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Do Overgeneral Autobiographical Memories Predict Increased Psychopathological Symptoms in Community Youth? A 3-Year Longitudinal Investigation

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Abstract Research suggests that an overgeneral autobiographical memory style (i.e., retrieval of general memories when instructed to retrieve a specific episodic memory) represents a vulnerability marker for depression. Although adolescence is a period of high risk for the emergence of depression, little research has investigated the associations among overgeneral memory, psychopathology, and risk factors longitudinally in a community sample in this age group. We, therefore, investigated overgeneral memory, psychopathology (depression and anxiety), and rumination (an established risk factor for psychopathology) longitudinally in 269 typically-developing youth (125 females, 144 males) across 3 annual assessment points. We sought to determine whether 1) overgeneral memory would predict psychopathology across the entire sample, and 2) whether associations would vary as a function of longitudinal rumination growth. Across the entire sample, overgeneral memory did not predict psychopathology. For youth who reported elevated, and increasing, patterns of rumination over time, transient relationships between overgeneral memory and subsequent increases in anxiety were found. We conclude that overgeneral memory may represent a vulnerability marker for adverse psychological outcomes only for youth at risk for psychopathology.

Keywords Autobiographical memory specificity · Overgeneral memory · Adolescent development · Rumination · Depression · Anxiety

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Autobiographical remembering is central to perceptions of the self, our emotional experience, and a sense of enduring existence within a broader cultural context (Conway and Pleydell-Pearce 2000). For example, drawing on the lessons learned from past experiences can guide our current and future behavior and facilitate problem solving (Bluck 2003; Nelson and Fivush 2004; Pillemer 2003). Problems and biases in autobiographical remembering, conversely, are implicated in psychopathology across the lifespan (for a review see Salmon and O'Kearney 2014). Overgeneral memory, one such bias, is defined as the tendency to retrieve memories in a general way when asked to retrieve a specific episode of less than 1 day's duration (Williams and Broadbent 1986). For example, in response to the cue word "angry", instead of saying "when John took my book during class", an individual might say "when John takes my things" (a category of similar memories) or "when John had my book for a week" (a temporally extended memory).

Research conducted with adults shows that depressed individuals report more overgeneral memories than non-depressed individuals (Williams 1996; Williams et al. 2007). Moreover, reporting more overgeneral memories predicts increases in depressive symptoms and a more severe course of depression (Brittlebank et al. 1993; Hermans et al. 2008; Van Vreeswijk and De Wilde 2004; see Sumner et al. 2010; Williams et al. 2007 for reviews), suggesting that a tendency to retrieve overgeneral memories is a marker for vulnerability to depression. These and related findings provide support for the dominant theoretical model of overgeneral memory (i.e., the CaR-FA-X model; Williams et al. 2007) which proposes that higher overgenerality may occur when negative cognitive processes, such as elevated levels of rumination (CaR) and avoidant response styles (FA), and reduced availability of executive resources (X), bring the hierarchical memory retrieval search to a premature halt at the level of general rather than specific memories. The resulting diminished ability to draw on

specific episodic information may then interfere with adaptive cognitive processing (e.g., problem-solving abilities) and give rise to, or exacerbate, psychopathology (Raes et al. 2005).

Adolescence is a time of particular risk for the development of depression. Longitudinal research suggests that major depression typically emerges between the ages of 11 to 14 years, with subsequent steady increases in incidence across adolescence and early adulthood, and that adolescent depression increases the risk of subsequent episodes (Cicchetti and Toth 1998; Thapar et al. 2012). Elucidating the precursors and mechanisms of overgeneral memory across this period can potentially shed light on the development and exacerbation of depression. Limited research exists on the longitudinal relationships between overgeneral memory and psychopathology across the period from late childhood into early adolescence, however. The primary aim of the current 3-year longitudinal study, therefore, was to investigate the relationships between overgeneral memory and psychopathology in a community sample ages 10 to 15 years at the first data collection point.

A number of cross-sectional studies with clinical and typically-developing children and adolescents have found a positive association between overgeneral memory and depressive symptoms (Orbach et al. 2001; Park et al. 2002; Swales et al. 2001; Vrielynck et al. 2007). For example, across two studies, Kuyken and Dalgleish (2011) reported that adolescents (ages 14 to 18 years) who were at greater risk of depression retrieved greater numbers of overgeneral memories than their lower-risk counterparts.

Of the few longitudinal investigations conducted with adolescents, the three that have focused on high risk youth have yielded inconsistent findings. For example, Hipwell et al. (2011) investigated the longitudinal relationships between overgeneral memory and depression for a sample of girls, half of whom screened high on a depression measure ($N = 195$). Overgeneral memories given in response to positive, but not negative, cue words at age 11 years predicted increases in depression 1 year later. A second longitudinal study, by Rawal and Rice (2012), followed participants between 10 and 18 years of age ($N = 277$) who were at familial risk for depression over a 12-months interval. Among adolescents reporting no depressive disorder at baseline, higher numbers of overgeneral memories in response to negative but not positive cue words predicted increases in depressive symptoms for females but not males. Higher numbers of overgeneral memories also predicted new-onset episodes for the 14 participants who developed a depressive disorder across the two time points. Similarly, Sumner et al. (2011) found that greater overgeneral memory predicted onset of a major depressive episode in older adolescents with past depression ($N = 55$), but only under conditions of concurrently reported high levels of interpersonal stress.

