Overgeneral autobiographical memory and depression.

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Introductory chapter: Thesis Overview

Overgeneral autobiographical memory (OGM), a term used interchangeably with reduced autobiographical memory specificity (AMS), refers to the finding that certain groups of people are more overgeneral (and less specific) in their retrieval of autobiographical memories than others (Williams et al., 2007; Williams & Broadbent, 1986). In particular, those with (or at high risk of) depression are thought to be more overgeneral compared to those who have never been depressed. This phenomenon has attracted much attention in the literature specifically since OGM status has been shown to predict the onset and course of depression (Mackinger, Pachinger, Leibetseder, & Fartacek, 2000), highlighting it as a marker of vulnerability rather than a mere symptom of depression itself (Brittlebank et al., 1993; Raes et al., 2006).

Over recent years there has been increased interest from those exploring the potential clinical benefits to manipulating OGM with researchers evaluating the extent to which new and existing treatment interventions can be used to improve memory specificity and what (if any) effect this has on depression (Raes, Williams, & Hermans, 2009; Watkins, 2015, Watkins, 2013). Chapter one of this thesis provides a review of the literature exploring a) the extent to which OGM/AMS can be modified and b) the effect this has on current depression in adults. The review discusses results from a range of interventions used to improve AMS across a variety of clinical and non-clinical depressed samples, including memory specificity training programmes, life review therapy, concreteness training and interventions based on cognitive behavioural principles. Although the majority of studies provide some support for the efficacy of memory interventions in the treatment of depression, it is unclear where the active component of therapeutic change lies since

several of the studies using a control group reported similar improvements across both treatment and control conditions.

Despite this emergence of studies exploring the clinical implications of OGM, the cognitive mechanisms underlying the phenomenon are still unclear (Sumner, 2012). Better understanding of the construct would certainly help in the development of treatment interventions designed to improve AMS. One model currently dominating the field suggests that OGM is underpinned by three components, namely: (1) Capture and Rumination (CaR), (2) Functional avoidance (FA) and (3) Executive control (X), i.e. the CaR-Fa-X model (Williams et al., 2007; Williams, 2006). This model has only been tested once in its entirety and the study yielded some inconsistent findings which the authors postulated may have been due to methodological issues (Sumner et al., 2014). Chapter 2 of this thesis describes an empirical study designed to build on the work of Sumner et al. (2014) by addressing the methodological limitations of the study, providing a rigorous test of the CaR-FA-X model in a non-clinical population.

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Chapter 1: Literature Review

What impact do interventions specifically designed to increase Autobiographical Memory Specificity have on depression? A systematic review.

Abstract

Introduction: A large body of research has demonstrated an association between autobiographical memory specificity (AMS) and depression. Although in its early stages several studies have attempted to manipulate memory specificity in order to reduce symptoms of depression. **Objectives:** to systematically review studies that have examined the effect of AMS interventions on depression in adults. **Methods:** Five electronic databases were systematically searched between August and September 2015. Studies were considered eligible if they used quantitative methodology and reported data for pre/post measures of depression and AMS. Additionally, the psychological intervention had to be specific in targeting change in memory specificity. **Results:** Fifteen studies were included in the review covering a range of interventions designed to target AMS. These included memory specificity training programmes, life review therapy, concreteness training and interventions based on cognitive behavioural principles. Overall, thirteen of the studies provided evidence to support the use of their interventions for the treatment of AMS and depression, though several also reported similar improvements in their control group. **Conclusions:** The results suggest that AMS can be improved over a short duration through a variety of different interventions designed to target AMS. Whilst these findings may have some clinical significance, larger, better quality studies are required before any firm conclusions can be drawn regarding their validity.

Keywords: Systematic Review, autobiographical memory specificity, overgeneral memory, depression

Introduction

Depression is a highly pervasive mental health condition and the leading cause of disability worldwide (World Health Organisation (WHO; 2004). It is estimated that by 2030 depression will rank top of the list of disorders with the highest burden of disease (Mathers & Loncar, 2006) with significant socioeconomic implications (Thomas & Morris, 2010; Olchanski et al., 2013).

Traditionally, depression has proven difficult to treat since only a portion of those suffering with the condition present to services; of those who do, 25% are misdiagnosed (Barbui & Tansella, 2006). Current treatment options for depression include antidepressant medications (ADM) and/or psychotherapeutic interventions, such as cognitive behavioural therapy (CBT) or interpersonal therapy (IPT) (National Institute for Health and Care Excellence; NICE; 2009a; 2009b). Although both types of intervention are thought to be equally efficacious in the treatment of depression, psychotherapeutic interventions are generally shown to be more cost effective long-term, more acceptable to patients, and have higher rates of compliance compared to pharmacological treatments (Dobson et al., 2008).

Yet despite the increased popularity of both ADM and psychotherapy and the growing evidence base reporting their efficacy for the treatment of depression (see Barth et al., 2013 for a review) recovery rates, particularly in the long-term are relatively poor (Steinert, Hofmann, Kruse, & Leichsenring, 2014). Only 50% of those who complete an intervention for depression (whether that be ADM, psychotherapy, or the two combined) recover, and of those a further 50% go on to relapse within two years (Dobson et al., 2008; Vittengl, Clark, Dunn, & Jarrett, 2007). Furthermore, the probability of future episodes of depression increases by approximately 18% with each relapse-recurrence highlighting significant scope for improvement (Mueller et al., 1999; Solomon, 2000).

Addressing these issues has led to a greater focus on investigating the risk factors associated with relapse (Vittengl et al., 2007) in particular the cognitive markers of depression thought to remain stable even during remission (Dalgleish et al., 2014).

Overgeneral autobiographical memory and depression

A large body of research spanning two decades has consistently demonstrated an association between autobiographical memory specificity (AMS) and depression (Williams et al., 2007). More precisely, when compared with non-depressed controls, participants who are currently depressed are significantly more likely to recall overgeneral (and non-specific) personal/episodic memories in response to emotionally toned cue words (see Sumner, 2012; Williams et al., 2007 for reviews and Van Vreeswijk & De Wilde, 2004 for meta analysis). For example, for the cue word 'enjoy' a specific personal memory refers to an event lasting no longer than a day ('I enjoyed Jane's party last Friday night') whereas an overgeneral memory (OGM) would refer to either a group of related events ('our holidays to France every year') or an extended period of time ('the Summer of 1976').

The phenomenon was first documented by Williams and Broadbent (1986) who noted significantly higher levels of OGM in a group of suicidal patients compared to non-suicidal controls. Memory specificity was measured using the Autobiographical Memory Test (AMT) which involves participants being presented with a number of emotionally toned cue words (such as 'happy', 'safe', 'hurt', 'lonely') and being asked to produce a specific personal memory in relation to that word. Participants are given an allotted amount of time to respond (usually either 30 or 60 seconds) and their responses are scored in relation to specificity. The measure is now widely used in empirical literature as a measure for AMS (Van Vreeswijk & De Wilde, 2004; Williams & Broadbent, 1986).

