Cogn Ther Res (2016) 40:774–782
DOI 10.1007/s10608-016-9784-y

ORIGINAL ARTICLE

Effects of Childhood Abuse on Overgeneral Autobiographical Memory in Current Major Depressive Disorder

James W. Griffith[1,2] · Stephan Claes[3] · Titia Hompes[3] · Elske Vrieze[3] · Stefanie Vermote[2] · Elise Debeer[2] · Bert Lenaert[2] · Filip Raes[2] · Dirk Hermans[2]

Published online: 14 May 2016

Abstract In a sample of adults diagnosed with major depressive disorder ($N = 77$), we examined the relationship between overgeneral autobiographical memory and childhood physical and sexual abuse. We hypothesised that childhood abuse would be related to retrieving fewer specific autobiographical memories, even after statistically covarying psychopathology-related variables, including posttraumatic stress disorder and depression severity. Our hypotheses were supported for childhood physical abuse but not for childhood sexual abuse. Childhood physical abuse was related to the recall of fewer specific memories on the Autobiographical Memory Test. No significant association, however, emerged between the Autobiographical Memory Test and childhood sexual trauma. Directions for future research include prospective designs as well as further examination of trauma characteristics (e.g., age of onset) and means by which individuals cope with trauma.

Keywords Overgeneral autobiographical memory (OGM) · Depression · Major depressive disorder · Posttraumatic stress disorder (PTSD) · Childhood trauma

✉ James W. Griffith
j-griffith@northwestern.edu; jameswgriffith@gmail.com

[1] Department of Medical Social Sciences, Northwestern University, Feinberg School of Medicine, 633 N St. Clair, 19th Floor, Chicago, IL 60611, USA

[2] Centre for Learning and Experimental Psychopathology, KU Leuven, Leuven, Belgium

[3] Research Group Psychiatry, KU Leuven, Leuven, Belgium

Introduction

Overgeneral autobiographical memory (OGM) is a phenomenon that is strongly associated with major depressive disorder (for review, see Williams et al. 2007). OGM is defined as a difficulty in recalling specific memories of autobiographical events. A *specific memory* is often defined as a memory of a personal event that occurred over the course of less than 1 day, at a specific time and place (e.g., When I met Sigrid at the Oude Markt). OGM is usually measured with the Autobiographical Memory Test (AMT; Williams and Broadbent 1986), which assesses autobiographical memories in response to cue words. In addition to its connection with psychopathology, amelioration of OGM is under study as a means to relieve emotional distress (Dalgleish et al. 2014; Moradi et al. 2014; Neshat-Doost et al. 2013; Raes et al. 2009; Eigenhuis et al. 2015). Thus, understanding the OGM-depression connection may have treatment implications if patients with depression and a history of abuse might benefit from memory specificity training.

Williams (2006) proposed the CaRFAX model to explain how OGM might develop, and this model includes mechanisms that may link childhood trauma to OGM. CaRFAX includes three mechanisms that can lead to difficulties retrieving specific autobiographical memories: capture and rumination, functional avoidance, and executive capacity. The mechanisms of the CaRFAX model are all possibly related to traumatic events. For example, individuals who have experienced trauma may have high levels of functional avoidance to avoid specific memories of trauma, which in turn might prevent short-term emotional pain that accompanies memories of negative events (e.g., Dalgleish et al. 2008; Hauer et al. 2008; Hermans et al. 2008; Hermans et al. 2005; Hermans et al. 2004; Raes

et al. 2003, but see Brewin et al. 1999). In addition, rumination may change how a person copes with traumatic events (e.g., Friedberg et al. 2005). Trauma victims may repeatedly think about the event (i.e., ruminate), which is distinct from the feeling of re-experiencing the trauma as seen in posttraumatic stress disorder, and this rumination is associated with posttraumatic stress disorder (PTSD) symptoms (Ehring et al. 2008). Repeatedly thinking about a past trauma may interfere with focusing on other things, which may in turn decrease executive capacity. Indeed, childhood trauma has been linked to neuropsychological measures of executive function (DePrince et al. 2009). Thus, trauma has the potential to interfere with autobiographical memory via all three mechanisms of the CaR-FAX model. Traumatic events, however, have not been consistently related to OGM across studies (for a review, see Moore and Zoellner 2007), so more research is needed to clarify how and why OGM and trauma are connected.

Childhood Abuse and OGM in People with Major Depression

Studies of childhood abuse and trauma have attempted to clarify their effects on both memory and depression, but there are mixed findings in studies of the relationship between childhood trauma and OGM within individuals suffering from major depression (e.g., Hermans et al. 2004). In a study of patients with major depression, Kuyken and Brewin (1995) found that childhood sexual abuse was related to higher levels of OGM, but childhood physical abuse was not significantly related to OGM. Aglan, Williams, Pickles, and Hill (2010) found that women suffering from adult-onset depression who had been exposed to childhood sexual abuse, relative to those without abuse, had more overgeneral memories. Crane and Duggan (2009) failed to find that the presence versus absence of childhood sexual abuse was related to OGM, but did find that earlier age of onset for sexual abuse was associated with higher levels of OGM. Hauer et al. (2008) found that participants with childhood sexual abuse, as compared to participants with no history, had more overgeneral memories, even when using depression as a covariate. In contrast, when using an AMT containing concrete cue words to promote *direct retrieval* (Conway and Pleydell-Pearce 2000), the two groups did not differ significantly. Among participants with childhood sexual abuse, those with post-trauma psychopathology had more overgeneral memory than those without post-trauma psychopathology, suggesting that perhaps the reaction to childhood sexual abuse may be important in determining memory outcomes. Kuyken et al. (2006) found that adolescents with major depression and a history of trauma reported *fewer* overgeneral memories as compared with adolescents with major depression but without a history of trauma. Kuyken et al.'s study was limited by small sample size: There were 22 depressed subjects with a history of trauma and 12 depressed participants without a trauma history. In the current study, we further investigated the link between childhood trauma and OGM in a sample of participants diagnosed with depression.