To draw stronger conclusions about the role of overgeneral memory in the emergence of youth psychopathology, research with at-risk samples must be complemented by longitudinal studies conducted with community youth (that is, individuals who are neither drawn from a clinical population nor specifically recruited as "at risk" for depression). A specific focus on at-risk youth increases the possibility that the patterns found for overgeneral memory might relate to heightened prior exposure to negative life events or past psychopathology (Crane et al. 2015). Therefore, while research with at-risk samples provides valuable insight into cognitive vulnerabilities implicated in the emergence and maintenance of psychopathology in clinical populations, there is a need for further investigation of the role of overgeneral memories in the development of new onset psychopathology. Three longitudinal studies have investigated the predictive relationships between overgeneral memory and depression in community samples. Focusing on youth ages 12–13 years ($N = 174$), Stange et al. (2013) found that the number of overgeneral memories positively predicted depression after an 8 months follow-up period, but only when elevated overgeneral memory co-occurred with self-reported emotional abuse. Another study, by Hamlat et al. (2015), found that, for adolescents with a mean age of 12 years ($N = 160$), the number of overgeneral memories positively predicted depressive symptoms over a 9 months period, but this effect was limited to females and occurred only for individuals reporting high levels of rumination and stressful life events. In contrast, Crane et al. (2015) found neither direct nor indirect effects of overgeneral memory at age 13 years ($N = 3708$) on depressive symptoms 3 years later.

Together, these findings raise the possibility that the relationship between overgeneral memory and depression found in high-risk groups may not generalize to community adolescents; that is, overgeneral memory may not predict psychological outcomes in the absence of risk factors for psychopathology, such as elevated rumination. Within this context, some research has shown that when individuals are asked to retrieve specific one-time childhood events, some general events are invariably reported (e.g., repeated experiences, which would be classified as overgeneral memories in the current area of research). That is, reporting some general memories when asked to retrieve a specific memory seems to be normative and does not necessarily reflect poor psychological functioning (Wang and Conway 2004). Moreover, general memories have been found to hold as much personal meaning for young adults as unique specific memories (Peterson et al. 2016). Together, these findings suggest that overgeneral memories may serve different functions, and have different consequences, in typical and atypical populations.

Current Study

By following a community sample of young people over three annual assessment points, we were able to address four gaps in the literature. First, we tested the possibility that, across the early adolescent period, reports of overgeneral memories would relate differentially to emerging psychopathology depending on whether youth reported high or low symptom trajectories of rumination across time. Rumination has been identified as a transdiagnostic risk factor for childhood depression and anxiety (Aldao et al. 2010; McLaughlin and Nolen-Hoeksema 2011). Moreover, from the theoretical perspective of the CaR-FA-X model (Williams et al. 2007), rumination contributes to the emergence and maintenance of overgeneral memory. Surprisingly, despite findings of significant associations between rumination, psychopathology, and overgeneral memory, few studies have so far investigated prospective associations between overgeneral memory and depression in youth while controlling for rumination (Hamlat et al. 2015; Rawal and Rice 2012).

Second, we broadened the typical focus on the relationship between overgeneral memory and psychopathology by including anxiety in addition to depression. While Rawal and Rice (2012) included a measure of anxiety in their study with at-risk youth, their focus was on the presence of anxiety disorders. During late childhood and early adolescence, however, it may prove fruitful to investigate associations between overgeneral memory and changes in symptoms of anxiety, rather than presence or absence of rarer anxiety disorders. Heightened anxiety is common during this developmental period, both predicting and co-occurring with depression (Cummings et al. 2014). Further, anxiety shares risk factors and information processing biases with depressed mood (Aldao et al. 2010; Reid et al. 2006).

Third, no single study has investigated associations between overgeneral memory and a range of psychopathological symptoms across more than two time points, and, with the exception of Crane et al. (2015), longitudinal studies have typically followed up participants for relatively short periods (e.g., 9 months). More reliable and sensitive statistical longitudinal analyses are based on datasets with three or more data collection points per individual (Little 2013). Fourth and last, we adopted an analytical strategy that allowed for more in-depth examination of the relationships between overgeneral memory and symptoms of anxiety and depression as a function of different patterns of change in rumination. We extend on past research that has examined rumination as a moderator of associations between overgeneral memory and psychopathology (Hamlat et al. 2015) by investigating differences in patterns of association as a function of rumination trajectories across the three time points.

We tested two hypotheses. First, we expected that, across the entire sample, increased overgenerality would not predict increases in symptoms of depression and anxiety. That is, for community youth, we expected that producing overgeneral memories would be neither indicative nor predictive of poor psychological functioning in line with previous findings (e.g., Crane et al. 2015). We considered, however, that analyses for the entire sample would mask differences in the relationships between overgeneral memory and psychopathology for young people reporting different levels and patterns of change in rumination across the three data collection points (Hamlat et al. 2015).