Since then, OGM (or reduced AMS) has been consistently observed in both clinical and non-clinical samples and is now considered to be a stable cognitive marker of depression (Sumner, Griffith, & Mineka, 2010; Sumner, 2012; Williams et al., 2007) with higher levels of OGM being positively correlated with symptom severity (Anderson, Goddard, & Powell, 2010). Interestingly, Autobiographical Memory (AM) status has been found to remain stable even during remission; that is, those recovered from a depressive episode continue to demonstrate higher levels of OGM compared to never-depressed controls (Mackinger, Pachinger, Leibetseder, & Fartacek, 2000; Spinhoven et al., 2006). This finding suggests that OGM is a marker of vulnerability to depression rather than a symptom of depression itself (Brittlebank, Scott, Williams, & Ferrier, 1993). Further evidence for this was demonstrated in a recent meta-analysis of longitudinal studies which found that AM status can successfully predict the onset and course of depression prospectively (Sumner et al., 2010).

Interventions to improve memory specificity

Although the underlying mechanisms involved in OGM are still being explored (Sumner, 2012; Sumner et al., 2014) the strong association between OGM and depression has attracted much attention from those considering the clinical implications of the phenomenon (Watkins, 2015).

In contrast to earlier theories (Williams, 1996) studies now suggest that although AM retrieval style is a well-entrenched aspect of cognition, it can be modified. Williams et al. (2000) reported a significant decrease in OGM in a group of formally depressed people who were exposed to an eight-week programme of Mindfulness Based Cognitive Therapy (MBCT) when compared to a treatment as usual (TAU) group. The programme involved training participants in techniques thought to increase specificity by being present-focussed and more aware of their moment-by-moment experiences. This study was followed by Au Yeung et al. (2006) who subjected healthy volunteers to

one of three mood induction groups (happy, neutral and sad). After receiving the mood induction, participants in the 'sad' group were significantly more overgeneral on the AMT compared to either of the other two groups suggesting that, not only can AM be manipulated, but it may be easier to manipulate than previously thought.

Since the theoretical framework underpinning the OGM literature suggests that an improvement in AMS will lead to a reduction in depressive symptoms and increased protection from relapse (Watkins, Baeyens, & Read, 2009) these findings present a significant opportunity for the development of therapeutic interventions specifically designed to target OGM (Watkins, 2015). More specifically, any therapeutic benefit derived from enhancing memory specificity could provide an attractive alternative, or adjunct to current evidence-based treatments particularly in those who do not respond to other treatments or are prone to relapse (Dalgleish et al., 2014). Furthermore, as OGM is a risk factor for depression those highlighted as vulnerable could benefit from low-level brief interventions designed to target memory specificity as a first line treatment.

Although in its early stages several intervention studies have been carried out investigating the extent to which pre-existing and novel interventions can modify autobiographical memory specificity (AMS) and, in turn, reduce depression (Watkins, 2013).

Aims and Objectives

The aim is to systematically review studies that have examined the effect of AMS interventions on depression in adults and provide a narrative discussion of the results.

Method

Scoping searches of the literature formed the basis of the protocol developed to guide the review (see Appendix A for review protocol). Searches and initial screening tasks were carried out by a single researcher with additional support from a second researcher when reviewing full text articles and during the quality assessment process.

Inclusion criteria

Studies were considered relevant if they used quantitative methodology and reported pre/post data for both measures of depression and measures of AMS/OGM. Additionally, the psychological intervention had to be specific in targeting change in AMS/OGM. Studies with and without control/comparison groups were included. Studies were limited to currently depressed adults (18years+) with no upper-age limit.

Exclusion criteria

Studies using child or adolescent samples were excluded. Studies with clinical samples currently in remission from depression were also not considered to be relevant since the focus of this review was to evaluate the impact of improving memory specificity on current mood.

Identification of studies

Five electronic databases were searched (MEDLINE, PsycINFO, PsycARTICLES, Scopus and Web of Science) and references exported to Endnote. Searches were conducted between August and September 2015 (see Appendix B for full search procedure).

Two categories of search terms were used cross-referencing terms for memory with depression ("overgeneral memor*" OR "overgeneral autobiographical memor* OR "autobiographical memor* specificity" OR "memor* specificity" OR "autobiographical memor* retrieval") AND (depress*). Search terms were required to appear in either the title, abstract or keywords. Searches were not restricted by date, language or document type.

Checks were made on ClinicalTrials.gov in order to identify any relevant ongoing research trials and references of key papers included in the review were hand searched for relevant studies that may have been missed during the electronic searches.

Once duplicates had been removed abstracts were screened and studies were removed if they did not meet the inclusion criteria. Full text papers were accessed when it was unclear from the abstract whether the study met the inclusion criteria. Queries related to inclusion were discussed with a second researcher to ensure accuracy.

Quality assessment strategy

Studies included in the review were assessed using the 'Quality assessment tool for studies with diverse designs' (QATSDD; Sirriyeh, Lawton, Gardner, & Armitage, 2012) a tool designed specifically for use with methodologically diverse research articles within a similar body of literature. The QATSDD has also been deemed a reliable and valid tool for use by health service researchers in the disciplines of psychology, sociology and nursing (Sirriyeh et al., 2012) making it a suitable choice for the current review.

Studies are scored on a four-point scale across 14 different areas (for quantitative studies) including research design, data collection and analysis, with a maximum score of 42 available. Studies can be scored both individually and amalgamated to produce a percentage score rating the overall quality of a particular body of evidence.

Results

Quantity of research available

The search process consisted of three stages. During the first stage electronic databases yielded 1398 citations with a further 2 being obtained through manual searches of the reference lists. After removing duplicates (K = 928), 472 abstracts were screened resulting in a further 424 citations being excluded (stage two of the search process). Full text articles were obtained for all remaining citations (N = 48) which were retrieved through the University of Liverpool's electronic library system (N = 46) and the interlibrary loans service (N = 2; see figure 1 for overview of search strategy).

Authors of non-English language papers (Spanish, Portuguese and Farsi) were contacted via email when the (English) abstract seemed relevant to the review question. Although authors responded they were unable to provide an English translation. Further attempts to translate articles using online software failed (due to interpretation difficulties) and so the studies were excluded (N = 4).

During the third part of the search process full text articles were reviewed in line with the inclusion criteria, 18 papers were removed due to having an inappropriate design or intervention and 12 were excluded based on their sample population. Bibliographic details and reasons for exclusion were recorded for all studies removed at this stage of screening (see Appendix C). The remaining 14 studies were selected for inclusion in the review along with a relevant article published after the initial search process.

One potentially relevant research trial was identified through ClinicalTrials.gov, though recruitment for the study was ongoing and was unlikely to be completed in time for inclusion in this review.