The Current Study

There is covariation between trauma and depression (e.g., Dube et al. 2001), and their covariation can obscure which of them is associated with OGM. In the present study, we sought to clarify the trauma-OGM connection within clinically depressed individuals, using other psychopathology-related variables as covariates. For example, Breslau et al. (2000) found associations between trauma and depression, but these associations were stronger within individuals who also developed PTSD. McNally et al. (1995) also found that PTSD, not just a history of trauma, was predictive of OGM. These results highlight the need to take PTSD into account when examining the trauma-depression relationship, so in the current study we included PTSD as a covariate in our analyses.

We sought to test the relationship between trauma and OGM in a sample of individuals with major depressive disorder. If an effect of trauma is observed within individuals suffering from major depressive disorder, then the effects cannot be explained by the presence/absence of depression being confounded with the presence/absence of trauma. We statistically covaried psychopathology-related variables (e.g., level of depressive symptoms, diagnosis of comorbid disorders) to determine whether the effects of childhood trauma would remain significant. One strength of the current study is the inclusion of more covariates than in past research to rule out psychopathology-related confounds.

We hypothesised that childhood physical and sexual abuse would be related to OGM (i.e., the recall of fewer specific memories). We also examined whether OGM would continue to be associated with childhood trauma after considering several psychopathology-related variables: PTSD, the number of depressive episodes, and the presence of comorbid disorders. Because of its relationship with memory, we also examined whether any effects of trauma and psychopathology remained after including age as covariate.

Method

Participants

We recruited a sample of 89 patients who had been hospitalised at the University Psychiatric Centre (Universitair

Psychiatrisch Centrum; UPC) of KU Leuven (Leuven, Belgium) and diagnosed with major depressive disorder. Participants were part of a larger longitudinal study on biomarkers (e.g., cortisol levels) and genetics of depression. A more extensive description of the study population can be found in Vrieze et al. (2014). Exclusion criteria included lifetime history of bipolar disorders, depressive episodes secondary to substance use or general medical conditions, hyper- or hypothyroidism, corticosteroid or beta-blocker treatment, pregnancy, unstable medical conditions, and any medical, cognitive, or psychosocial factors that could hamper participation in the study. Participants were required to be at least 18 years of age to participate. The local ethics committee approved the study. All participants provided informed consent and signed a consent form.

Of the initial 89 patients, 10 participants were excluded because of missing data on the Autobiographical Memory Test (AMT; Williams and Broadbent 1986) and/or childhood abuse variables from the Structured Trauma Interview (STI). Of the remaining 79 participants, one person was excluded because their AMT had 9 out of 10 non-responses, and another person was excluded because of reticence to discuss history of abuse. For this latter person, the trauma data could not be reliable coded, so we considered it missing. Thus, the final sample was on 77 participants (see Results for demographics, etc.). Mean (SD) age of the sample was 44.7 (11.9) with a range of 18–70. The sample was 58 % female. Additional descriptive statistics are presented in Table 1.

Table 1 Descriptive statistics (N = 77)

	Number (%)
Gender (number/percentage of women)	45 (58 %)
Married	36 (47 %)
Living alone	21 (27 %)
Education (3+ years higher education)	30 (39 %)
Unemployed (not including stay-at-home parents)	7 (9 %)
Physical abuse	17 (22 %)
Sexual abuse	21 (27 %)
PTSD	11 (14 %)
Presence of comorbid disorders (besides PTSD)	44 (57 %)

	M (SD)	Minimum	Maximum
Age in years	44.7 (11.9)	18	70
Number of depressive episodes	2.3 (1.6)	1	10
Age of onset for major depressive disorder	36.2 (13.1)	11	61
Hamilton Rating Scale for Depression (17-items)	16.6 (4.9)	6	33

PTSD posttraumatic stress disorder. Two cases were missing data for age of major depressive disorder onset

Measures

Structured Clinical Interview for DSM-IV (SCID)

The Structured Clinical Interview for DSM-IV (SCID) was used to assess Axis I psychopathology, including past and current depressive episodes (SCID; First et al. 1996; Dutch version by van Groenestijn et al. 1999). This SCID is a semistructured interview that is considered a "gold-standard" measure of psychiatric diagnosis. Kappa for major depression using the SCID ranges from .61 to .93 (for a list of psychometric studies of the SCID, see http://www.scid4.org/psychometric/scidI_reliability.html; http://www.scid4.org/psychometric/scidI_validity.html). The SCID was administered in person by a qualified psychiatrist and a trained research nurse. Each SCID was supervised and reviewed by an expert psychiatrist who had specific training in the SCID.