Thus, our second hypothesis was that overgeneral memory would predict increases in symptoms of depression and anxiety for participants at increased risk of poorer psychological functioning. In line with previous work, risk was operationalised as elevated longitudinal levels of rumination (Hamlat et al. 2015). Further, we expected associations between overgeneral memory and psychopathology among high ruminating adolescents for negative cues only: this latter prediction is consistent with Kuyken and Dalgleish's (2011) proposal that overgeneral memory as an affect regulation strategy may initially be limited to negative cues, but may develop into an inflexible and more globalised style of memory retrieval as psychopathology becomes more chronic. Finally, while we expected that these relationships would be evident across the first time lag, we predicted that associations would be maintained, and increase in strength, across time as the risk of psychopathology onset increases with age (the second time lag should be stronger relative to the first).

Method

Participants

Participants were recruited from eight secondary schools in urban and rural areas in New Zealand. Of the 322 participants at Time 1, 288 participated approximately 12 months later at Time 2, and 269 (144 males, 125 females) approximately 11 months later at Time 3 (for an overall retention rate of 84%). The average age of boys at Time 1 ($M = 13.1$, $SD = 1.2$) was significantly greater than that of girls ($M = 12.5$, $SD = 1.0$). Parental consent and student assent were obtained separately for each wave, giving the option of withdrawal at follow-up stages. Attrition at follow-up was primarily due to the student being absent on the day of testing or having moved to an unknown school. The majority (80.1%) of participants identified as New Zealander or European New Zealander, 5.3% as Māori, 7.9% as Asian, 3.4% as Pacific Islanders, and the remaining 3.4% classified their ethnicity as Other. Across participating schools, children from low to high socio-economic bands were represented in the sample, with the majority of children from the middle socio-economic

band. This research was approved by the School of Psychology Human Ethics Committee, under delegated authority to the Victoria University of Wellington's Ethics Committee.

Measures

Depression Participants completed the 12-item Children's Depression Inventory–2 Self-Report Short Version (CDI-2:SR[S]; Kovacs 1985, 1992). Participants were presented with three sentences per item (e.g., "I hate myself", "I do not like myself", "I like myself"), and asked to select the one response option that best corresponds to how they had been feeling over the past 2 weeks. All items are scored on a 3-point scale (0 = *no symptoms*, 1 = *mild symptoms*, 2 = *severe symptoms*). The measure demonstrated good internal consistency across the three waves of data collection (αs = 0.74 to 0.83).

Rumination An abbreviated version of the Ruminative Response subscale of the Children's Response Styles Questionnaire (CRSQ; Abela et al. 2002) was administered to assess rumination, defined as "comparison of one's current situation with some unachieved standard" (Treynor et al. 2003, p. 256). Participants were presented with statements about cognitive processing styles (e.g., "When I am sad, I think about how angry I am with myself") and asked to indicate how often they engage in this response style on a 4-point scale (1 = *almost never*; 2 = *sometimes*; 3 = *often*; 4 = *almost always*). The 6-item scale yielded good internal reliability across the three waves of data collection (αs = 0.77 to 0.85).

Anxiety The Revised Children's Manifest Anxiety Scale–2 (RCMAS-2; Reynolds and Richmond 2008) Short Form is a 10-item self-report measure of general anxiety. Items tap into three facets of anxiety: social concerns (e.g., "I feel someone will tell me I do things the wrong way"), physiological anxiety (e.g., "Often I feel sick in my stomach"), and worry (e.g., "I often worry about something bad happening to me"). Participants respond with either *YES* or *NO*. The RCMAS-2 Short Form yields a total anxiety score, and demonstrates good construct validity (e.g., Lowe 2015). Good internal reliability was obtained across the three waves of data collection (αs = 0.75 to 0.80).

Autobiographical Memory An adapted written version of the Minimal Instructions Autobiographical Memory Test (Mi-AMT; Debeer et al. 2009) was used to assess specificity and generality of autobiographical memory. Prior research has found this version of the AMT, which does not include example or practice items, to be more sensitive to overgeneral autobiographical memory in non-clinical populations than Williams and Broadbent's (1986) original measure (Debeer et al. 2009). On the basis of a pilot test, we made slight alterations to the instructions provided by the Mi-AMT, as we found that our participants, who were younger than in Debeer's research, required additional information regarding type and specificity of memories sought. Participants were presented with 10 cue words in a fixed order, alternating between positive (*happy*, *lucky*, *proud*, *excited*, *relaxed*) and negative valence (*sad*, *angry*, *lonely*, *guilty*, *scared*). The cues were adopted from past research with participants of comparable age (Hipwell et al. 2011; Raes et al. 2010). Students were told that they were completing a memory test, and were asked to think of and write down a specific event or situation of which each cue word reminded them. The current test differed from the Mi-AMT in that we gave an example of a correct and an incorrect response to a cue word not included in the test word list, but instructions regarding the degree of desired specificity of memories were minimal. In line with the Mi-AMT, and unlike the original AMT, no practice items were provided. Students were given 1 min to write down their memory for each cue word. Participants provided their responses in writing; our previous research (Glynn et al. 2016) has shown that reporting mode (writing vs speaking) does not significantly influence the number of specific and overgeneral memories children provide on the AMT.