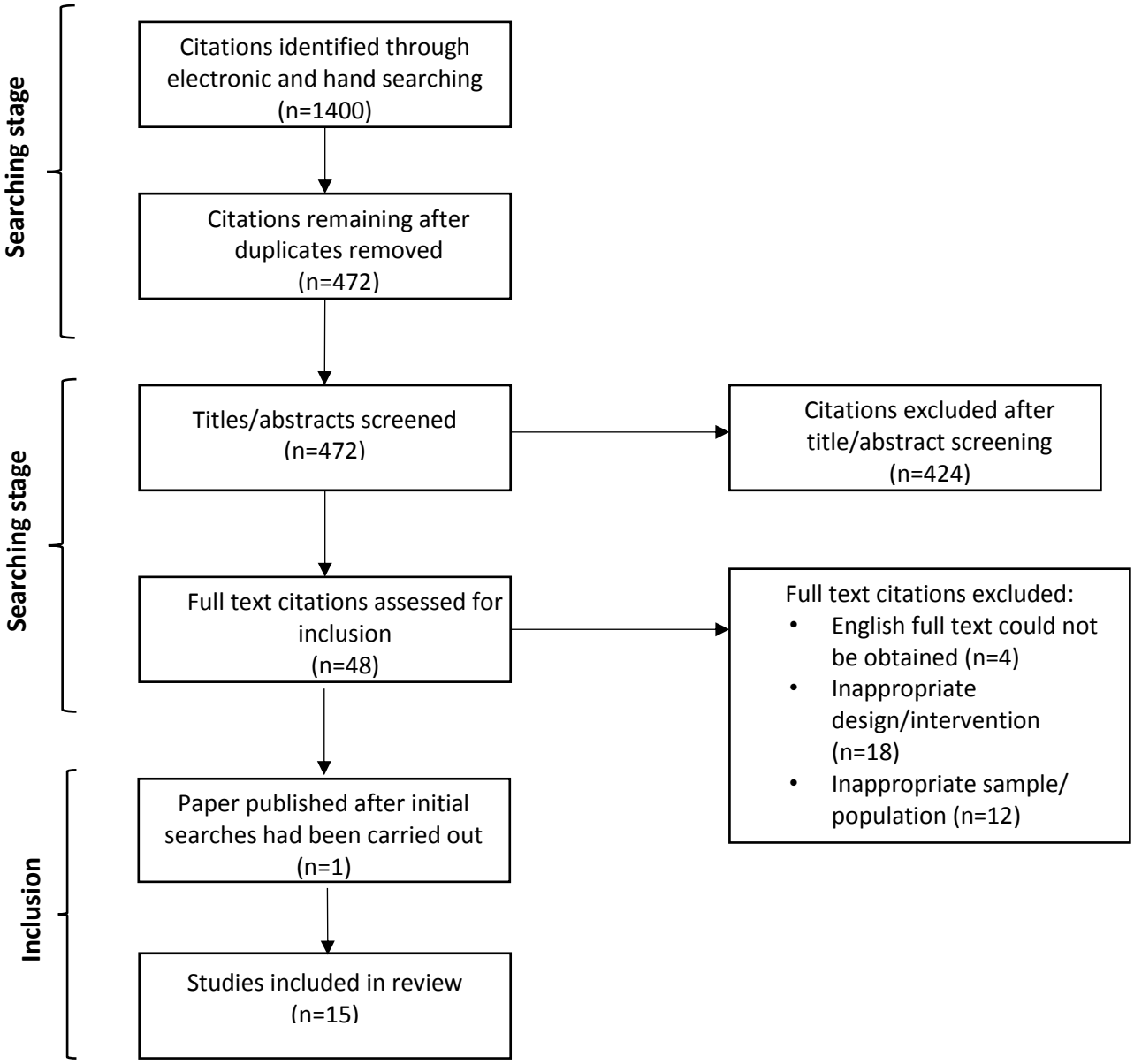

Figure 1. Identification of studies included in the systematic review

Study characteristics

Study characteristics are presented in Table 1. Studies were published between 2000 and 2015 with sample sizes ranging between 10 and 50 participants. Studies were carried out by researchers in nine different countries including Australia, Belgium, Canada, Iraq, The Netherlands, Portugal,

Romania, Spain and the United Kingdom. Four of the fifteen studies were either pilot or feasibility studies.

Ten of the studies were randomised controlled trials (RCT; Crane, Winder, Hargus, Amarasinghe, & Barnhofer, 2012; Goncalves & Albuquerque, 2009; McBride, Segal, Kennedy, & Gemar, 2007; Mogoaşe, Brăilean, & David, 2013; Moradi et al., 2014; Ramírez, Ortega, Chamorro, & Colmenero, 2014; Ricarte, Hernández-Viadel, Latorre, & Ros, 2012; Serrano, Latorre, Gatz, & Montanes, 2004; Watkins, Teasdale, & Williams, 2000; Serrano et al., 2012) and one non-randomised controlled trial (Blairy et al., 2008). Four used a repeated measures design (Eigenhuis, Seldenrijk, van Schaik, Raes, & van Oppen, 2015; Raes, Williams, & Hermans, 2009; Sutherland & Bryant, 2007; Watkins & Teasdale, 2001).

Although all participants were experiencing clinically significant levels of depression (in line with the inclusion criteria), a variety of clinical and non-clinical settings were demonstrated including inpatient (Blairy et al., 2008; Raes et al., 2009; Ricarte et al., 2012), outpatient (Eigenhuis et al., 2015; McBride et al., 2007; Moradi et al., 2014; Sutherland & Bryant, 2007) and community settings (Crane et al., 2012; Watkins et al., 2000; Watkins & Teasdale, 2001). Four studies used an older adult population (Goncalves, Albuquerque, 2009; Ramírez et al., 2014; Serrano et al., 2012, 2004) and one recruited a student sample (Mogoaşe et al., 2013).

Several clinical interventions were tested in an attempt to modify AMS. Three studies investigated the efficacy of Life Review Therapy (LRT) in enhancing AMS compared to controls (Goncalves, Albuquerque, 2009; Serrano et al., 2012, 2004). A fourth study combined aspects of LRT and positive psychology in a program called MAPEG (Ramírez et al., 2014).

Three studies directly targeted specificity through Memory Specificity Training (MEST; Moradi et al., 2014; Eigenhuis et al., 2015; Raes et al., 2009).

A variety of cognitive-based interventions were investigated including CBT (McBride et al., 2007; Sutherland & Bryant, 2007), a Memory Training program derived from CBT principles (Ricarte et al., 2012), MBCT (Crane et al., 2012) and Cognitive Remediation Therapy (CRT; Blairy et al., 2008). Two further studies focused on rumination, distraction and self-focus (Watkins et al., 2000; Watkins & Teasdale, 2001) whilst Mogoaşe et al. (2013) used a Concreteness Training (CNT) program to improve specificity.

Table 1. Study Characteristics

Authors	Year	Design	Country	Sample/population	Study *N*	Intervention	Quality rating (42)
Blairy et al.	2008	Non-RCT	Belgium	Inpatients with Schizophrenia & depression	27	Cognitive Remediation Therapy Vs control	16
Crane et al.	2012	RCT	United Kingdom	Community with MDD	27	MBCT Vs waitlist control	32
Eigenhuis et al.	2015	Repeated measures (pilot)	The Netherlands	Depressed outpatients	26	Memory Specificity Training	30
Goncalves et al.	2009	RCT	Portugal	Depressed older adult women	22	Life review therapy Vs control	15
McBride et al.	2007	RCT	Canada	Outpatients MDD	42	Cognitive behavioural therapy Vs Pharmacological treatment	23
Mogoase et al.	2013	RCT (pilot)	Romania	Dysphoric undergraduates	42	Concreteness Training Vs waitlist control	33
Moradi et al.	2014	RCT (pilot)	Iraq	Veterans with PTSD & depression	24	Memory specificity training Vs control	32
Raes et al.	2009	Repeated measures (pilot)	United Kingdom	Depressed female inpatients	10	Memory specificity training	23
Ramirez et al.	2014	RCT	Spain	Dysphoric older adults	46	MAPEG program Vs active control	26
Ricarte et al.	2012	RCT	Spain	Inpatient and outpatients with Schizophrenia & depression	50	Cognitive-based Memory training Vs active control	32
Serrano et al.	2012	RCT	Spain	Depressed older adult outpatients	37	Life review therapy Vs active control	32
Serrano et al.	2004	RCT	Spain	Dysphoric older adults	43	Life review therapy Vs TAU	29
Sutherland et al.	2007	Repeated measures	Australia	PTSD outpatients with depression	20	Cognitive behavioural therapy	20
Watkins et al.	2001	Repeated measures	United Kingdom	Depressed volunteers	36	Rumination Vs Distraction Vs high/low self-focus	19
Watkins et al.	2000	RCT	United Kingdom	Dysphoric/depressed volunteers	48	Rumination Vs distraction	18

Quality assessment of included studies

Overall, the methodological quality of included studies was moderate with quality assessment scores ranging from 15-33 out of a possible 42 per study (Sirriyeh et al., 2012). The sum quality assessment score across all fifteen papers on the QATSDD was calculated at 60% highlighting significant shortcomings in this area of literature as a whole. Total percentage scores were also calculated for each of the assessment criteria.