Hamilton Rating Scale for Depression (HRSD; 17-Item Version)

We used the Dutch version (Evers et al. 1992) of the HRSD (Hamilton 1967), which is a clinician-rated scale of the severity of depression. Multiple raters using the HRSD have shown high levels of reliability (.81; Williams 1988). Self-report versions of the HRSD have also shown high levels of internal consistency ($\alpha \geq .91$; Reynolds and Kobak 1995).

Structured Trauma Interview (STI)

To assess the presence of childhood sexual and physical abuse before the age of 16, we used the short version of the STI (Draijer 2003), which is an interview intended for use by skilled clinicians. The STI assesses experiences with physical and sexual violence, as well as parental loss and parental dysfunction. Physical abuse as operationalized by the STI includes physical acts of aggression toward the child (e.g., punching, kicking), but not verbal aggression or humiliation. Sexual abuse includes rape, fondling, and other inappropriate sexual experiences. The STI has convergent validity with trauma-related concepts (e.g., dissociation, Draijer and Langeland 1999). Moreover, the STI has yielded slightly higher prevalence rates than questionnaire-based measures (Kooiman et al. 2002). Cohen's kappa with an abuse questionnaire was .71 for sexual abuse and .62 for physical abuse (Kooiman et al. 2002).

Autobiographical Memory Test (AMT)

We used the Dutch version of the Autobiographical Memory Test (Williams and Broadbent 1986), which consisted of 10 words, 5 each of positive and negative

valence. The AMT presents positive and negative words in alternating order. The words used in this study were, in Dutch (English) were aangenaam (pleasant), boos (angry), belangstellend (interested), gekwetst (hurt), trots (proud), kwaad (angry), sociaal (social), onhandig (clumsy), enthousiast (enthusiastic), and ontgoocheld (disappointed). The AMT is widely-used in psychopathology research as a measure of OGM (see Williams et al. 2007). The AMT was administered in a written format, which has been successfully used in several past studies (e.g., Henderson et al. 2002; Heron et al. 2012; Raes et al. 2009). Participants received an AMT booklet that contained written instructions, which were repeated verbally by the experimenter. The instructions asked participants to generate one specific memory in response to each of the cue words. Participants were instructed not to use the same memory more than once. A specific memory was defined as a memory of a personally experienced event that occurred only once, within the course of a single day. Examples of specific (e.g., "I was happy with the beautiful wristwatch I got for my birthday three weeks ago") and non-specific memories (e.g., "I am always happy when I get gifts for my birthday") were provided. Participants worked through the AMT booklet at their own pace, with the experimenter available to answer any questions. There was no time limit imposed on the participants.

The responses were coded as *specific* (an event that occurred at a specific time and place lasting less than 1 day, e.g., My birthday party 2 months ago), *extended* (an event that lasted more than 1 day, for an extended period of time, e.g., whilst I was in Spain on holiday), *categoric* (a theme of class of events, e.g., Whenever I am at the café), *no memory* (no response whatsoever, or a response that is not a memory, e.g., I'm a clumsy person), or *same event* (a memory that has already been mentioned). Our group has used this scoring method with high reliability (Raes et al. 2003, 2004), with inter-rater agreement ranging from 92 to 99 % (kappa = .83 to .96). Other groups have also shown high levels of agreement for specific memories (e.g., kappa = .77, Heron et al. 2012). Internal consistency of the AMT is also adequate (reliability point estimate = .79, 95 % confidence interval of .74–.84.; Griffith et al. 2012a, b). Finally, multiple studies including clinical and non-clinical participants support that the AMT is unidimensional (Griffith et al. 2009, 2012a, b; Heron et al. 2012). In this study, we used the number of specific memories as the dependent variable. Thus, OGM was operationalized as the retrieval of few specific memories.

Analytic Strategy: Multiple Regression

Because, when abuse is present, it is common for children to suffer from multiple forms of abuse (e.g., van IJnezdoorn et al. 2009), we examined the association of the presence/absence of physical as well as sexual abuse. We also included both of these variables simultaneously in our regression analyses.

First, to determine whether childhood abuse was related to the number of specific memories, uncomplicated by other covariates, we regressed the number of specific memories on the presence/absence of childhood sexual abuse and childhood physical abuse using dichotomous variables to represent abuse status (1 = present, 0 = absent). We entered these two abuse variables simultaneously because we expected them to be associated with each other. We then added additional covariates to the model and rechecked the statistical significance and effect sizes of childhood sexual abuse and physical abuse dichotomous variables after statistically controlling for additional covariates. Thus, on Step 2 of the regression, we entered a dichotomous variable for the presence of PTSD. On Step 3 of the regression, we entered depression-relevant variables—the number of depressive episodes and the level of depression severity as measured by the HRSD. Next on Step 4, we entered a dichotomous variable for the presence of any other Axis I comorbid disorders (1 = any other disorder present, 0 = no additional comorbidity). Finally, age of the participant was entered on Step 5. Age was included as a covariate because of the wide range of age in our participants as well as the potential effects of age on autobiographical memory (e.g., Holland and Rabbitt 1990; Borrini et al. 1989).

Our final regression model allowed us to examine the abuse-related dichotomous variables after statistically controlling for PTSD, depressive symptoms, comorbidity, and age of the participant, all of which could be related to OGM. By doing the regression in this way, it allowed us to examine the abuse-related variables with and without covariates in the model.