Memory Coding and Reliability Memories were assigned to one of eight different memory categories. In line with pre-established AMT coding guidelines (Griffith et al. 2012; Williams et al. 2007), a memory referring to a single specific event lasting less than 1 day was coded as *specific* (e.g., "my last birthday party"); a memory referring to an event that lasted longer than 1 day was coded as *extended* (e.g., "visiting Spain last summer"); a memory referring to a collection of similar events repeated over time was coded as *categoric* (e.g., "playing with my friends"); and a verbal association to the cue (e.g., "movie" in response to cue word *happy*) was coded as a *semantic associate*. Events that had not yet happened were coded as *future oriented* (e.g., "going swimming next Sunday"); repetitions of previously reported memories as *repeated*; incomplete responses (providing partial information about an event) as *incomplete*; and failure to provide a response as an *omission*.

One of the complexities in current research is inconsistency in conceptualization of overgenerality. For example, whereas Hamlat et al. (2015) analyzed total number of categoric and extended memories, Crane et al. (2015) analyzed specific memories, with all other types of responses, including omissions and semantic associates, being considered non-specific. In order to obtain the fairest picture of associations between study variables, we integrated past research and adopted a range of conceptualizations. Six different indices of overgeneral memory–as utilized in previous research–were tested separately as part of all analyses. First, proportions of

specific and overgeneral memories (extended and categoric), and, due to inconsistencies in findings of associations between psychopathology and overgeneral memories provided in response to cues of different emotional valence (e.g., Hipwell et al. 2011; Kuyken and Dalgleish 2011), proportions of specific and overgeneral memories when split by cue word valence (positive or negative). All proportions were computed using total number of responses to cue words excluding omissions (Griffith et al. 2012).

To establish reliability, all memories (100%) were coded independently by two raters. Average Cohen's kappa across the three waves of data, totalling 8,070 memories, was 0.77. A dichotomous memory specificity variable was also computed, with specific memories being assigned a value of 1, and remaining overgeneral/non-specific memories being coded as 0. Average kappa was 0.85 across the three waves, suggesting high interrater agreement with respect to whether a memory was considered specific or not.

Procedure

Eight out of 18 schools initially contacted about the study agreed to participate (44%). Parent consent forms were distributed by the school to appropriate-age classes; the percentage of forms returned from the number distributed is unknown. Across all waves, participants were assessed at school, in groups of approximately 10 students during class time. At the beginning of each session, participants were told their answers would be confidential, and that responses would be traced back to participants and schools contacted only if responses raised concerns about their wellbeing. On completion of assent forms, the first part of assessment entailed administration of the adapted Mi-AMT. The second part of the session involved completion of self-report questionnaires. Participants were then debriefed about the purpose of the study and invited to ask questions. Sessions, on average, lasted 45 min. Data collection and coding were carried out by trained postgraduate students and research fellows.

Missing Data

Analysis of patterns of item-level missing data in self-report measures using Little's MCAR test (Little and Rubin 2002) showed that data were missing completely at random, Little's MCAR $\chi^2(2716, N = 269) = 2711.78$, $p = 0.520$. Across the three data collection waves, total percentage of missing items was 1.90%. Using SPSS, an expectation-maximization (EM) algorithm was employed to impute missing values, on the basis of which scale totals were subsequently computed und used for analyses.

Analytic Strategy

Following preliminary analyses to obtain descriptive statistics, autoregressive cross-lagged models were estimated to test for prospective associations among study variables. Six models adopting different indices of overgeneral memory, as outlined earlier, were tested separately using the structural equation modelling software package AMOS Version 23 (Arbuckle 2014). Due to the large number of multiple comparisons carried out, a Šidák correction for multiple comparisons was computed and applied to all analyses, resulting in rejection of the null hypothesis only if the p-value was equal to or smaller than 0.015 (Šidák 1967). Bias-corrected (BC) 98.5% confidence intervals (CI) were bootstrapped (2000 samples) for all prospective association analyses. The true population value for a given estimate lies within the upper and lower limits of this interval.

First, baseline models with freely varying autoregressive coefficients (representing stability of each measure across consecutive time points) were compared to models where such coefficients were constrained to equality across the three waves. Because we expected to find associations of different magnitude across the two time lags on theoretical grounds (Time 1 to Time 2, and Time 2 to Time 3), cross-lagged pathways were allowed to vary freely in all models. Constraining them would entail averaging strengths of associations, and this approach can conceal time-specific effects. Chi-square difference tests were carried out to identify the most parsimonious cross-lagged autoregressive models including measures of depression, anxiety, and rumination, and one of the six indices of overgeneral memory at a time. Variables were allowed to covary with one another at each time point. This process resulted in a final selection of six best-fitting models. Gender and age were included as covariates in all analyses. To test our first hypothesis, the final models' path estimates were assessed for significant prospective associations between overgeneral memory and psychopathology.

