a greater proportion of their lifetime displayed more OGM for negative cues.

The current study demonstrated a number of strengths including a large sample size, the assessment of diagnoses among mothers and children and the focus on a never-depressed, at-risk sample. Despite the strengths of our study, there were some limitations that highlight areas for future research. First, the design of our study was cross-sectional, which precludes any causal conclusions. Future research is needed, therefore, to better understand the temporal relations among maternal depression, children's OGM and children's risk for depression. In addition, our study did not test specific mechanisms that may underlie the development of OGM for negative cues in children of depressed mothers. Future studies would benefit from prospective studies examining potential mechanisms.

In summary, the current results support the role of OGM as a cognitive vulnerability for depression. Importantly, this study is the first to examine OGM in never-depressed children of depressed mothers. In doing so, our results suggest that OGM for negative memories may exist as a cognitive vulnerability in populations at-risk for MDD. If replicated, these results could contribute to the development of clinical intervention programmes that utilise memory specificity training to improve autobiographical memory performance and reduce depressive symptoms. These programmes could be modelled after current adolescent programmes that employ this approach (e.g., Neshat-Doost et al., 2013). Although future research is needed to examine the precise mechanisms of how children of depressed mothers may develop OGM, intervention and prevention programmes such as these may be the key to reducing the occurrence of depression among at-risk populations.

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