Whilst most articles gave a good description of the theoretical framework (total quality score across papers 93%) to support their stated aims and objectives, along with a clear description of the research setting (91%), only one study out of the fifteen reported evidence of a power calculation when considering their sample size (Moradi et al., 2014). Sample biases were evident across all papers (total score 44%) with most studies employing a convenience sampling strategy to recruit participants from institutions or services local to, or affiliated with the authors (Eigenhuis et al., 2015; Mogoaşe et al., 2013; Moradi et al., 2014; Raes et al., 2009; Ramírez et al., 2014; Ricarte et al., 2012; Sutherland & Bryant, 2007). Several papers documented sample biases related to gender (Goncalves & Albuquerque, 2009; Moradi et al., 2014; Raes et al., 2009), age (Raes et al., 2009) and education (Goncalves & Albuquerque, 2009; Serrano et al., 2012, 2004) making them less reflective of their intended target population. Sample sizes across several studies were also very low (Goncalves & Albuquerque, 2009; Raes et al., 2009; Sutherland & Bryant, 2007) though the absence of power calculations make it difficult to ascertain which studies fall short of recruiting the required number of participants. It should also be noted that several of the included articles were pilot or feasibility studies. Whilst sample size calculations are not always appropriate in these studies, pilot samples should still accurately reflect their target population and interpretations of findings should be cautioned unless the study was powered appropriately to assess statistical significance (Arain, Campbell, Cooper, & Lancaster, 2010; Thabane et al., 2010).

Several papers failed to provide adequate detail of their recruitment strategy (total score 69%) or data collection methods (64%) for the study to be replicated (Blairy et al., 2008; Goncalves & Albuquerque, 2009; McBride et al., 2007; Sutherland & Bryant, 2007; Watkins & Teasdale, 2001) and whilst most studies used standardised measures, few provided statistical properties of reliability and validity for all of their chosen measures (total score 60%).

Methods of analysis were mostly appropriate across studies (total score 98%), however few authors justified why their statistical procedure suited their research question (total score 31%). Most notably, only one paper discussed user involvement in the design of their study (total score 4%) and this was only in the context of making changes to their treatment intervention (Eigenhuis et al., 2015).

Overall, the studies included in the review were appropriately designed to address their research question/s (total score 76%) despite there being room for improvement across most. Some studies did not highlight their limitations whilst others failed to critically discuss limitations in view of the interpretability of their results (total score 69%). Table 2 outlines the main findings of included studies (a summary of these findings can also be found in Appendix H).

Author	Year	Intervention	Aims/ research questions	Depress measure	AMS Measure	Main findings
Blairy et al.	2008	Cognitive Remediation Therapy Vs control	Does CRT enhance AMS in Schizophrenia patients? What effect does this have on other related variables?	BDI	AMT	The CRT group were sig. more specific than controls. Depressive scores did not change in either group & no relationship between depression & AMS was found
Crane et al.	2012	MBCT Vs waitlist control	Does MBCT improve goal specificity, achievability & AMS?	BDI-II	AMT	Those who received MBCT were sig. more specific and increased goal specificity
Eigenhuis et al.	2015	Memory Specificity Training	Is MEST feasible in an outpatient mental health setting? Does MEST improve AMS and/or decrease depression?	BDI-II	AMT	AMS increased after MEST, depression reduced after treatment. Improvements were maintained at follow-up
Goncalves et al.	2009	Life review therapy Vs control	Does LR reduce depressive symptoms in depressed older adults?	GDS	AMT	Significant increases in AMS and reductions in depressive symptoms compared to controls
McBride et al.	2007	Cognitive behavioural therapy Vs Pharmacological treatment	What are the effects of CBT versus pharmacological treatment on AMS? Will people who receive CBT be more specific than those who receive medication?	BDI-II	AMT	Both groups were significantly more specific and less depressed after treatment. CBT participants did recall significantly less extended memories to those in PHT.
Mogoase et al.	2013	Concreteness Training Vs waitlist control	Will CNT reduce depressive symptoms & rumination & increase AMS?	BDI-II	AMT	Whilst concreteness did improve, depression & AMS did not
Moradi et al.	2014	Memory specificity training Vs control	Does MEST improve AMS in PTSD patients? Does MEST improve symptoms of PTSD?	BDI-II	AMT	MEST group were more specific compared to controls but there was no change in depression score
Raes et al.	2009	Memory specificity training	Is group-based MEST a feasible intervention? Can specificity be increased in depressed participants? Explore how increased AMS affect other variables	BDI-II & MDQ	AMT & SCEPT	AMS significantly improved from pre- to post-intervention. Significant reductions in rumination & hopelessness were also found post-treatment
Ramirez et al.	2014	MAPEG program Vs active control	Does the MAPEG programme improve psychological wellbeing & life satisfaction by reducing depression	BDI	AMT	MAPEG participants were significantly more specific and less depressed compared with controls. Though improvements were lost at 4-month follow-up.
Ricarte et al.	2012	Memory training Vs active control	How will the memory training programme affect AMS in patients with Schizophrenia? How will this affect depression scores?	BDI	AMT	Participants in the Memory Training group were significantly more specific than controls & depression scores significantly reduced between pre/post-test.
Serrano et al.	2012	Life review therapy Vs active control	What are the effects AM retrieval practice on AMS in older adults with Major depression?	GDS	AMT	Depression scores significantly improved for LRT, though improvements did not differ from active-control group
Serrano et al.	2004	Life review therapy Vs TAU	What are the effects AM retrieval practice on AMS in older adults with depressive symptoms?	CES-D	AMT	LRT participants were significantly more specific and less depressed at post-test compared with controls
Sutherland et al.	2007	Cognitive behavioural therapy	Will CBT reduce OGM in PTSD patients?	BDI-II	AMT	AMS was not significantly increased post-treatment. No relationship between depression & AMS was observed
Watkins et al.	2001	Rumination Vs Distraction Vs high/low self-focus	What affect does analytical thinking and self-focus have on OGM and mood?	BDI	AMT	Low self-focus was sig. associated with increased AMS
Watkins et al.	2000	Rumination Vs Distraction	Do decentring prompts reduce OGM?	BDI	AMT	Participants given decentring were sig. more specific

Table 2. Findings of included studies

Rumination, distraction and self-focus

Watkins et al. (2000, 2001) published two studies exploring the roles of distraction, rumination and decentring in the maintenance of OGM. During the first study (2000) 48 depressed/dysphoric volunteers were randomly allocated to one of four groups: rumination then control, rumination then decentring, distraction then control, and distraction then decentring. The authors hypothesised that those in the distraction groups would show higher AMS post-treatment compared to those in the rumination groups. They predicted that decentring would also be associated with higher levels of AMS compared to controls. Results showed a significant decrease in the number of overgeneral memories (OGM) reported in the pre to post-test scores of those that had received the distraction intervention (F (1, 46) = 8.7, $p < .01$). Furthermore, those exposed to decentring showed a significant reduction in OGM compared to controls (F (1, 43) = 10.48, $p < .003$). Overall, participants across all conditions were less despondent (F (1, 46) = 6.66, $p < 0.015$) and happier (F (1, 46) = 5.77, $p < 0.03$) post-treatment compared to baseline scores, though there were no statistically relevant associations between the decentring condition and improvements in mood. These results suggest that distraction and decentring techniques are effective in increasing AMS compared to rumination, though how these relationships effect depression is unclear.