Next, a latent class growth analysis (LCGA) was carried out to identify subgroups of individuals in the sample with different growth trajectories on the rumination measure across the three data collection waves. While the traditional latent growth curve modeling approach identifies an overall trajectory of change for the population and estimates individual deviation from this curve, LCGA assumes that the population of interest is comprised of distinct subgroups with varying patterns of temporal change on a given measure (Muthén and Muthén 2000). The best-fitting model with the optimal number of subgroups is considered to have the smallest Bayesian Information Criterion (BIC) and a significant Lo et al.'s (2001) likelihood ratio test statistic (LMR-LRT) when comparing a current model with k groups to a model with $k - 1$ groups (e.g., Jung and Wickrama 2008; Muthén and Muthén 2000). The software package Mplus Version 7 (Muthén and Muthén 1998–2015) was used for analyses.

To test our second hypothesis, omnibus tests of interaction effects between rumination trajectory group membership and overgeneral memory indices in predicting anxiety and depression were first carried out. If an interaction effect was significant across either time lag, stratified, multi-group analyses were then carried out to determine differences in prospective associations across subgroups.

Results

Attrition

Analyses were conducted to determine whether a participant's gender, age, symptoms of depression, anxiety, and rumination, and proportions of specific and overgeneral memories at Time 1 were systematically related to whether or not they participated in all three data collection waves. A Pearson's chi-square test showed no significant relationship between gender and attrition group membership (completers vs. non-completers), $\chi^2(1, N = 322) = 0.81, p = 0.369$. A multivariate analysis of variance was carried out with attrition status as the independent variable and rumination, anxiety, depression, and overgenerality as the dependent variables. A non-significant overall multivariate group effect for attrition was found; $F(4, 317) = 1.32$, $p = 0.263$, Wilk's $\Lambda = 0.984$, $\eta_p^2 = 0.02$. Despite a non-significant multivariate main effect, univariate between-participants effects suggested that participants who completed all three waves of data collection displayed slightly lower levels of rumination at Time 1 ($M = 1.94$, $SD = 0.65$) than non-completers ($M = 2.15$, $SD = 0.69$), $F(1, 320) = 4.43$, $p = 0.036$, $\eta_p^2 = 0.02$. Possible implications of this difference are addressed in the limitations section of the Discussion.

Descriptive Statistics

Table 1 reports correlations among study variables across the three waves of data collection. In light of the predictions, several zero order correlations were notable, albeit small in size. With regard to correlations involving the memory indices, higher proportions of specific memories at Time 2 were significantly correlated with lower depression scores at Time 1 and Time 2, and higher proportions of specific memories at Time 3 were correlated with lower depression scores at Time 2. Higher proportions of specific memories at Time 2 were correlated with lower anxiety scores at Time 1 and 2. In contrast, proportions of overgeneral memories did not correlate significantly with depression or anxiety at any point in time. Depressive and anxious symptom constructs displayed good stability across data collection points, and these measures intercorrelated significantly in the expected direction. Table 2 presents study variables' means and standard deviations. Mean levels of overgeneral memory and specificity are consistent with those reported in past research (Hipwell et al. 2011; Rawal and Rice 2012).

Model Fitting

Step-wise relaxation of autoregressive parameter constraints did not provide a significantly better fit to the data for any of the six models, regardless of which overgeneral memory index was adopted. Consequently, the most parsimonious models contained autoregressive pathways that were constrained across the two time lags. Cross-lagged pathways were allowed to vary freely on theoretical grounds, as discussed earlier. The final six models exhibited acceptable fit to the data, with $\chi^2(31, N = 269)$ values ranging from 67.92 to 79.51, $ps < 0.001$, *CFI*s = 0.97 to 0.98, and *RMSEA*s = 0.07.

Prospective Associations between Overgeneral Memory and Psychopathology for the Entire Sample

To test our hypotheses, cross-lagged path estimates were first examined across the entire sample, and then as a function of trajectory subgroup. Across the entire sample, none of the six overgeneral memory indices predicted change in symptoms of anxiety or depression across either time lag. This result is consistent with our first hypothesis, namely that the association between an overgeneral memory retrieval style and psychopathology for the entire community sample would be weak to non-existent.

Identification of Latent Classes

The initial test of prospective relationships among overgeneral memory and psychopathology was performed on the entire sample, but follow-up moderation analyses were conducted using classes based on rumination symptom trajectories. In order to perform the latter analyses, latent class growth modelling analyses were carried out to identify subgroups of adolescents with varying developmental trajectories on the rumination measures across the three data collection waves. On the basis of the LMR-LRT test, a three-group solution was found to be optimal. Testing models with more subgroups resulted in non-significant LMR-LRT test statistics and only marginal reductions in BIC values, suggesting that additional classes did not clarify the composition of the model. Intercepts and slopes are reported. The three subgroups were: 1) a group displaying stable low levels of rumination symptoms over time ($N = 161$, $I = 1.63$, $S = -0.01$, $p < 0.001$ and $p = 0.686$, respectively), 2) a group displaying slightly higher and increasing symptoms ($N = 83$, $I = 2.18$, $S = 0.21$, $p < 0.001$ and $p = 0.002$, respectively), and 3) a group displaying stable high

Table 1 Correlations between study variables ($N = 269$)

	Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Prop. OGM T1	–													
2.	Prop. OGM T2	0.33**	–												
3.	Prop. OGM T3	0.18**	0.28**	–											
4.	Prop. SPM T1	−0.82**	−0.31**	−0.24**	–										
5.	Prop. SPM T2	−0.29**	−0.76**	−0.37**	0.36**	–									
6.	Prop. SPM T3	−0.20**	−0.26**	−0.85**	0.27**	0.38**	–								
7.	CDI-2 T1	−0.04	0.07	0.04	0.01	−0.18**	−0.07	–							
8.	CDI-2 T2	0.01	0.10	0.07	−0.02	−0.20**	−0.13*	0.55**	–						
9.	CDI-2 T3	0.04	0.08	0.00	−0.02	−0.12	−0.04	0.53**	0.62**	–					
10.	RCMAS-2 T1	−0.07	0.10	0.11	−0.04	−0.21**	−0.09	0.61**	0.41**	0.38**	–				
11.	RCMAS-2 T2	0.01	0.06	0.09	−0.06	−0.14*	−0.10	0.48**	0.65**	0.47**	0.61**	–			
12.	RCMAS-2 T3	−0.05	0.05	0.05	0.03	−0.08	−0.04	0.39**	0.46**	0.61**	0.50**	0.58**	–		
13.	CRSQ T1	0.03	0.05	0.01	−0.11	−0.14*	−0.04	0.50**	0.35**	0.30**	0.55**	0.47**	0.36**	–	
14.	CRSQ T2	0.05	0.01	0.04	−0.05	−0.13*	−0.09	0.33**	0.53**	0.35**	0.37**	0.58**	0.39**	0.63**	–
15.	CRSQ T3	0.04	0.07	0.04	−0.06	−0.15*	−0.08	0.33**	0.45**	0.55**	0.41**	0.45**	0.61**	0.50**	0.66**

Note. *T1* Time 1; *T2* Time 2; *T3* Time 3; *Prop. OGM* Proportion of overgeneral autobiographical memories (sum of categoric and extended memories); *Prop. SPM* Proportion of specific autobiographical memories; *CDI-2* Children's Depression Inventory–2; *RCMAS-2* Revised Children's Manifest Anxiety Scale–2; *CRSQ* Children's Response Styles Questionnaire

**$p < 0.01$; *$p < 0.05$

levels of rumination symptoms ($N = 25$, $I = 3.20$, $S = 0.04$, $p < 0.001$ and $p = 0.725$, respectively).

Table 2 Means and standard deviations

Measure	*M*	*SD*
Prop. OGM T1	0.23	0.20
Prop. OGM T2	0.19	0.18
Prop. OGM T3	0.19	0.17
Prop. SPM T1	0.65	0.24
Prop. SPM T2	0.68	0.22
Prop. SPM T3	0.71	0.20
CDI-2 T1	4.30	3.12
CDI-2 T2	4.57	3.60
CDI-2 T3	5.52	3.87
RCMAS-2 T1	2.95	2.50
RCMAS-2 T2	3.17	2.60
RCMAS-2 T3	3.74	2.77
CRSQ T1	1.94	0.65
CRSQ T2	2.02	0.76
CRSQ T3	2.07	0.70

Note. T1 Time 1; *T2* Time 2; *T3* Time 3; *Prop. OGM* Proportion of overgeneral autobiographical memories (sum of categoric and extended memories); *Prop. SPM* Proportion of specific autobiographical memories; *CDI-2* Children's Depression Inventory–2; *RCMAS–2* Revised Children's Manifest Anxiety Scale; *CRSQ* Children's Response Styles Questionnaire

Comparison of Prospective Associations across Rumination Trajectory Subgroups

As the small size of the high rumination trajectory subgroup ($N = 25$) renders estimation of parameters among 12 variables statistically untenable, medium and high growth subgroups were collapsed into a single group, resulting in low vs. medium/high group comparisons. First, differences in levels of overgeneral and specific memory across the low and medium/high rumination trajectory subgroups were assessed using a repeated measures MANOVA. Age and gender were included as covariates in all analyses. Findings suggested absence of trajectory subgroup main effects for overgenerality and specificity variables, respectively; Fs(1, 265) = 0.70 and 3.55, ps = 0.404 and 0.061 Further, the Levene's Test for equality of variances was non-significant for proportions of overgeneral memories, suggesting that the variance of proportions of overgeneral memories reported did not differ across the two subgroups. There was, however, a significant difference in variance of proportions of specific memories reported across the two rumination subgroups at Time 2, with greater variance in the medium/high rumination group, $F(1, 267) = 4.43$, $p = 0.036$.

Next, omnibus tests, using one of the six overgeneral memory indices at a time, were run to test whether rumination trajectory group membership and overgeneral memory interacted to predict anxiety and depression. Cross-lagged effects of depression and anxiety on each other were included in all models. One significant interaction was found: proportions

of overgeneral memories to negative cues and rumination trajectory group membership in interaction at Time 1 predicted anxiety at Time 2, $\beta = 0.25$, $p = 0.003$, BC 98.5% CI [0.06, 0.45]. Follow-up multi-group analyses showed that in the medium/high rumination subgroup, but not the low rumination subgroup, the proportion of overgeneral memories to negative cue words at Time 1 predicted an increase in levels of anxiety at Time 2, $\beta = 0.25$, $p = 0.006$, BC 98.5% CI [0.04, 0.43]. In the low rumination subgroup, the association between the proportion of overgeneral memories to negative cue words at Time 1 and anxiety at Time 2 approached significance; higher overgeneral memory proportions were associated with decreases in anxiety, $\beta = -0.13$, $p = 0.016$, BC 98.5% CI [−0.27, 0.003].