In terms of statistical power, we strove to keep our regression model as simple as possible (cf. "less is more", pp. 185–186, Cohen et al. 2013) but also wanted to show the effects of abuse above and beyond the effects of psychopathology. To maintain statistical power above 80 %, the effect size of the abuse variables would need to be $f^2 \geq .11$, which was between a medium and large effect size (Cohen 1988; power calculations conducted in G*Power 3.1.9.2). This strategy also allowed for adequate power for effect sizes found in the literature. For example, Hermans et al. (2004) found a large ($r = -.71$) correlation between memory specificity and child physical abuse. Kuyken and Brewin (1995) found medium to large effect sizes between participants with a history of child sexual abuse versus controls for both positive (Cohen's $d = .57$; Cohen 1988) and negative cue words ($d = .79$).

Results

Descriptive statistics are presented in Table 1. As expected, there was an association between physical and sexual abuse as evidenced by a medium-sized φ coefficient of .31, $p = .007$. In terms of their distribution, 9 of 21 (43 %) of participants with a history of childhood sexual abuse also had a history of physical abuse; 9 of 17 (53 %) with a history of physical abuse had also suffered childhood sexual abuse. Because our main hypothesis was on the relationship between OGM and childhood trauma in major depressive disorder, we regressed the number of specific memories on dichotomous variables (1 = present, 0 = absent) for the presence of sexual abuse and physical abuse, respectively. As shown in Table 2, Step 1 of the regression resulted in a significant ΔR^2. Within this step, only the presence of physical abuse was significantly related to the recall of fewer specific memories, B (SE) = −2.3 (.8), β = −.3, $p < .01$. Also as shown in Table 2, this association remained significant after covarying the presence of PTSD, the number of depressive episodes, HRSD, the presence of additional Axis I comorbidity, and age.[1] In terms of effect size, being physically abused as a child resulted in retrieving approximately two fewer specific memories on the AMT, on average. It should be noted that scores on our AMT, and many other versions of the AMT in the literature, can range from 0 to 10 specific memories. Not surprisingly, increased age was also associated with retrieving fewer specific memories. According to the parameters in Table 2, 12.8 years of increased age would result in approximately one fewer specific memory on the AMT, on average. It should be noted that calculating the effect size f^2 of the abuse variables relative to the overall R^2 of the model yielded $f^2 = .12$, slightly above the level needed to maintain power above 80 %.

Table 2 Multiple regression analyses (N = 77) of the number of specific memories on trauma, psychopathology variables, and age

Covariate	B	SE (B)	β	ΔR^2
Step 1				
Intercept	10.05*	2.14		
Physical abuse	−1.98*	.85	−.27*	.09*
Sexual abuse	1.43	.86	.21	
Step 2				
PTSD	−.26	1.09	−.03	.00
Step 3				
No. of episodes	−.26	.23	−.13	.02
HRSD	−.02	.07	−.04	
Step 4				
Comorbidity	−.28	.72	−.05	.00
Step 5				
Age (in years)	−.08*	.03	−.30*	.08*

The B, SE (B), and β regression statistics are based on the final model with all seven covariates in the model. Thus, each covariate is statistically controlled for the others. The ΔR^2 values show the increment in R^2 with the addition of covariates at that step. The regression parameters for the Step 1 model with only childhood sexual and physical abuse in the model are presented in the text

PTSD posttraumatic stress disorder, *HRSD* Hamilton Rating Scale for Depression, 17-item version

* $p < .05$

Discussion

The relationships among trauma, autobiographical memory, and psychopathology are complex and existing studies have not fully examined how these relationships may be causally interrelated to each other over time. In this study, we sought to examine one aspect of the effects of childhood trauma. In participants with major depression, we sought to examine the relationship between childhood physical and sexual abuse with OGM, and whether these associations would survive even when psychopathology-related covariates were considered. In doing so, we sought to rule out the possibility that the link between childhood trauma and OGM is confounded by psychopathology. Using regression analyses, we showed that there was indeed a unique association between physical abuse in

[1] We also conducted some alternative analyses to ensure the robustness of this regression. We choose to enter childhood physical and sexual abuse on Step 1 of the regression to show test their effects uncomplicated by the other covariates, but it should be stressed that the final regression model presented in Table 2 shows the unique effects of childhood physical and sexual abuse above and beyond the other covariates. We verified this by rerunning the regression with childhood sexual and physical abuse on the *last* step. Doing the regression in this way leaves the results absolutely unchanged; the ΔR^2 for childhood sexual and physical abuse entered on the last step was .08 in this model, indicating that these two dichotomous variables accounted for 8 % of the variance beyond the other five covariates, $p = .046$. For the final model, the values for B, SE (B), and β statistics were all exactly as reported in Table 2, as would be expected.

We also ran the regression shown in Table 2 also including age at depression onset as an additional covariate in Step 3 of the regression along with the number of depressive episodes, as well as gender as an additional covariate in the final step of the model. We did not present this as the primary regression because the ratio of cases to parameters would drop to less than 10, and two cases would need to be excluded due to missing data on age of onset ($N = 75$). The results for childhood physical abuse were nevertheless unchanged in this model—It was still a significant predictor of fewer specific memories in the final model including all of the other covariates. Thus, the final interpretation of the data would remain absolutely unchanged.