In their second study, Watkins et al. (2001) further developed this research by exploring the mechanisms within the distraction technique responsible for changes in AMS, specifically self-focus and analytical thinking. Memory specificity was measured before and after four attentional tasks: high analysis-high self-focus (rumination), low analysis-low self-focus (distraction), high analysis-low self-focus and low analysis-high self-focus. In line with previous findings they hypothesised that distraction would be associated with higher levels of specificity when compared to rumination and low self-focus would be associated with greater improvements in mood compared to the high self-focus condition.

Participants were recruited from a community sample of depressed volunteers. Results demonstrated a significant reduction in despondency (F (1, 32) = 5.02, p < .032) and increase in happiness (F (1, 32) = 4.22, p < .048) in the low self-focus groups compared with the high self-focus/analytical groups. The proportion of categoric memories retrieved was also significantly lower in the low self-focus group (t (17) = -4.06, p < .001) compared to the high self-focus group.

These two studies present early attempts to manipulate AMS. Although the results are promising both papers scored poorly during quality assessment and so findings must be interpreted with caution. Most notably, the repeated administration of measures in such a short space of time, particularly the AMT, is likely to have caused some practice effects which may have compromised the validity of findings, yet authors fail to discuss these limitations to their study (Watkins & Teasdale, 2001).

Cognitive Behavioural Interventions

Six studies assessed the impact and effectiveness of CBT-based interventions to improve AMS and depressive symptomology.

Sutherland and Bryant (2007) tested AMS (AMT; Williams & Broadbent, 1986) and depression (BDI-II; Beck, Steer, & Carbin, 1988) in adult outpatients with Post Traumatic Distress Disorder (PTSD; N = 20) before and six months after they received a course of individual CBT (eight, 90-minute sessions). Results yielded no significant changes in memory specificity overall between pre and post-treatment scores, although participants recalled significantly more specific memories for positive cue words compared to negative. In addition, no association between changes in depression scores and memory specificity was observed. The authors acknowledged that the study was not adequately powered which may have contributed to the non-significant findings.

McBride et al. (2007) explored changes in AMS following CBT versus pharmacology (PHT) for major depression. They hypothesised that participants in the CBT group would develop increased specificity compared to those treated with medication. Participants (N = 42) were randomly assigned to each group and measures of AMS (AMT; Williams & Broadbent, 1986) and depression (BDI-II; Beck et al., 1988) were collected pre and post-intervention. In contrast to their hypotheses results highlighted improvements across both groups in pre to post-treatment scores, showing a significant increase in the number of specific memories retrieved (F (1, 39) = 4.38, MSE = 0.28, p < 0.05) and decrease in categoric memories (F (1, 39) = 5.66, MSE = 0.33, p < 0.05). Although there were no significant differences between groups on these measures, the CBT group did produce significantly fewer extended memories compared to the PHT group (F (1, 39) = 4.71, MSE = 0.10, p < 0.05). Similarly, both groups reported significantly fewer depressive symptoms post treatment with no differences between groups, suggesting that both CBT and PHT were equally effective in treating depression. Overall the study scored poorly on quality assessment measures (23/42); the sample was predominantly female (N = 29) and although there was a gap of four months between the collection of pre and post measures, cue words on the AMT were the same at both time points increasing the probability of repetition memory effects. Moreover, the authors did not give any details about how (or who) delivered the CBT programme making it impossible to estimate either the quality of the intervention, or how well confounding variables were managed.

Blairy et al. (2008) looked at the therapeutic efficacy of Cognitive Remediation Therapy (CRT) in a clinical sample of people diagnosed with Schizophrenia. The intervention, based on cognitive behavioural principles involved keeping a diary of personal memories as a way of practicing autobiographical memory retrieval, recording thoughts, feelings and reflecting upon self-definition and future goals. The intervention consisted of nine, 90-minute group sessions delivered by two, trained facilitators. The authors hypothesised that an intervention of CRT would lead to increased AMS which would, in turn, result in improvements across a range of variables including depression. Participants were assigned to either the CRT group (N = 15) or a psychoeducation control group (N =

12). Results indicated that participants in both groups were significantly more specific overall at post-treatment compared to baseline scores (F (1, 25) = 30.86, $p < 0.001$, $\eta^2 = 0.55$) though the CRT group were also significantly more specific at post-treatment when compared to the control group (F (1, 25) = 6.20, $p < 0.02$, $\eta^2 = 0.198$). This suggests that whilst both treatments improved AMS, CRT was significantly more effective than the psychoeducation control. Though both these interventions successfully increased AMS, and changes were maintained at three-month follow-up, no significant associations between AMS and depressive symptomology were observed. Whilst findings from this study seem promising in terms of identifying an intervention to modify AMS (despite the lack of effect on mood) a number of methodological issues are worth noting; sample sizes for both groups were small with all participants being recruited from the same two psychiatric hospitals. It was not clear how participants were selected or recruited to the study highlighting potential selection bias and there was very limited information on how data was collected. None of these issues are discussed by the authors.

In a similar study, Ricarte et al. (2012) used a combination of cognitive-based memory training and Life Review Therapy (LRT) to develop a 10-week long memory training programme designed to improve AMS by coaching participants to keep detailed diaries of personal memories. Using a similar sample to Blairy et al. (2008), participants diagnosed with Schizophrenia were randomly allocated to either the memory training group (N = 24) or an active control group (targeting social skills and occupational therapy) (N = 26). Measures included the written version of the AMT (Williams & Broadbent, 1986) to measure AMS and the BDI to measure AMS and the BDI to measure current depressive symptoms (Beck et al., 1988).

A significant increase in AMS was noted in the Memory Training intervention at post-treatment compared to baseline scores (F (1, 23) = 42.23, $p < .001$, $\eta^2 = .65$) and also when compared to the post-treatment scores of the active control group (F (1, 48) = 8.23, $p < .006$, $\eta^2 = .15$). Depression scores in the memory training group had also significantly decreased at post-testing compared to

pre-testing (F (1, 23) = 16.12, p < .001, η^2 = .41). It should however be noted that due to basal differences in the BDI scores between groups (they were higher for the experimental group than control), this significant reduction in depressive symptoms may reflect regression to the mean since no significant differences in depression scores between groups was found. The overall quality of this study was high relative to other studies within the review. The authors' description of recruitment and data collection procedures is thorough and they document ways in which they attempt to control for bias, such as the use of a random number generator programme for group allocation and in ensuring those who collected data were blind to group conditions. The use of an active control group also adds credence to the findings, however this could have been further benefited by the use of separate clinicians to facilitate each of the two conditions.