Results Summary

In summary, the findings provided support for our first hypothesis, namely that elevated overgeneral memory would not predict increases in depression or anxiety across time for the entire community sample. We obtained partial support for our second hypothesis that associations between overgeneral memory and psychopathology would vary as a function of rumination tendencies, and that associations would be evident for overgeneral memory to negative, but not positive, cue words. Only in youth with elevated and increasing rumination levels across time was transient evidence of a predictive association between overgeneral memories to negative cue words and subsequent increases in anxiety symptoms found. Increases in overgeneral memory did not predict increases in psychopathology across the low trajectory subgroup. Unexpectedly, overgeneral memory to negative cue words at Time 1 modestly predicted reductions in anxiety symptoms at Time 2 in this group.

Discussion

The aim of the current study was to investigate longitudinal associations among overgeneral autobiographical memory, rumination, and psychopathology in community youth. Consistent with our first hypothesis, across the entire sample, proportions of overgeneral memories did not predict increases or decreases in symptoms of psychopathology (anxiety or depression) over time. Partially consistent with our second hypothesis, however, for the subgroup of youth who reported higher trajectories of rumination across the three waves, proportions of overgeneral memories generated in response to negative cue words at Time 1 predicted an increase in anxiety (but not depression) at Time 2. This pattern was relatively weak and was not replicated from Time 2 to Time 3. For the subgroup reporting low rumination trajectories, proportions of overgeneral memories reported did not predict increases in psychopathology. Together, these findings suggest that the role of overgeneral memory as a vulnerability marker for adverse outcomes may be limited to youth who are at elevated risk of psychopathology, as indexed by reports of heightened levels of rumination across an extended period of time.

The only evidence obtained for a link between overgeneral memory and psychopathology was for the outcome of anxiety. Research on overgeneral memory in youth has typically focused on relationships with depression and/or trauma (for a review, see Hitchcock et al. 2014), and anxiety has received very limited research attention. Although Rawal and Rice (2012) assessed predictive associations between overgeneral memory and new-onset anxiety disorders, subthreshold anxiety symptoms were not included in their analyses. Moreover, Hamlat et al. (2015) reported an association between overgeneral memory and psychopathology in youth with heightened levels of rumination, but did not assess relationships with anxiety. Yet anxiety occurs very commonly during childhood and adolescence and is an established precursor of later psychopathology, including depression (Cummings et al. 2014; Moffitt et al. 2007). Further, anxious individuals manifest negative repetitive thinking to a similar degree as individuals experiencing depression (McEvoy et al. 2013). In summary, rumination may exacerbate the influence of overgeneral memories on the development of anxiety across early adolescence. It may be, therefore, that overgeneral memory plays multiple roles in the development and maintenance of psychopathology, and that associations vary depending on the levels and nature of concurrent cognitive vulnerabilities.

Our finding that, for our higher rumination subgroup, overgeneral memory predicted increases in anxiety but not increases in depression may reflect differences in covariates between our and other studies. Our path models included the variables anxiety and depression, controlling for the effect of each variable on the other, and accounted for rumination tendencies across time. This statistical approach is important because adolescents at risk of depression engage in high levels of rumination (Kuyken et al. 2006) and are also likely to experience heightened anxiety (Pine et al. 1998). Unlike previous research, which has tended to focus on depression to the exclusion of anxiety, this approach enabled us to isolate the unique relationships between overgeneral memory and psychopathology while controlling for known covariates and for baseline levels of outcome variables.

In contrast to patterns of findings for individuals who engaged in higher levels of rumination, for the subgroup reporting stable lower levels of rumination, neither proportions of overgeneral nor specific memories were significantly related to increases in symptoms of anxiety or depression. These findings are consistent with those reported by Crane et al. (2015); despite adopting a different methodology from our own to elicit memories, these researchers found no significant longitudinal associations between overgeneral memory and depression across two time points in a large community

adolescent sample. Collectively, therefore, findings suggest that community samples do not yield significant relationships between memory overgenerality (whether conceptualized as higher overgenerality or low specificity) and psychopathology.

One might argue that generation of overgeneral memories is not indicative of risk within community samples. Research investigating diverse research questions relating to autobiographical memory in non-clinical samples finds that, despite being asked to retrieve specific memories, invariably some participants recall general memories (e.g., Wang and Conway 2004). Memories of repeated experiences are comparable to specific memories when rated by participants for their biographical importance and personal significance (e.g., Peterson et al. 2016), and, when used to develop relationships with others, relate to psychological well-being to a similar extent as unique memories (Waters 2014). Despite a number of differences amongst these various studies in mode of memory retrieval and task instructions, the findings, in combination with our own, suggest that retrieval of non-specific memories in non-clinical samples, even when asked to retrieve specific experiences, is not necessarily a harbinger of poor psychological outcomes.