Finally, we examined bivariate associations between the number of specific memories abuse variables. The correlation was only significant for childhood physical abuse, $r = -.27$, $p = .019$; for childhood sexual abuse, the correlation was $r = .06$, $p = .62$, *ns*.

childhood and the retrieval of fewer specific memories on the AMT. This association was present even when covarying out effects of childhood sexual abuse, PTSD, the presence of other Axis I disorders, and the number of depressive episodes, and age (see Table 2). These results suggest that, among patients with major depression, childhood physical abuse has an effect of OGM, even with psychopathology-related variables included as covariates.

Child Sexual Abuse and Memory

It was unexpected that childhood sexual abuse was not significantly related to OGM among patients with major depression (but see Hermans et al. 2004). Indeed, the literature on OGM and childhood sexual abuse is characterised by mixed findings. For example, Ogle et al. (2013) found that child sexual abuse was related to decreased memory specificity, but only among adolescents and not adults. Burnside et al. (2004) studied 41 women with a history of child sexual abuse, who were also assessed for depression and OGM. Their sample contained women with a history of depression and women with no history of depression; women who were currently depressed were excluded from their analyses. They did report some associations between characteristics of child sexual abuse and OGM—younger age of abuse and longer-lasting abuse were associated with more OGM. In a study of patients with depression, Hermans et al. (2004) also found that younger age of abuse was associated with more OGM in adulthood (for similar findings in a non-clinical sample, see Henderson et al. 2002). Although these data are suggestive, they are limited by the fact that PTSD was not assessed. Many children suffer from multiple forms of maltreatment (e.g., Euser et al. 2010), so the lack of a unique statistical effect of sexual abuse should not be interpreted as sexual abuse being unimportant. It may be that sexual abuse occurs in the context of other maltreatment, rendering it difficult to detect unique statistical effects in a regression model.

It may be that how one copes with trauma is associated with whether one develops OGM later on (Raes et al. 2005, 2006). By analogy in combat veterans, the development of PTSD and not trauma exposure alone is associated with OGM (McNally et al. 1995). Some individuals who have been sexually abused as children do not interpret the abuse as a trauma at the time of the event, only experiencing distress later on when the event is reinterpreted (for review see McNally and Geraerts 2009). The interpretation of sexual abuse, at the time of the event and later in life, may be related to the development of psychopathology. The association between OGM and child sexual abuse merits further investigation, especially using methods that focus on the characteristics of the abuse, subjective reactions to the abuse, and how one copes with the abuse over time.

Child Physical Abuse and Memory

Our findings show an association between physical abuse in childhood and overgeneral memory in adulthood, which is consistent with Hermans et al. (2004), who found that a history of physical abuse was correlated with OGM in a sample of 23 adults with major depression. In the Hermans et al. study, the effect size for the association between specificity and physical abuse was larger than the effect size for the current study ($r = -.71$ vs. $r = -.27$, $\beta = -.27$). The Hermans et al. study was smaller in terms of sample size, (23 vs. 77 participants) and their trauma assessment was questionnaire-based, which may account for the differences in effect size.

The CaRFAX model (Williams 2006) suggests that there are multiple routes to OGM. Although an overgeneral style may develop to avoid the emotional pain of past trauma, the data are inconsistent on this point. Rumination and trauma might be related in several ways including individuals ruminating about the meaning and psychological consequences of abuse, trauma being related to rumination, or rumination rendering a person more susceptible to the effects of trauma. Individuals with low executive capacity may also be less apt to effectively cope with the emotional stress of a trauma. It is possible that, in our sample, physical versus sexual trauma differed in one or more ways (e.g., ways of coping, memorability, immediate or lasting distress),[2] which subsequently led to different outcomes in terms of OGM. Thus, a priority for future studies should be to examine trauma characteristics, as well as how individuals cope with trauma over time (see also Raes et al. 2005, 2006).

Limitations and Future Directions

Although this study provides some interesting evidence on the link between childhood abuse and memory dysfunction, some limitations should be noted. First, we used a written AMT. Although several studies have successfully employed a written AMT (e.g., Henderson et al. 2002; Heron et al. 2012; Raes et al. 2009), it is possible that different results would have been obtained using the interviewer-administered version of the AMT (Williams and Broadbent 1986). Second, although our sample size was large in comparison to some others that have examined similar questions (cf., Burnside et al. 2004; Hermans et al. 2004; Kuyken and Brewin 1995), the number of

[2] Our trauma interview contained some individual items that could speak to these questions in a future, larger sample. Unfortunately our sample sizes for participants with a history of abuse were too small to conduct analyses within only these individuals. Future studies along these lines would need to be large enough for sufficient variability of abuse characteristics to determine which characteristics are reliably related to overgeneral memory.

participants with a history of childhood abuse was still modest (Table 1). This limitation of the field might be redressed by future studies with specific recruitment targets for participants with a history of childhood physical and/or sexual abuse. Rather than using retrospective designs, another approach would be to identify children with and without various abuse histories and to follow them over time, monitoring levels of psychopathology as well as OGM. These strategies would be logistically challenging, but perhaps necessary to fully understand the consequences of child abuse. Any form of child abuse is already something that civilised society seeks to minimise and eradicate. Thus, it often occurs in secret, which creates challenges for clinical assessment and research. Nonetheless, understanding the ways in which abuse changes a child's developmental trajectory will help to develop targeted prevention and intervention programmes. If OGM is a causal mechanism in depression, rather than a symptom of depression, then intervention strategies such as memory specificity training (Moradi et al. 2014; Neshat-Doost et al. 2013; Raes et al. 2009) might help to palliate any detrimental effects of child abuse and reduce emotional distress. Future studies will be needed to address these questions.