A further study carried out by Crane et al. (2012) investigated MBCT on the specificity of life goals. They recruited a community sample of depressed adults who were randomly allocated to an MBCT treatment condition (N = 14) or waitlist control (N = 13). The intervention encouraged a shift towards more concrete styles of thinking in an attempt to weaken reliance on the ruminative and abstract thinking styles associated with the maintenance of depression. Participants completed measures of depression (BDI-II; Beck et al., 1988) and AMS, (AMT; Williams & Broadbent, 1986) and a measure of positive future goals and plans, in line with the research questions. Results showed a significant pre to post-treatment increase in AMS in those who had received MBCT (Mi-j = 1.17, p< .01). Furthermore, post-treatment depression scores were significantly reduced in the MCBT group when compared to the control group (Mi-j = 13.41, SE = 2.93, p < .001). Further analyses indicated that increases in AMS were also significantly correlated with goal specificity for those in the MBCT group (r = (26) = .55, p < .05). Any effect the intervention had on depressive symptoms was not explicitly discussed. Similar to Ricarte et al. (2012) this paper scored well on quality assessment measures with a well-designed and replicable study. However, the small sample size and lack of a control group matched for 'professional contact' may limit the generalisability of findings.

The final study included in this section also builds on Mindfulness-based principles. Mogoase et al. 2013 used concreteness training (CNT) to manipulate AMS. The intervention consisted of a 1.5-2-hour training session, facilitated by the experimenter followed by seven days of 30-minute homework tasks completed by the participant. Homework exercises included guided relaxation, concrete processing tasks, mental imagery and mindfulness. Participants were 42, dysphoric undergraduate students defined by a minimum score of 12 on BDI-II (Beck et al., 1988) randomly allocated to CNT or waitlist control. The analysis provided no statistically significant findings related to AMS or depressive scores. Although 'Concreteness' was found to have significantly increased across the experiment group (t = (19) = 7.62, p <.01, Cohen's d = .46) CNT was not proven effective in increasing specificity or modifying mood. Although this study was also relatively well designed and written, the sample was almost entirely female (N = 40) again limiting the results.

Overall, studies using cognitive-behavioural frameworks to manipulate AMS provided mixed results. Whilst most of the studies tested treatment interventions against a control group, only three used active controls aimed to match therapeutic time (Blairy et al., 2008; McBride et al., 2007; Ricarte et al., 2012) and sample biases were evident across all studies to varying degrees. It should be noted however that three of the papers included in this section received good quality assessment scores relative to others included in the review (Crane et al., 2012; Mogoaşe et al., 2013; Ricarte et al., 2012).

Life Review Interventions

Life review therapy (LRT) consists of weekly sessions conducted in a group setting where a range of pre-defined therapy questions are used to prompt the retrieval of specific autobiographical memories. A number of studies included in the review used this approach to improve AMS and to explore the impact on depression.

Serrano et al. (2004; 2012) published two separate studies evaluating LRT in a depressed, older adult population (mean age 77.1 in the 2004 study and 73.9 in 2012). During the first study they randomised participants with clinically significant depression to either LRT (N = 20) or a control group (N = 23). All participants completed measures of depression (Centre for Epidemiologic Studies Depression Scale; CES-D; Radloff, 1977) and memory specificity (AMT; Williams & Broadbent, 1986), along with measures for other variables relevant to the research questions (life satisfaction and hopelessness). A series of ANOVAs confirmed initial hypotheses that older adults who received LRT were more specific (d = .71) and less depressed at post-treatment (d = -.97) compared with older adults in the control group. A regression analysis also indicated that those who were more specific at post-test showed a bigger reduction in depressive symptoms (β = -.25, p = .06), hopelessness (β = -.29, p = .01) and an increase in life satisfaction (β = .24, p = .03).

In their second study Serrano et al. (2012) used a similar design to randomly assign older adults with major depression to either LRT (n=18) or an active control group (N =19). Participants in the control group received one-to-one weekly sessions with a psychologist for 'supportive therapy'. All participants completed measures of depression (Geriatric Depression Scale; GDS; Yesavage et al., 1983) and memory specificity (AMT; Williams & Boradbent, 1986). Individual growth models demonstrated a significant quadratic effect for AMS ($\chi 2$ (1) = 5.0, p< .0253) with number of specific memories increasing across both treatment groups. These findings were mirrored in depression scores with results indicating a significant linear ($\chi 2$ (1) = 5.9, p< .0151) and quadratic change ($\chi 2$ (1) = 7.8, p< .0052). Group condition was not shown to predict change in either memory specificity or changes in depression suggesting that both the treatment and control interventions were effective in increasing AMS and reducing depressive symptoms.

There are several methodological limitations to consider with these two studies. First, whilst it was the intention of the authors to test LRT in an older adult population the generalisability of results are thus limited to this group. In addition, of the samples included in these studies only 15% of the

control group (and none of the treatment group) were reportedly able to read or write, highlighting considerable bias in the sample. Finally, rates of attrition in the 2012 study were reportedly high with only 17 participants (out of an original 43) across both groups completing the six month follow-up (Serrano et al., 2012).

A third study randomly assigned 22 depressed female older adults to either LRT or control (Goncalves & Albuquerque, 2009). Measures of depression (GDS; Yesavage et al., 1983) memory specificity (AMT; Williams & Broadbent, 1986) and life satisfaction were collected before and after treatment. Results indicated significant increases in AMS in the LRT group when compared to controls (t (20) = 3.46, p<0.05), reporting a large effect size (r = 0.78). Similarly, significant improvement in depressive symptoms were also observed for the LRT group compared to the control group (t (20) = 3.58, p<0.05, r = 0.64).

Although these results appear promising this study had significant limitations achieving the lowest score during quality assessment within this review (15/42). It is possible that the authors simply failed to report the level of detail required to obtain sufficient marks on the QATSDD, however several sample biases were evident in the report, particularly the all-female sample and low educational level of participants which make it difficult to generalise results to a broader older adult population.

More recently, Ramírez et al. (2014) incorporated LRT with elements of positive psychology including gratitude and forgiveness to develop the MAPEG programme; an intervention designed to improve psychological wellbeing and life satisfaction by reducing anxiety and depressive symptomology and increasing AMS (Ramírez et al., 2014). The intervention consisted of nine 1.5 hour, weekly group sessions delivered by a psychologist. Participants completed measures of depression (BDI; Richter, Werner, Heerlein, Kraus, & Sauer, 1998), memory specificity (AMT; Williams & Broadbent, 1986) and other variables relative to the research questions (anxiety, subjective happiness, life satisfaction and cognition) and were randomly allocated to receive either the MAPEG intervention or to an active

'positive psychology' control group. Results showed a significant increase in the pre to post-treatment specificity scores for those who completed the MAPEG programme (F (1,44) = 8.16, p < .0006, η^2 = 0.15), a finding that was not observed in the control group and a significant decrease in depression scores in the intervention group post-treatment relative to the control group (F (1,44) = 4.39, p < .04, η^2 = 0.1). It should be noted however, that the significant changes observed during the post-treatment assessment were no longer evident at the four-month follow-up suggesting benefits of the intervention were not sustained.

Overall, the four studies using LRT to improve AMS and decrease depression yielded positive results in evidencing the efficacy of AM retrieval practice in reducing depressive symptomology. Although they all employed a randomised controlled design, only two studies compared treatment interventions with a control matched for therapy contact and cognitive demand (Ramírez et al., 2014; Serrano et al., 2012). The first of these studies found significant decreases in depression scores for both groups and the second found that any positive differences gained by the intervention group was lost at four-month follow-up. These findings raise questions regarding which aspects of the intervention are attributable for the therapeutic changes observed. Selection biases are also evident across this group of studies with all four using an older adult sample making results less generalizable to broader populations. Within this, three studies identified biases in the educational level of their sample (Goncalves & Albuquerque, 2009; Serrano et al., 2012, 2004) and one study used all-female participants (Goncalves & Albuquerque, 2009).

