



## Involuntary and voluntary autobiographical memory specificity as a function of depression

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### ABSTRACT

**Background and objectives:** This study tests the hypothesis derived from the CaR-FA-X model (Capture and Rumination, Functional Avoidance and Executive Function model, Williams et al., 2007), that depressed individuals will be less specific during voluntary than involuntary autobiographical memory retrieval and looks at the relative contributions of rumination, avoidance and executive function to memory specificity.

**Methods:** Twenty depressed and twenty never depressed individuals completed a memory diary, recording 10 involuntary and 10 voluntary autobiographical memories. Psychiatric status (assessed with the Structured Clinical Interview for DSM-IV, SCID-1), psychopathology, rumination, avoidance and executive function were assessed prior to completion of the memory diary.

**Results:** Both groups were more specific during involuntary than voluntary memory retrieval. No overall group differences were identified. However, when non-remitted depressed participants were compared to partially remitted and never depressed participants the expected interaction was identified; non-remitted depressed individuals were less specific during voluntary, but not during involuntary recall. Consistent with theory, negative correlations between memory specificity, rumination and avoidance were also present.

**Limitations:** The study presents an important yet preliminary finding which warrants further replication with a larger sample size.

**Conclusions:** The findings provide support for a number of models of autobiographical memory retrieval in particular the CaR-FA-X model of memory specificity.

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Williams et al. developed the Capture and Rumination, Functional Avoidance and Executive function model (CaR-FA-X, Williams et al., 2007) based on research suggesting that changes in cognitive mechanisms such as rumination, avoidance and executive function during depression contribute to the finding that depressed individuals retrieve significantly fewer specific autobiographical memories than never depressed individuals (Williams et al., 2007). One important prediction of the model is that these mechanisms will lead to greater reductions in memory specificity during depression when memories are retrieved voluntarily (i.e. following a schema-based search) than when they are retrieved involuntarily (i.e. when they come to mind spontaneously). To date no studies have directly compared the specificity of involuntary and voluntary memories in depressed and never depressed groups. This study uses a well established methodology developed in autobiographical

memory studies of the general population to investigate the relationship between the mode in which memories are retrieved and memory specificity during depression. A secondary aim is to assess the relationship between memory specificity and rumination, avoidance and executive function during both involuntary and voluntary memory retrieval.

Current autobiographical memory frameworks share the view that two modes of memory retrieval operate on the same episodic memory system. Voluntary or generative memory retrieval involves a schema-based search during which the mechanisms of activation and inhibition act to retrieve contextually appropriate memories. Conversely, involuntary or direct memory retrieval occurs spontaneously, when situational cues map onto episodic events from the past (Berntsen, 2009, 2010; Conway & Pleydell-Pearce, 2000). Due to the abstract nature of schema-based information, voluntary memory recall favours the retrieval of general events consistent with schematized knowledge, whereas the unique associative link between current situation and past event during involuntary memory recall favours the retrieval of specific

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episodic memories. Evidence for this comes from studies which compare involuntary and voluntary memory retrieval in the general population. Such studies have shown that involuntary memories are more specific than voluntary memories, have more mood impact and generate stronger emotional and physical reactions, whereas voluntary memories are more frequently rehearsed, more central to individuals' life stories and contain less sensory-perceptual information (Berntsen, 1998; Berntsen & Hall, 2004; Johannessen & Berntsen, 2010; Schlagman & Kvavilashvili, 2008).

Depressed individuals also retrieve memories both involuntarily (Kvavilashvili & Schlagman, 2011; see Williams & Moulds, 2011 for a review) and voluntarily (Williams et al., 2007). Depressed individuals are found to be less specific than never depressed individuals during voluntary memory retrieval and it has been suggested that this occurs when the strategic memory search is stopped prematurely in depressed individuals (Conway & Pleydell-Pearce, 2000; Williams et al., 2007). The most comprehensive theoretical exposition of this is the CaR-FA-X model (Williams et al., 2007).

The CaR-FA-X model (Williams et al., 2007) states that reduced memory specificity is likely to occur during voluntary memory retrieval due to a complex interplay between capture and rumination (CaR), functional avoidance (FA) and execution function (X). *Functional avoidance* occurs when depressed individuals avoid the retrieval of specific memories due to the associated emotional content (Conway & Pleydell-Pearce, 2000). The continual avoidance of such specific episodic information then leads to the development of elaborated self-knowledge at the general or abstract level (Hermans, Defranc, Raes, Williams, & Eelen, 2005). Consequently, when presented with a cue during a voluntary autobiographical memory task, the attention of depressed individuals is likely to be *captured* to the extent that the cue taps into the depressed individual's highly elaborate self-schema. Capture at this abstract level may then trigger *rumination* which will further enhance access to abstract and generic self-knowledge (Watkins, 2008; Watkins & Teasdale, 2001). Finally, due to impairments in executive function (Dalgleish et al., 2007), depressed individuals may experience difficulties in inhibiting the habitual processing of this abstract self-knowledge thus further preventing the retrieval of specific episodic events.