Longitudinal studies, beginning in childhood, would help to redress another limitation of our study: It is unknown how current depression and other adulthood experiences may have influenced memories of the traumatic experiences, or lack thereof. For example, perhaps some participants in our study had traumatic experiences that they did not report in this study. This could be due to simple forgetting, embarrassment, or avoidance. Although we used psychometrically-strong clinical interviews, any interview-based method relies heavily on verbal reports. Thus, memory distortion is possible, especially given that these traumatic events happened in the distant past for many of our participants.

Finally in terms of limitations, it should be noted that our study included only depressed inpatients, so future studies might be served well by the inclusion of outpatients for a broader range of depressive symptoms. We cannot be sure that these results will generalise beyond inpatient populations. Due to the sensitivity of child abuse, there will often be a reticence to discuss it. Although several participants in our study did disclose their experiences, it is unknown how much child abuse was not disclosed to our interviewers.

Conclusion

We found an association between childhood physical abuse and overgeneral memory in a sample of patients with current major depressive disorder. The raw effect size was such that a history of physical abuse was associated with approximately two fewer specific memories on the AMT. We failed to find a significant association between OGM and child sexual abuse. Our study is consistent with the notion that some forms of childhood adversity are related to OGM, which is known to correlated with depression both cross-sectionally and longitudinally. Our study does not, in any way, rule out other deleterious effects of child sexual abuse, but in this study it was not related to poor performance on the AMT. Developmental studies are needed to address the specific mechanisms that may lead to OGM, as well as how OGM may lead to and exacerbate psychopathology. Future studies should also address how variability in trauma characteristics (e.g., age of onset) and means of coping are associated with memory and depression.

Funding This research was supported by an unrestricted research Grant from Johnson and Johnson, by a research Grant (OT06/60) from KU Leuven, by a Grant from the Fonds Wetenschappelijk Onderzoek – Vlaanderen, Flanders, Belgium (FWO; ELG-B5588-G.0193.07), and by KU Leuven grant (PF) – 10/005. We also gratefully acknowledge the support of the Fonds Wetenschappelijk Onderzoek – Vlaanderen (FWO) to Dr. Griffith (GP.035.11N). Stephan Claes is a Senior Clinical Investigator for the FWO. Bert Lenaert is a research assistant for the FWO. Preliminary analyses of these data were completed as part of the Master's Thesis of Stefanie Vermote.

Compliance with Ethical Standards

Conflict of Interest James W. Griffith, Stephan Claes, Titia Hompes, Elske Vrieze, Stefanie Vermote, Elise Debeer, Bert Lenaert, Filip Raes and Dirk Hermans declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Animal Rights No animal studies were carried out by the authors for this article.

References

Aglan, A., Williams, J. M. G., Pickles, A., & Hill, J. (2010). Overgeneral autobiographical memory in women: Association with childhood abuse and history of depression in a community sample. *British Journal of Clinical Psychology, 49*, 359–372. doi:10.1348/014466509X467413.

Borrini, G., Dall'Ora, P., Della Sala, S., Marinelli, L., & Spinnler, H. (1989). Autobiographical memory: Sensitivity to age and education of a standardized enquiry. *Psychological Medicine, 19*, 215–224. doi:10.1017/S0033291700011181.

Breslau, N., Davis, G. C., Peterson, E. L., & Schultz, L. R. (2000). A second look at comorbidity in victims of trauma: The posttraumatic stress disorder-major depression connection. *Biological Psychiatry, 48*, 902–909.

Brewin, C. R., Reynolds, M., & Tata, P. (1999). Autobiographical memory processes and the course of depression. *Journal of Abnormal Psychology, 108*, 511–517.

Burnside, E., Startup, M., Byatt, M., Rollinson, L., & Hill, J. (2004). The role of overgeneral autobiographical memory in the development of adult depression following childhood trauma. *British Journal of Clinical Psychology, 43*(4), 365–376.

Crane, C., & Duggan, D. S. (2009). Overgeneral autobiographical memory and age of onset of childhood sexual abuse in patients with recurrent suicidal behaviour. *British journal of clinical psychology, 48*(1), 93–100. doi:10.1348/014466508X370600.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: L. Erlbaum Associates.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Routledge.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*, 261–288. doi:10.1037//0033-295X.107.2.261.

Dalgleish, T., Bevan, A., McKinnon, A., Breakwell, L., Mueller, V., Chadwick, I., et al. (2014). A comparison of MEmory Specificity Training (MEST) to education and support (ES) in the treatment of recurrent depression: Study protocol for a cluster randomised controlled trial. *Trials, 15*, 1–9. doi:10.1186/1745-6215-15-293.

Dalgleish, T., Rolfe, J., Golden, A.-M., Dunn, B. D., & Barnard, P. J. (2008). Reduced autobiographical memory specificity and post-traumatic stress: Exploring the contributions of impaired executive control and affect regulation. *Journal of Abnormal Psychology, 117*, 236–241. doi:10.1037/0021-843X.117.1.236.

DePrince, A. P., Weinzierl, K. M., & Combs, M. D. (2009). Executive function performance and trauma exposure in a community sample of children. *Child Abuse and Neglect, 33*(6), 353–361. doi:10.1016/j.chiabu.2008.08.002.

Draijer, N. (2003). *Structured trauma interview (STI): Description, administration and scoring*. Amsterdam: Department of Psychiatry, Vrije Universiteit.

