Valence-related impairments in the retrieval of specific autobiographical memories amongst patients with schizophrenia

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Abstract

Objectives

People with schizophrenia have difficulty recalling specific autobiographical events from their past. However, the nature of this difficulty (e.g., whether these problems are only for memories that are negative or positive) and the mechanisms associated with it remain poorly understood.

Methods

The present investigation asked patients with schizophrenia (n = 91) and healthy controls (n = 109) to recall memories related to several positive and negative cue words. Participants also completed self-report measures of rumination and depressive symptoms and a measure of verbal fluency to assess executive functioning. Participants' memories were coded for specificity (whether or not they referred to a specific event lasting less than 24 hours) and valence (positive vs. negative).

Results

Patients recalled fewer specific memories than controls and they showed particular difficulty recalling specific negative memories cued by negative words. For healthy controls, impoverished verbal fluency was associated with recall of fewer specific memories and particularly recall of fewer positive specific memories. These variables were unrelated to specificity amongst patients. Rumination was not associated with specificity in either group.

Conclusions

These findings are discussed with reference to other possible mechanisms that might contribute towards reduced specificity in schizophrenia, such as the tendency to avoid negative affect, and the implications of this for interventions for schizophrenia and memory specificity problems.

Practitioners points

- The experience of schizophrenia is associated with problems recalling specific events from one's past.
- In particular, patients have difficulty recalling specific negative memories from their past.
- These memory problems are independent of executive functioning difficulties, ruminative tendencies and also depression symptoms.
- Interventions for memory problems in schizophrenia must target the difficulty people have in recalling specific negative events.

Introduction

Schizophrenia is characterised by several impairments in autobiographical memory which contribute towards the positive and negative dimensions of the disorder (Berna et al., 2016; Ricarte, Ros, Latorre, & Watkins, 2017). One of these impairments, reduced autobiographical memory specificity (rAMS), refers to the difficulty people with schizophrenia have in retrieving memories of specific events (Berna et al., 2016). For example, when asked to recall a memory of an event related to *confidence* a person with schizophrenia might recall general events that happened over an extended period (e.g., 'when I was in school') whereas someone with no experience of schizophrenia might recall a specific event (e.g., 'I delivered a presentation and I had prepared well'). Meta-analyses suggest that schizophrenia patients have substantially worse memory specificity than healthy controls (Berna et al., 2016). However, despite the burden that such impairments have on the quality of life and social and economic functioning of people with schizophrenia (Fioravanti, Bianchi, & Cinti, 2012; Green, 1996; Green, Kern, Braff, & Mintz, 2000; Heinrichs & Zakzanis, 1998) the nature of these problems within schizophrenia and their underlying mechanisms remain poorly understood.

Individual differences in AMS are typically measured using the Autobiographical Memory Test (AMT) where participants are asked to recall memories in response to positive and negative cue words (Williams & Broadbent, 1986). Psychometric studies with healthy participants conclude that rAMS is best quantified as the number or proportion of memories that refer to a single event lasting less than 24 hours (Griffith et al., 2009, 2012; Heron et al., 2012; Takano, Mori, Nishiguchi, Moriya, & Raes, 2017). However, patients with schizophrenia have shown particular difficulty recalling specific memories in response to negative cues (e.g., *ashamed*, *guilty*) compared to healthy controls (Neumann, Blairy, Lecompte, & Philippot, 2007; Potheegadoo, Cuervo-Lombard, Berna, & Danion, 2012).

Similarly impoverished recall of negatively-cued episodic memories amongst patients has also been reported in other paradigms (Peters, Hauschildt, Moritz, & Jelinek, 2013). While two AMT studies have failed to replicate these effects (Kaney, Bowen-Jones, & Bentall, 1999; Wood, Brewin, & McLeod, 2006) most studies have not reported any analysis of it (Bennouna-Greene et al., 2012; Berna et al., 2011; Cuervo-Lombard et al., 2007; D'Argembeau, Raffard, & Van der Linden, 2008; Danion et al., 2005; Mehl, Rief, Mink, Lüllmann, & Lincoln, 2010; Potheegadoo, Berna, Cuervo-Lombard, & Danion, 2013; Potheegadoo, Cordier, Berna, & Danion, 2014; Raffard et al., 2009; Ricarte, Hernández, Latorre, Danion, & Berna, 2014; Riutort, Cuervo, Danion, Peretti, & Salamé, 2003; Vorontsova, Garety, & Freeman, 2013). Further clarification of these possible valence-specific effects are therefore warranted.