Particularly interesting was our finding that the mean proportions and variances in overgeneral memories did not significantly differ between our lower and higher rumination subgroups despite their different relationships with psychopathology. Our data suggest that the functions and implications of overgeneral memories vary according to the level of rumination experienced by the young person. For the low rumination group, the prospective association between overgeneral memories to negative cue words and reductions in anxiety approached significance. This finding is consistent with theory and research suggesting that retrieval of overgeneral memories can help an individual avoid the emotions aroused by specific distressing memories (Ganly et al. 2016; Hermans et al. 2008; Raes et al. 2003; Williams et al. 2007). Over time, however, this pattern, if repeated, may become inflexible and counterproductive (Hermans et al. 2008). Individuals engaging in higher levels of rumination may be particularly vulnerable to this kind of emotion regulation strategy, as rumination is also associated with avoidant behaviors and cognitions (Lyubomirsky et al. 2015; Moulds et al. 2007). For the higher ruminators, therefore, recalling overgeneral memories may contribute to a cycle of attempted avoidance, which maintains and exacerbates poor psychological functioning over time (Hermans et al. 2008). Consistent with this notion are findings by Raes et al. (2005) that overgeneral memory mediated the association between rumination and impaired problem solving in depressed women.

The positive link between overgeneral memory and anxiety for high ruminators was found only across the first time lag. This finding is inconsistent with our expectation that associations would emerge early and be perpetuated as risk for psychopathology increases. One possible explanation may be that time-varying factors not measured in our study interacted with rumination and overgeneral memory to predict anxiety. For example, recent findings have identified stress as central to the association between overgeneral memory and psychopathology in youth (Hamlat et al. 2015; Stange et al. 2013). Hamlat et al. (2015) found that stress and rumination in interaction moderated the association between overgeneral memory and depression in a community youth sample. As we did not assess stress, we could not test this hypothesis.

Consistent with our prediction, significant relationships between overgeneral memory and anxiety were found for participants' responses to negative rather than positive cues. Although research provides evidence for a uni-dimensional AMT factor structure (Griffith et al. 2009; Heron et al. 2012), mixed findings regarding cue valence effects have been reported in past studies with youth (e.g., Hipwell et al. 2011; Kuyken and Dalgleish 2011; Rawal and Rice 2012; see Heron et al. 2012). Kuyken and Dalgleish (2011) theorise that, in adults, valence effects may be less common because they have developed a global avoidance style relating to both positive and negative autobiographical memories. In young adolescents who report lower levels of psychopathology, as in the current sample, avoidant responding may still be restricted to negative memories. As rumination leads to depression over time, overgenerality to both negative and positive cues may become evident.

How might these findings advance theory and clinical practice? From a theoretical perspective, our findings that overgeneral memory predicted increases in anxiety only for the medium/high rumination group is broadly consistent with the CaR-FA-X model, which proposes that rumination and overgeneral memory may interact over time to contribute to and maintain psychopathology (Williams et al. 2007). Our findings highlight: 1) the importance of anxiety as an outcome in a sample of young people, and 2) that overgeneral memory retrieval per se may not be indicative of poor psychological outcomes in community youth but rather represent a marker for adverse outcomes in interaction with other maladaptive cognitive vulnerabilities. Particularly relevant for clinical contexts, the current findings identify rumination as critical to understanding associations between overgeneral memory and psychopathology in youth (see also Hamlat et al. 2015). Indeed, our findings support past research findings demonstrating that rumination exacerbates the effects of other cognitive vulnerabilities on psychopathology (Ciesla and Roberts 2007). Collectively, these findings underscore the importance of targeting rumination in clinical interventions with youth as with adults (e.g., Nolen-Hoeksema and Watkins 2011).

In addition to the lack of a measure of stress, a limitation of our study is that students who only completed the first data collection wave reported significantly higher levels of rumination at Time 1 than youth who remained in the study for all

three time points. Although it raises the issue of lack of generalizability, this difference yielded a very small effect size, and the current study's low drop-out rate and large sample size buffer against possible effects of such a bias. Further, although gender was included as a covariate, we did not analyze potential gender differences. Including gender as an additional multigroup factor in models would have substantially increased the Šidák significance threshold adjustment, compromising chances of detecting significant differences in associations of primary interest. Finally, our sample was relatively homogenous with respect to ethnicity; given the impact of cultural factors on autobiographical memory, this fact also limits the generalizability of our findings (Hipwell et al. 2011; Wang and Conway 2004).

In conclusion, our findings suggest that overgeneral memory plays a role, albeit a relatively weak one, in fostering poor psychological functioning in community youth who have, by early adolescence, established relatively elevated and increasing levels of the psychopathology risk factor of rumination. In contrast, well-functioning youth may opt for an overgeneral memory retrieval style from time to time to regulate and cope with occasional difficult emotional experiences without adverse consequences.

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Compliance with Ethical Standards

Conflict of Interest The authors 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 a parent or guardian of all individual participants included in the study.

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