Memory Specificity Training (MEST)

More recently, attention has turned to the development of interventions designed specifically to target and improve AMS. Memory specificity training was first piloted by Raes et al. (2009) who conducted the first in a series of trials investigating the effectiveness of a group-based MEST

programme (Raes et al., 2009). Using a sample of currently depressed, female inpatients they measured AMS using the AMT (Williams & Broadbent, 1986) and the Sentence Completion for Event from the Past test (SCEPT; Raes, Hermans, Williams, Bijttebier & Eelen, 2008) and measures depressive symptoms using the Major Depression Questionnaire (MDQ; Wang et al., 2009) and the BDI-II (Beck et al., 1988), along with several other variables (rumination, social problem-solving skills, hopelessness and functional avoidance) thought to mediate the relationship between AMS and depression. The primary aim of the study was to evaluate the feasibility of delivering MEST in a group setting whilst also exploring the potential for directly manipulating memory specificity.

Participants completed measures before and after the MEST intervention, which was delivered in four, weekly one-hour sessions. Repeated measure ANOVAs showed that memory specificity significantly increased from pre- to post-intervention on both the AMT, (F (1, 9) = 25.85, p < .001, $\eta p^2 = 0.74$) and the SCEPT (F (1, 9) = 5.99, p < .05) and remained significant on both measures even after controlling for changes in depression scores, which also improved (d = 0.79). Furthermore, they found significant decreases in rumination (F (1, 8) = 8.08, p <0.05) and feelings of hopelessness (F (1, 9) = 8.71, p <0.05), factors thought to play a role in the maintenance of depression (Williams et al., 2007).

Although these results appear promising, the limitations of the study are significant. The sample size was very small (N = 10) and participants were all female. Based on this, the authors cannot generalise findings to males and absence of a control group makes it difficult to ascertain the therapeutic qualities of this particular intervention compared to any other.

A second study investigating MEST recruited Iranian war veterans experiencing PTSD (Moradi et al., 2014). Participants, who were all male, were randomly allocated to MEST (N = 12) or a control group (N = 12). Memory specificity (AMT; Williams & Broadbent, 1986) and depression measures

(BDI-II; Beck et al. 1988) were administered pre- and post-MEST intervention which was delivered in accordance to protocol put forward by Raes et al. (2009). At post-treatment the MEST group were significantly more specific than the control group on both positive (t (22) = 6.75, p<.001, d =2.76) and negative (t (22) = 6.35, p<.001, d =2.60) cue words. These improvements were maintained at three-month follow-up. Further analyses highlighted significant reductions in PTSD symptoms within the MEST group at post-training (t (22) = 11.72, p<.001, d =4.79) and follow-up (t (22) = 11.44, p<.001, d =4.67) compared to controls.

In addition to differences between groups, the MEST group had significantly higher AMS at post-training compared to baseline (t (11) = 9.87, p<.001, d=3.43) and significantly fewer PTSD symptoms (t (11) = 20.55, p<.001, d=6.99), though differences in AMS between post-training and follow-up were not significant. Similar to the study by Raes et al. (2009) findings remained significant when depressive and PTSD symptoms were controlled for.

Despite improvements to AMS, depression scores were not significantly different in either group from pre- to post-training, but did significantly increase between post-training and three-month follow-up.

Overall, this study was well designed and reported, though the single-gendered sample, who had all participated in the same war may limit how well findings could be generalised to broader populations. Whilst the sample size was also small (N = 24) the study did recruit the required number of participants stated in their power calculation. The randomisation process and use of a control group adds credence to changes in AMS being attributable to the MEST intervention, although an active control with a similar level of therapeutic contact or cognitive demand would have been preferable.

A third study that used MEST to improve AMS recruited depressed outpatients (*n*=26) from a clinic in Amsterdam (Eigenhuis et al., 2015). Participants currently on a waiting list to receive psychotherapy were invited to receive the MEST intervention whilst waiting for their preferred treatment. Measures included the BDI-II (Beck et al., 1988) and the AMT (Williams & Broadbent, 1986) which were collected pre and post-treatment. As in the previous studies, delivery of the intervention was based on Raes et al. (2009) protocol. One sample *t*-tests indicated a significant increase in specificity post-treatment compared to pre-treatment scores (t (25) = 3.99, p<.001). A significant decrease in depressive scores was also observed at post-treatment compared to baseline (t (25) = 4.10, p<.001). These improvements were maintained at follow-up.

Once again the nature of a pilot study having a relatively small sample size raises questions about the interpretability of the results, along with the absence of a control group.

Overall, studies using MEST to improve AMS are in the early stages of development. All three of the above studies identified themselves as pilots or feasibility studies giving some justification for the low sample sizes. Two of the studies did not use a control group which makes it difficult to attribute findings to the intervention under review. The third study used a no-treatment control that may also be subject to bias.

Discussion

This systematic review of the literature aimed to examine the effect of interventions designed to target AMS. In particular, the review sought to establish whether AMS status is modifiable and, if so, what implications these changes have on depressive symptomology in adult and older adult populations. Fifteen studies were included in the final review which were discussed in relation to the following four categories: rumination versus distraction studies; CBT-based approaches; interventions based on LRT and MEST programmes.

Overall, thirteen of the studies provided evidence to support the use of their interventions for the treatment of AMS and depression (Blairy et al., 2008; Crane et al., 2012; Eigenhuis et al., 2015; Goncalves & Albuquerque, 2009; McBride et al., 2007; Moradi et al., 2014; Raes et al., 2009; Ramírez et al., 2014; Ricarte et al., 2012; Serrano et al., 2012, 2004; Watkins et al., 2000; Watkins & Teasdale, 2001) and only two studies did not report a change in AMS as a result of their intervention (CBT; Sutherland & Bryant, 2007; CNT; Mogoaşe et al., 2013).

These results suggest that as well as being modifiable within a short duration (Watkins et al., 2000; Watkins & Teasdale, 2001) AMS can be improved through a variety of different interventions (CBT, MBCT, LRT and MEST) that are feasible and cost-effective to deliver and acceptable to patients (Eigenhuis et al., 2015; Moradi et al., 2014).

Although these results sound positive, a number of issues must be noted. First, two studies reported that whilst their intervention successfully increased AMS this did not translate to changes in depression (Blairy et al., 2008; Moradi et al., 2014) and a third study reported a loss of any short-term improvements in depression at the time of follow-up (Ramírez et al., 2014). These findings contradict the theoretical underpinnings of the OGM literature and have significant implications in those attempting to justify the therapeutic value of such interventions being used clinically (Watkins, 2015).

Second, a number of studies who reported both an increase in AMS and a decrease in depression in the pre to post-treatment scores of participants who received their intervention also observed a similar pattern of change in the comparison group, making it difficult to attribute findings to the independent variable (Blairy et al., 2008; McBride et al., 2007; Serrano et al., 2012). These findings also bring into question the validity of results from other studies, who report significant findings to

support AMS interventions in the absence of a control group (Eigenhuis et al., 2015; Raes et al., 2009; Sutherland & Bryant, 2007).