Any such effect may be because negatively valenced cues evoke an emotion that a person might otherwise seek to avoid (Williams et al., 2007). Although it is reasonable to assume that patients may have difficulty retrieving specific memories in response to negative cues because these cues are likely to evoke retrieval of negative memories, for some people, cues of any valence might evoke negative memories. For example, the word *confidence* might evoke memories of events where one lacked confidence. As such, it is important to not only consider the effects of cue valence on retrieval but also the extent to which participants have difficulty retrieving specific memories of particular valences. Indeed, participants with and without depression tend to recall more positive than negative specific memories (Young, Bellgowan, Bodurka, & Drevets, 2014), and yet depressed participants recall even fewer specific positive memories than healthy participants (Young, Bellgowan, Bodurka, & Drevets, 2015, 2013; Young et al., 2014), In a similar study amongst participants with schizophrenia, recall of fewer positive specific memories and more negative specific memories was associated with increased risk of a depressive episode a year later (Iqbal,

Birchwood, Hemsley, Jackson, & Morris, 2004). However, there has not yet been an investigation of whether participants with schizophrenia show problems recalling negative or positive specific memories compared with healthy participants.

It is also important to consider other mechanisms associated with the retrieval of specific autobiographical memories such as individual differences in executive functioning and rumination (Sumner, 2012; Williams et al., 2007). Whilst early evidence and predominant theories suggested that elevated rumination – or repetitively thinking in an unconstructive and abstract manner (e.g., why me?) – was associated with reduced specificity (Williams et al., 2007), a recent study in patients with schizophrenia (N=31) failed to replicate this association (Ricarte et al., 2014), Similarly mixed findings have been found in examinations of executive functioning amongst patients with schizophrenia. In these studies, investigations with small samples have shown no evidence of a significant correlation (N = 32; r and p values not reported; D'Argembeau et al., 2008) however, studies with larger samples have shown evidence of a trend-level correlation ($r(60) = .23$, $p = .07$; Vorontsova et al., 2013). It therefore remains possible that an association between these mechanisms and specificity might be found in studies with larger samples (e.g., greater than $N = 60$) and also when other known covariates are taken into account.

In particular, one might account for individual differences in depressive symptoms. The only study to examine differences in specific memories of positive and negative valence in patients with schizophrenia found that the experience of a depressive episode moderated these effects (Iqbal et al., 2004). Also, attempts to improve specificity amongst patients with schizophrenia have been associated with improvements depressive symptoms (Ricarte, Hernández-Viadel, Latorre, & Ros, 2012). Again, however, studies with patients with schizophrenia ($N = 31$; Ricarte et al., 2014) have failed to find any association between self-reported depressive symptoms and rAMS. Further clarification of this association in studies

with larger samples, and where the effects of other covariates are accounted for, are therefore warranted.

The present investigation therefore provides the most highly powered investigation to-date of the nature of specificity impairments in patients with schizophrenia. We examined whether specificity is impaired for patients (n = 91) compared to controls (n = 109), and if this impairment was worse for cues and memories of a particular valence. We expected that patients would recall fewer specific memories overall and following negative cues than positive cues and that they would also recall fewer negative specific memories than positive specific memories. We also examined whether these effects were independent of self-reported depression symptoms and rumination and executive functioning. Executive functioning was measured in terms of verbal fluency or the ability to generate nouns beginning with a given letter (e.g., words beginning with *N*) or category. This ability draws upon a range of executive processes related to the initiatiation and maintainenance of a search of semantic memory whilst maintaining the test instructions and the retrieved words in working memory and inhibiting inappropriate responses (e.g., words with other letters). Previous investigations that examined the contribution of self-reported rumination and verbal fluency to specificity in participants with and without a history of depression, found that both variables predicted unique variance in specificity (Sumner et al., 2014). We expected to replicate these predictive effects amongst patients with schizophrenia.