Draijer, N., & Langeland, W. (1999). Childhood trauma and perceived parental dysfunction in the etiology of dissociative symptoms in psychiatric inpatients. *American Journal of Psychiatry, 156*, 379–385.

Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the lifespan: Findings from the Adverse Childhood Experiences Study. *Journal of the American Medical Association, 256*, 3089–3096.

Eigenhuis, E., Seldenrijk, A., Schaik, A., Raes, F., & Oppen, P. (2015). Feasibility and effectiveness of memory specificity training in depressed outpatients: A pilot study. *Clinical Psychology & Psychotherapy*. doi:10.1002/cpp.1995.

Ehring, T., Frank, S., & Ehlers, A. (2008). The role of rumination and reduced concreteness in the maintenance of posttraumatic stress disorder and depression following trauma. *Cognitive Therapy and Research, 32*(4), 488–506. doi:10.1007/s10608-006-9089-7.

Euser, E. M., van IJzendoorn, M. H., Prinzie, P., & Bakermans-Kranenburg, M. J. (2010). Prevalence of child maltreatment in the Netherlands. *Child Maltreatment, 15*, 5–17. doi:10.1177/1077559509345904.

Evers, A., Van Vliet-Mulder, J. C., & Ter Laak, J. (1992). *Documentatie van tests en test research in Nederland (Documentation on tests and test research in the Netherlands)*. Assen: Commissie Testaangelegenheden Nederland, Nederlands Instituut van Psychologen, Van Gorcum.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1996). *Structured clinical interview for DSM-IV axis I disorders: Patient edition (SCID-I/P, version 2.0)*. Washington, DC: American Psychiatric Press.

Friedberg, J. P., Adonis, M. N., Von Bergen, H. A., & Suchday, S. (2005). September 11th related stress and trauma in New Yorkers. *Stress and Health, 21*, 53–60. doi:10.1002/smi.1039.

Griffith, J. W., Kleim, B., Sumner, J. A., & Ehlers, A. (2012a). The factor structure of the Autobiographical Memory Test in recent trauma survivors. *Psychological Assessment, 24*, 640–646. doi:10.1037/a0026510.

Griffith, J. W., Sumner, J. A., Debeer, E., Raes, F., Hermans, D., Mineka, S., et al. (2009). An item response theory/confirmatory factor analysis of the Autobiographical Memory Test. *Memory, 17*, 609–623. doi:10.1080/09658210902939348.

Griffith, J. W., Sumner, J. A., Raes, F., Barnhofer, T., Debeer, E., & Hermans, D. (2012b). Current psychometric and methodological issues in the measurement of overgeneral autobiographical memory. *Journal of Behavior Therapy and Experimental Psychiatry*. doi:10.1016/j.jbtep.2011.05.008.

Hamilton, M. (1967). Development of a rating scale for primary depressive illness. *British Journal of Social and Clinical Psychology, 6*, 278–296.

Hauer, B. J. A., Wessel, I., Geraerts, E., Merckelbach, H., & Dalgleish, T. (2008). Autobiographical memory specificity after manipulating retrieval cues in adults reporting childhood sexual abuse. *Journal of Abnormal Psychology, 117*, 444–453. doi:10.1037/0021-843X.117.2.444.

Henderson, D., Hargreaves, I., Gregory, S., & Williams, J. M. G. (2002). Autobiographical memory and emotion in a non-clinical sample of women with and without a reported history of childhood sexual abuse. *British Journal of Clinical Psychology, 41*(2), 129–141.

Hermans, D., de Decker, A., De Peuter, S., Raes, F., Eelen, P., & Williams, J. M. G. (2008). Autobiographical memory specificity and affect regulation: Coping with a negative life event. *Depression and Anxiety, 25*, 787–792. doi:10.1002/da.20326.

Hermans, D., Defranc, A., Raes, F., Williams, J. M. G., & Eelen, P. (2005). Reduced autobiographical memory specificity as an avoidant coping style. *British Journal of Clinical Psychology, 44*, 583–589. doi:10.1348/014466505X53461.

Hermans, D., Van den Broeck, K., Belis, G., Raes, F., Pieters, G., & Eelen, P. (2004). Trauma and autobiographical memory specificity in depressed inpatients. *Behaviour Research and Therapy, 42*, 775–778. doi:10.1016/S0005-7967(03)00197-9.

Heron, J., Crane, C., Gunnell, D., Lewis, G., Evans, J., & Williams, J. M. G. (2012). 40,000 memories in young teenagers: Psychometric properties of the Autobiographical Memory Test in a UK cohort study. *Memory, 20*, 300–320. doi:10.1080/09658211.2012.656846.

Holland, C. A., & Rabbitt, P. M. A. (1990). Autobiographical and text recall in the elderly: An investigation of a processing resource deficit. *The Quarterly Journal of Experimental Psychology Section A, 42*, 441–470. doi:10.1080/14640749008401232.

Kooiman, C. G., Ouwehand, A. W., & ter Kuile, M. M. (2002). The Sexual and Physical Abuse Questionnaire (SPAQ): A screening instrument for adults to assess past and current experiences of abuse. *Child Abuse and Neglect, 26*, 939–953.

Kuyken, W., & Brewin, C. R. (1995). Autobiographical memory function in depression and reports of early abuse. *Journal of Abnormal Psychology, 104*, 585–591.