The model outlined above suggests that reliance on schema-based information and the increased call upon executive resources during voluntary memory retrieval maximizes the conditions under which reduced memory specificity will occur in depressed individuals. Conversely, due to the reduced need for executive resources and emphasis on sensory-perceptual information, it is predicted that involuntary memory retrieval will minimize reduced memory specificity in depressed individuals. The CaR-FA-X model (Williams et al., 2007) therefore predicts an interaction in memory specificity between mode of memory retrieval and depression.

Based on studies of autobiographical memory retrieval in the general population (Berntsen & Hall, 2004) it can be hypothesized that both depressed and never depressed individuals will be less specific during voluntary than involuntary memory retrieval. Based on the predictions of the CaR-FA-X model (Williams et al., 2007), differences in depressive status will interact with this effect such that depressed individuals will show greater reductions in memory specificity during voluntary than involuntary memory retrieval relative to never depressed individuals because of impaired executive functioning, higher levels of rumination, and greater avoidance. To test these hypotheses, depressed and never depressed individuals recorded their involuntary and voluntary memories using an established diary methodology (Berntsen & Hall, 2004). Depressive status was assessed using the Structured Clinical

Interview for DSM-IV (SCID-1). Symptoms of depression are known to change over time (Teasdale & Barnard, 1993) and therefore a secondary aim of the study was to examine the hypotheses regarding memory specificity in participants who also met criteria for a diagnosis of major depression at the end of diary study period, relative to participants whose diagnoses of depression remitted, relative to the never depressed group. The CaR-FA-X model (Williams et al., 2007) has provided a comprehensive explanation of the role of rumination, avoidance, and executive function during voluntary memory retrieval. However, little is known about how these mechanisms influence memory specificity during involuntary memory retrieval. Therefore, the third aim of the study was to conduct preliminary investigations into the role of retrieval mode on the relationships between rumination, avoidance, executive function and memory specificity. The CaR-FA-X model predicts an association between impairments in executive functioning and reduced memory specificity during voluntary, but not during involuntary, autobiographical memory retrieval. No further predictions have been made. To explore these relationships, levels of rumination, avoidance and executive function were recorded prior to completion of the memory diary.

## 1. Method

### 1.1. Design

A mixed design compared memory specificity during involuntary and voluntary memory retrieval (within-groups factor) in depressed and never depressed individuals (between-groups factor).

### 1.2. Participants

Forty participants took part, 29 females, 72.5%;  $M_{\text{age}} = 20.55$ ,  $SD = 3.50$ . Participants were recruited at the University of Exeter and reimbursed for their time with a £29 (\$47) gift voucher. Participants who scored  $>19$  on the BDI and met criteria for a current major depressive episode were included in the depressed group ( $n = 20$ ). The never depressed group ( $n = 20$ ) consisted of individuals with a BDI score  $<13$  who had never met criteria for an episode of major depression. Detailed information about the sample, recruitment and characteristics not relevant to the current hypotheses is given elsewhere (Watson, Berntsen, Kuyken, & Watkins, in press). No significant between-group differences in terms of age, or gender were identified. Table 1 presents the demographic and diagnostic characteristics for each group. The study was approved by the ethics review board in the Department of Psychology at the University of Exeter.

### 1.3. Measures

#### 1.3.1. Structured clinical interview for the DSM-IV axis 1 disorders (SCID-I, First, Spitzer, Gibbon, & Williams, 1995)

To assess the presence of current and lifetime DSM-IV Axis 1 disorders the SCID-I was administered by a post-doctoral researcher with SCID-1 training and extensive experience using the SCID-1 in clinical research settings. To ensure accuracy, differential diagnoses were discussed in group supervision facilitated by an experienced clinician with  $>500$  h of SCID experience

#### 1.3.2. Beck depression inventory – second edition (Beck, Steer, & Brown, 1996)

The BDI-II was used to assess the presence and severity of depressive symptoms in the past two weeks. The BDI-II possesses high internal consistency ( $\alpha = 0.91$ ) and excellent validity

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