Methods

Participants

Patients (n = 91; M_{age} = 43.9; SD_{age} = 9.9; *Females* = 45.2%) were recruited from the University Hospital Complex associated with the second and third author, after diagnosis from their current psychiatrist/psychologist as having schizophrenia. Participants with neurological damage or disability, recent changes in medication or a history of epilepsy or

alcohol or substance abuse were excluded. All patients were receiving long-term antipsychotic medication. Control participants were recruited through local advertisements placed around the community near to the aforementioned hospital complex (n = 109; M_{age} = 37.3; SD_{age} = 10.2; *Females* = 47.7%). The study was approved by the appropriate ethical committee.

Measures

Autobiographical Memory Test (AMT)

The AMT was used as a measure of memory specificity (Williams & Broadbent, 1986). The test contained five positive and five negative cue words (happy, sad, safe, evil, interested, awkward, successful, emotionally hurt, surprised and lonely). Participants were given 60 seconds to recall a specific memory for each cue. Verbal responses were transcribed, and memories were scored as specific (unique events that took place within a single day and were more than seven days old) or non-specific and whether they were positive in valence or negative (Brittlebank, Scott, Williams, & Ferrier, 1993; Ricarte et al., 2011; Ricarte, Ros, Serrano, Martínez-Lorca, & Latorre, 2015). Specificity was operationalised as the proportion of specific memories recalled across all cues, and for memories of each valence for each cue type, relative to the total number of responses given.

Verbal fluency

Individual differences in (phonetic and semantic) verbal fluency were assessed by asking participants to generate as many words beginning with the letters *F*, *A* and S, in one minute and also as many animals as possible within the same time (Benton & Hamsher, 1983). Repetitions, proper nouns (e.g., place names) and words of the same origin (e.g., swim and swimming) were considered as errors. The total number of words generated was totalled such that a higher score reflected greater verbal fluency.

Self-report questionnaires

The Beck Depression Inventory Second Version (BDI-II; Beck, Steer, & Brown, 1996; Sanz, Perdigón, & Vázquez, 2003) was used as a self-report measure of depression symptoms. The BDI-II is a 21-item self-report questionnaire where participants report their experience of typical depressive symptoms on scales from 0 to 3. A higher score reflects greater experience of depressive symptoms. A 10-item version of the Ruminative Response Scale (RRS; Hervás, 2008; Treynor, Gonzalez, & Nolen-Hoeksema, 2003) was used to assess one's tendency to cope with depressive moods by ruminating. A higher score reflects greater tendency to ruminate in this way. Both the BDI-II and RRS showed good internal consistency in the current study (Cronbach's alpha, BDI-II: .87; RRS: .73).

Procedure

Control participants attended a test session at the university of the third author while clinical participants were assessed at their clinical settings in coordination with their referring physician. Information about the aims of the study and procedure was provided before obtaining informed consent from participants or legal guardians (if applicable). Measures were completed in the following order: AMT, RRS, verbal fluency and BDI-II. Five clinical participants were excluded from analyses because they dropped out before completing all measures.

Results

Between-group analyses

There was no difference between groups in the proportion of females, $x^2(1) = .12$, $p = .712$. Compared to controls, patients were older (*Mean Diff.* = 6.59, *SE* = 1.42, $t(202) = 4.65$, $p < .001$) and had significantly higher scores on the BDI-II ($M_{patient} = 15.50$; $SD_{patient} = 10.38$; $M_{control} = 9.96$; $SD_{control} = 9.48$; $t(200) = 3.96$, $p < .001$) and RRS ($M_{patient} = 22.22$; $SD_{patient} = 5.32$; $M_{control} = 20.2$; $SD_{control} = 4.78$; $t(201) = 2.70$, $p = .004$) and significantly worse verbal fluency ($M_{patient} = 22.96$; $SD_{patient} = 7.61$; $M_{control} = 30.73$; $SD_{control} = 9.04$; $t(202) = -6.56$, $p <$

.001).

A 2 (Group: Patient vs. Control) x 2 (Cue valence: Positive vs. Negative) x 2 (Memory valence: Positive vs. Negative) mixed ANOVA examined between-group differences in recall of specific memories of different valences for each cue word valence within the AMT (see Table 1 for means and Table 2 for ANOVA results).