Kuyken, W., Howell, R., & Dalgleish, T. (2006). Overgeneral autobiographical memory in depressed adolescents with, versus without, a reported history of trauma. *Journal of Abnormal Psychology, 115*, 387–396. doi:10.1037/0021-843X.115.3.387.

McNally, R. J., & Geraerts, E. (2009). A new solution to the recovered memory debate. *Perspectives on Psychological Science, 4*, 126–134.

McNally, R. J., Lasko, N. B., Macklin, M. L., & Pitman, R. K. (1995). Autobiographical memory disturbance in combat-related post-traumatic stress disorder. *Behaviour Research and Therapy, 33*, 619–630.

Moore, S. A., & Zoellner, L. A. (2007). Overgeneral autobiographical memory and traumatic events: An evaluative review.

Psychological Bulletin, 133(3), 419–437. doi:10.1037/0033-2909.133.3.419.

Moradi, A. R., Moshirpanahi, S., Parhon, H., Mirzaei, J., Dalgleish, T., & Jobson, L. (2014). A pilot randomized controlled trial investigating the efficacy of MEmory Specificity Training in improving symptoms of posttraumatic stress disorder. *Behaviour Research and Therapy, 56*, 68–74. doi:10.1016/j.brat.2014.03.002.

Neshat-Doost, H., Dalgleish, T., Yule, W., Kalantari, M., Ahmadi, S. J., Dyregrov, A., & Jobson, L. (2013). Enhancing autobiographical memory specificity through cognitive training: An intervention for depression translated from basic science. *Clinical Psychological Science, 1*, 84–92. doi:10.1177/2167702612454613.

Ogle, C. M., Block, S. D., Harris, L. S., Goodman, G. S., Pineda, A., Timmer, S., et al. (2013). Autobiographical memory specificity in child sexual abuse victims. *Development and Psychopathology, 25*(2), 321–332. doi:10.1017/S0954579412001083.

Raes, F., Hermans, D., de Decker, A., Eelen, P., & Williams, J. M. G. (2003). Autobiographical memory specificity and affect regulation: An experimental approach. *Emotion, 3*, 201–206. doi:10.1037/1528-3542.3.2.201.

Raes, F., Hermans, D., Williams, J. M. G., Brunfaut, E., Hamelinck, L., & Eelen, P. (2006). Reduced autobiographical memory specificity and trauma in major depression: On the importance of post-trauma coping versus mere trauma exposure. In S. M. Sturt (Ed.), *New developments in child abuse research* (pp. 61–72). New York: Nova Science Publishers Inc.

Raes, F., Hermans, D., Williams, J. M. G., & Eelen, P. (2005). Autobiographical memory specificity and emotional abuse. *British Journal of Clinical Psychology, 44*, 133–138. doi:10.1348/014466504X20080.

Raes, F., Pousset, G., & Hermans, D. (2004). Correlates of autobiographical memory specificity in a non-clinical student population. Unpublished manuscript.

Raes, F., Williams, J. M. G., & Hermans, D. (2009). Reducing cognitive vulnerability to depression: A preliminary investigation of MEmory Specificity Training (MEST) in inpatients with depressive symptomatology. *Journal of Behavior Therapy and Experimental Psychiatry, 40*, 24–38. doi:10.1016/j.jbtep.2008.03.001.

Reynolds, W. M., & Kobak, K. A. (1995). Reliability and validity of the Hamilton Depression Inventory: A paper-and-pencil version of the Hamilton Depression Rating Scale Clinical Interview. *Psychological Assessment, 7*(4), 472.

van Groenestijn, M. A. C., Akkerhuis, G. W., Schneider, N., Kupka, R. W., & Nolen, W. A. (1999). *Gestructureerd klinisch interview voor de vaststelling van DSM-IV as I stoornissen (SCID-I/P DSM-IV)*. Lisse: Swets & Zeitlinger.

van IJnezdoorn, M. H., Euser, E. M., Prinzie, P., Juffer, F., & Bakermans-Kranenburg, M. J. (2009). Elevated risk of child maltreatment in families with stepparents but not with adoptive parents. *Child Maltreatment, 14*, 369–375. doi:10.1177/1077559509342125.

Vrieze, E., Demyttenaere, K., Bruffaerts, R., Hermans, D., Pizzagalli, D. A., Sienaert, P., et al. (2014). Dimensions in major depressive disorder and their relevance for treatment outcome. *Journal of Affective Disorders, 155*, 35–41. doi:10.1016/j.jad.2013.10.020.

Williams, J. B. W. (1988). A structured interview guide for the Hamilton Depression Rating Scale. *Archives of General Psychiatry, 45*, 742–747.

Williams, J. M. G. (2006). Capture and rumination, functional avoidance, and executive control (CaRFAX): Three processes that underlie overgeneral memory. *Cognition and Emotion, 20*, 548–568. doi:10.1080/02699930500450465.

Williams, J. M. G., Barnhofer, T., Crane, C., Hermans, D., Raes, F., Watkins, E., & Dalgleish, T. (2007). Autobiographical memory specificity and emotional disorder. *Psychological Bulletin, 133*, 122–148. doi:10.1037/0033-2909.133.1.122.

Williams, J. M. G., & Broadbent, K. (1986). Autobiographical memory in suicide attempters. *Journal of Abnormal Psychology, 95*, 144–149. doi:10.1037/0021-843x.95.2.144.