There were main effects of group, cue and memory valence, as well as a significant cue valence by memory valence interaction and a group by cue valence by memory valence interaction. The main effect of cue was explained by recall of significantly fewer specific memories following negative cues than positive cues (*Mean Diff.* = -.02, *SE* = .01, *p* = .006, 95% CI [.01, .03]). Similarly, the main effect of valence was explained by recall of significantly fewer specific negative memories than specific positive memories (*Mean Diff.* = -.02, *SE* = .01, *p* = .002, 95% CI [.01, .03]). The interaction between cue and memory valence was explained by recall of significantly more negative memories following negative cues than positive cues (*Mean Diff.* = 19, *SE* = .01, *p* < .001, 95% CI [.18, .21]) and significantly more positive memories following positive cues than negative cues (*Mean Diff.* = .23, *SE* = .01, *p* < .001, 95% CI [.21, .24]).

The main effect of group was explained by recall of significantly more specific memories amongst controls relative to patients (*Mean Diff.* = .03, *SE* = .01, *p* = .001, 95% CI [.01, .04]). Subsequent pairwise comparisons explored the significant three-way group by cue valence by memory valence interaction. Both groups showed evidence of cue-memory congruence effects such that they recalled more negative specific memories for negative cues than positive cues (Control: *Mean Diff.* = .22, *SE* = .01, *p* < .001, 95% CI [.19, .25], Patient: *Mean Diff.* = .17, *SE* = .01, *p* < .001, 95% CI [.14, .20]) and more positive memories for positive cues than negative cues (Control: *Mean Diff.* = .25, *SE* = .01, *p* < .001, 95% CI [.23, .28], Patient: *Mean Diff.* = .20, *SE* = .01, *p* < .001, 95% CI [.17, .23]). However, relative to

patients, controls recalled significantly more positive specific memories following positive cues (*Mean Diff.* = .05, *SE* = .02, *p* = .004, 95% CI [.02, .09]) and negative specific memories following negative cues (*Mean Diff.* = .05, *SE* = .02, *p* = .008, 95% CI [.01, .09]). There was also a trend for recall of fewer negative specific memories in response to positive cues amongst patients relative to controls (*Mean Diff.* = .004, *SE* = .002, *p* = .065, 95% CI [.00, .08]). There was no group difference in recall of positive specific memories following negative cues (*Mean Diff.* = .00, *SE* = .00, *p* = .864, 95% CI [-.01, .01]).

Regression analyses

We first conducted correlations on a sample-wide level to examine the relation between each of the independent and dependent variables (see Table 3 for correlation matrix). Neither BDI-II nor RRS scores correlated significantly with the proportion of specific memories recalled overall or for each cue and memory valence type. Higher verbal fluency scores were associated with recall of a greater proportion of specific memories recalled and a greater proportion of positive specific memories for positive cues and negative memories for negative cues. Older age was also associated with worse verbal fluency and recall of few specific memories.

Regression analyses then examined whether the significant group effect on overall specificity and the group differences in positive specific memories recalled from positive cues and negative specific memories recalled from negative cues were explained by group differences in depressive symptoms, rumination and verbal fluency. As such, the regressions included group as a predictor, as well as self-reported depressive symptoms, trait rumination, verbal fluency and the interaction between group and each of these variables. Age was included too given the group difference in age and the correlation with verbal fluency and specificity (see Table 4).

The first regression predicted the overall proportion of specific memories recalled.

Only verbal fluency and its interaction with group predicted significant amounts of variance in recall. This model explained 11% of the variance in specificity, $F(9, 187) = 2.54$, $p = .009$. The verbal fluency and group interaction was explained by a significant positive correlation between the proportion of specific memories recalled and verbal fluency abilities amongst control participants, $r = .23$, $p = .017$, but not patients, $r = -.11$, $p = .299$.

Subsequent regression analyses examined whether similar effects were evident when predicting individual differences in recall of positive specific memories from positive cues and negative specific memories from negative cues. As Table 4 shows, only in the regression predicting the proportion of specific positive memories recalled following positive cue words was there evidence of a significant relation between independent variables and the dependent variable. In particular, verbal fluency and its interaction with group explained significant amounts of variance in specificity. Again, this effect was explained by a significant positive correlation between verbal fluency and the proportion of specific memories recalled amongst control participants, $r = .21$, $p = .031$, but not patients, $r = -.09$, $p = .403$. Also, in the regression predicting positive specific memories recalled for positive cues, individual differences in BDI-II scores explained a significant amount of variance in specificity and the interaction between group and BDI-II scores explained a trend-level amount of variance. Interestingly, there was a trend-level *positive* correlation between total BDI-II scores and specificity for controls, $r = .19$, $p = .052$, but not patients, $r = -.04$, $p = .731$.

Discussion

We investigated the nature of problems in the recall of specific memories amongst patients with schizophrenia compared with healthy controls and whether these problems differed between cues and memories of positive and negative valence. We also explored the contribution of other known correlates of specificity (e.g., rumination, executive functioning) to these effects.

Participants had greater difficulty recalling negative specific memories than positive specific memories, and had greater difficulty recalling specific memories cued by negative cues than positive cues. Also, participants tended to recall more specific memories that had the same valence as the word that cued them than memories of the opposite valence. This congruence between cue and memory valences is in line with other evidence with healthy (Johnstone Ganly, 2017) and depressed participants (Nelis, Debeer, Holmes, & Raes, 2013; Young, Erickson, & Drevets, 2012.) Although our data suggest that patients with schizophrenia show similar valence congruence effects, the three-way interaction between memory and cue valence and group also suggests that patients had particular difficulty, compared to controls, recalling negative specific memories in response to negative cues and positive specific memories in response to positive cues whereas all participants had recalled similar proportions of specific memories whose valence was incongruent to the cue that preceded them.

As expected, across participants, and amongst control participants, greater recall of specific memories was associated with greater recall of specific memories. This finding adds to existing evidence suggesting that the aspects of executive functioning (e.g., working memory and inhibitory control) that the verbal fluency task taps into are associated with specificity (Sumner, 2012). The absence of any such association amongst patients, however, adds further support to the findings of previous studies with patients which have also shown non-significant (D'Argembeau et al., 2008) or trend-level (Vorontsova et al., 2013) associations between these variables. The contrast between patients and controls and the finding that this was particularly the case for positive specific memories recalled for positive cues and not negative specific memories recalled for negative cues also suggests that different mechanisms may contribute towards the recall of specific memories between different groups of people and depending on the valence of the memory and its cue.

It may be that most people have difficulty recalling negative specific memories related to negative cues due to avoidance of negative affect evoked by the cues and their associated memories (Williams et al., 2007). For patients with schizophrenia, similar avoidance might also explain their problem in recalling positive specific memories for positive cues, if for them positive cues evoke negative thoughts. Dalgleish et al. (2008) suggested avoidance of negative affect may be particularly prominent amongst people who have been exposed to trauma who are trying to avoid the negative affect associated with their traumatic past. Indeed, people who have been exposed to trauma show particularly poor specificity compared with non-trauma-exposed controls (Barry, Lenaert, Hermans, Raes, & Griffith, 2018; Ono, Devilly, & Shum, 2015). Patients with schizophrenia are likely to have experienced early traumas (Bebbington et al., 2014; Shevlin et al., 2007) as well as later traumas associated with hospitalisation (Harrison & Fowler, 2004). Avoidance tendencies might therefore be a better predictor of specificity problems in patients with schizophrenia than other mechanisms such as executive functioning.

The data presented here also suggest that there is no relation between self-reported trait rumination and AMS. This finding aligns with a recent meta-analysis from studies with healthy participants and other clinical groups (Chiu et al., 2018). Chiu et al. (2018) concluded that although there was no evidence of an association between these variables, it may be that state increases in rumination could nonetheless compromise AMS. No study has yet examined this directly by inducing ruminative states in schizophrenia patients and healthy controls to examine the differential effects of this on specificity.

Our findings also suggest that depressive symptoms do not contribute towards reduced specificity amongst patients with schizophrenia or healthy controls. Although there was some evidence that individual differences in depressive symptoms were associated with specificity amongst healthy controls, this correlation was small and failed to reach

significance. This finding is perhaps to be expected given that it aligns with those of other studies with healthy participants (Barry, Takano, Boddez, & Raes, 2018; Raes, Hermans, Williams, & Eelen, 2007; Smets, Griffith, Wessel, Walschaerts, & Raes, 2013; Takano, Gutenbrunner, Martens, Salmon, & Raes, 2018). Previous studies have also reported trend-level positive correlations between BDI-II scores and specificity (Barry, Takano, et al., 2018). Given the cross-sectional nature of this study, it remains possible that rAMS might predict changes in depressive symptoms over time, especially amongst patients, as has been found elsewhere (Iqbal et al., 2004). Nevertheless, our findings suggest that depressive symptoms do not have as strong a relation with specificity as might have been previously suggested (Williams et al., 2007), particularly in patients with schizophrenia with whom their may be other factors contributing to rAMS.

Our findings have implications for interventions for specificity problems. First, our data suggest that executive functioning training (Schweizer, Grahn, Hampshire, Mobbs, & Dalgleish, 2013; Schweizer, Hampshire, & Dalgleish, 2011) would be unlikely to improve specificity amongst patients with schizophrenia even if such interventions might be helpful for healthy controls. Also, given that patients had particular difficulty recalling negative specific memories related to negative cues than positive specific memories related to positive cues, interventions such as Memory Specificity Training (MeST; Raes, Williams, & Hermans, 2009; Ricarte et al., 2012) must give particular focus to helping people deal with the emotion evoked by negative cues and in trying to extract specific memories related to these cues. Future research could examine these possibilities by testing these interventions and other possible variants in order to test the validity of our findings within a more causal framework than the correlational case-control design used here.

In summary, we provide the most in-depth examination of specificity problems in people with schizophrenia. Our findings suggest that patients have broad difficulty recalling

specific memories but that they have particular problems recalling negative specific memories cued by negative words. Our analysis also suggested that although problems with executive functioning might explain the difficulty that some people experience with recalling specific memories, for patients with schizophrenia other mechanisms are likely to explain their difficulties.

Table 1.

	Cue valence				
	Negative		Positive		
	Memory valence				
	Negative	Positive	Negative	Positive	Total
Patients	.169(.121)	.004(.021)	.000(.000)	.202(.135)	.385(.209)
Controls	.222(.153)	.004(.020)	.000(.014)	.256(.129)	.491(.234)

Note. Means (and standard deviations) for the proportion of specific memories recalled for each group and for each cue and memory valence, as well as overall specificity scores.

Table 2.

	Specificity (1, 198)		
	F	*P*	*Eta*^{2}
Cue valence	7.86	.006	.04
Memory valence	10.06	.002	.05
By cue valence	697.74	< .001	.78
Group	12.21	.001	.06
By cue valence	.05	.828	.00
By memory valence	.02	.879	.00
By cue valence	10.75	.001	.05

Note. Results of a 2 (Group: Patient vs. Control) x 2 (Cue valence: Positive vs. Negative) x 2 (Memory valence: Positive vs. Negative) mixed ANOVA.

Table 3.

	Age	BDI total	RRS total	Verbal fluency
BDI total	.07			
RRS total	.01	.29***		
Verbal fluency	-.28***	-.21**	.01	
Prop. spec	-.17*	-.01	-.04	.18*
Prop. spec - -	-.18*	-.06	-.07	.12$^{\#}$
Prop. spec + +	-.14*	.02	.02	.15*

Note. Correlation matrix for self-report depressive symptoms measured using the Beck Depression Inventory version II (BDI-II), ruminative tendencies measured using the Ruminative Response Scale (RRS), verbal fluency scores and also the proportion of specific memories recalled in the Autobiographical Memory Test (sProp. spec). The correlations for the number of specific positive memories for positive cues (++) and specific negative memories for negative cues (--) are also given. *$p < .05$; $^{\#}p = .08$.

Table 4.

	Prop spec.		Prop spec. - -		Prop spec. + +	
	b	*SE*	*b*	*SE*	*b*	*SE*
Age	-.004	.005	-.003	.003	-.001	.003
BDI	.009	.005	.003	.003	.007	.003*
RRS	.001	.011	.002	.007	-.001	.006
Verbal fluency	.014	.006*	.005	.004	.008	.004*
Group	.152	.234	.077	.146	.096	.138
by age	.002	.003	.001	.002	-.000	-.000
by BDI	-.005	.003	-.002	.002	-.004	-.004[#]
by RRS	-.001	.007	-.002	.004	.002	.002
by verbal fluency	-.009	.004*	-.003	.003	-.005	-.005*
	R^2 = .11, p = .009		R^2 = .09, p = .044		R^2 = .09, p = .036	

Note. Results from three linear regressions predicting individual differences in the proportion of specific memories recalled overall (Prop. spec) as well as the proportion of specific positive memories recalled for positive cues (++) and specific negative memories for negative cues (--). *p < .05; [#]p = .054; BDI: Beck Depression Inventory Version II; RRS: Ruminative Response Scale.

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