Limitations of included studies

Although this body of literature is in its early stages of development, the overall quality of the studies available was poor (see Table 1 for quality assessment scores for each study). This partly reflects the number of pilot and feasibility studies included in the review which, by their nature used small samples that were often recruited opportunistically resulting in considerable sampling biases.

A number of studies used same-sex samples (Goncalves & Albuquerque, 2009; Moradi et al., 2014; Raes et al., 2009) and others were biased in terms of their samples educational level (Serrano et al., 2012, 2004) and how they were recruited (Moradi et al., 2014; Raes et al., 2009).

Overall, the quality of reporting was poor with many studies failing to document crucial aspects of their recruitment and data collection procedures. Considering a good proportion of the included studies described themselves as a randomised controlled trials (Crane et al., 2012; Goncalves & Albuquerque, 2009; McBride et al., 2007; Ramírez et al., 2014; Ricarte et al., 2012; Serrano et al., 2012, 2004; Watkins et al., 2000), few made reference to how participants were allocated and how researchers were blinded to reduce bias during data collection. Only one study referred to the use of a power calculation (Moradi et al., 2014) and only one study discussed the involvement of service users in the design of their intervention (Eigenhuis et al., 2015), which is poor considering most of these intervention studies were developed for use in clinical populations.

Limitations of the review

Since this review was concerned with depression outcome in relation to AMS interventions, a number of studies were excluded if they failed to measure or analyse changes in depressive symptoms pre and post treatment (Watkins & Teasdale, 2004; Bessell, Watkins, & Williams, 2008). This included studies which used a non-clinical sample or a group who were currently in remission (Heeren, Van Broeck, & Philippot, 2009; Latorre et al., 2015; Maestas & Rude, 2012; Williams et al., 2000). Whilst these studies would not have been able to comment on the effects of AMS interventions on depression, they may have offered greater clarity into the effectiveness of AMS interventions across different samples. Similarly, inclusion of studies using adolescent samples may have also been beneficial in generating an overall picture into the efficacy of AMS interventions across the lifespan (Neshat-Doost et al., 2013).

Although non-English language papers were not removed during the search process, four of the non-English language papers identified during systematic search of the literature had to be excluded due to difficulties in translating the documents. It is thought that two of the four papers excluded may have been relevant to the current review question and although the authors were corresponded with directly, translated transcripts were unavailable.

These restrictions will undoubtedly limit the extent to which this review can comment on both the findings and quality of studies published within this area of the literature. Moreover, since the aim of the review was to provide a systematic search of the literature along with a narrative discussion of the results, there was no official attempt to synthesis results from individual studies via meta-analyses. Given that many of the studies reported here have used the same tools to measure depression (i.e. BDI) and memory specificity (i.e. AMT) an obvious next step may be to explore this.

Clinical Implications

The results of this review have important clinical implications. Although there were inconsistencies in findings across studies and the overall quality of the research is currently poor, thirteen of the fifteen studies identified demonstrated the use of clinical interventions that significantly increased AMS (Blairy et al., 2008; Crane et al., 2012; Eigenhuis et al., 2015; Goncalves & Albuquerque, 2009; McBride et al., 2007; Moradi et al., 2014; Raes et al., 2009; Ramírez et al., 2014; Ricarte et al., 2012; Serrano et al., 2012, 2004; Watkins et al., 2000; Watkins & Teasdale, 2001). Further to this, three studies also observed a decrease in depressive symptoms post-intervention that were not mirrored by controls (Goncalves & Albuquerque, 2009; Ricarte et al., 2012; Serrano et al., 2004).

These findings, coupled with the theoretical basis underpinning the OGM literature (Sumner, 2012; Williams et al., 2007) would suggest that new interventions designed to target memory specificity could derive significant therapeutic benefit in those suffering from depression (Watkins, 2015). The trait-like vulnerability factor associated with OGM during remission makes this type of intervention an attractive alternative for those groups who do not respond to current treatments for depression (Dalgleish et al., 2014; Steinert et al., 2014). Furthermore, since AMS interventions such as the ones discussed in this review are relatively brief and simple to administer, and thus likely to be cost-effective, they could easily be provided as a low-intensity guided self-help treatment which would fit in well with modern day primary care services such as Improving Access to Psychological Therapies (IAPT; Turpin, Clarke, Duffy, & Hope, 2009).

Conclusions

This systematic review presents current empirical literature around interventions designed to improve AMS. The review also considers this evidence in relation to current depression. There now exists a growing body of literature to support the use of various AMS interventions in the treatment

of depression. More specifically there is good evidence to support the notion that AMS is modifiable through various types of brief intervention, though how these changes relate to depression is less clear.

Overall, the literature around such interventions is still in the early stages of development and the quality of studies currently available is poor. Nevertheless, the findings of the current review provide a useful foundation from which to build a more rigorous empirical support. Further research is needed to investigate the efficacy of interventions targeting AMS, since the clinical implications of such approaches are significant and alternatives to current treatments for depression are urgently needed.

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Chapter 2: Empirical Paper

Overgeneral autobiographical memory and depression: An analysis of the Car-Fa-X model.

Article prepared for submission to the *Journal of Behaviour Therapy and Experimental Psychiatry* for peer review. Please see Appendix D for a copy of journal guidelines for authors.

Abstract

Introduction: The past 25 years has seen a growing body of research highlighting an association between overgeneral autobiographical memory (OGM) and psychological dysfunction, in particular depression. One model attempting to explain the OGM phenomenon suggests that a combination of rumination which captures attention (CaR), functional avoidance coping (FA) and poor executive control (X) (i.e. CaR-FA-X model) are associated with OGM and may influence the relation of OGM to depression. **Aims:** the current study aimed to examine the role of the three processes of the CaR-FA-X model in OGM and current depression. **Method:** the sample comprised 87 volunteers from a non-clinical population. Participants completed measures of current depression, perseverative thinking and rumination, functional avoidance, executive control and autobiographical memory specificity. **Results:** OGM, CaR and FA were positively correlated with current depression. Multiple regression analyses indicated that these three variables together predicted 39% of the variation in current depression. Executive control was not significantly associated with depression and no element of the CaR-FA-X model was associated with OGM. **Conclusions:** Findings from this study call into question the validity of OGM as a distinct construct suggesting instead that individual mechanisms of the CaR-FA-X model (specifically CaR and FA) may better explain current depressive symptomology.

Keywords: Overgeneral autobiographical memory, autobiographical memory specificity, depression, CaR-FA-X model

Introduction

Overgeneral Memory (OGM), refers to the phenomena that when depressed individuals are asked to produce a specific autobiographical memory in response to a cue word they are more likely to produce overgeneral memories (i.e. non-specific memories) where as non-depressed individuals were more likely to produce specific memories. This phenomenon was first documented by Williams and Broadbent (1986) who observed significantly higher levels of overgenerality in a group of suicide attempters compared to controls. These authors developed a task to assess OGM the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986). Participants would be asked to recall a specific episodic, personal memory in response to positively and negatively valenced words. Specific memories were defined as an event that occurred at a particular time and place and lasted no longer than a day (for example, if given the word 'enjoy' a specific memory would be 'I enjoyed Jane's Halloween party last year'). Overgeneral memories were defined as either extended; a memory which spanned a period of time greater than a day ('my first year at university') or categoric; a collection or summary of related memories ('going to my uncle's Christmas party every year').

Since this initial study the relationship between OGM and emotional disorders has attracted much attention and there now exists a large body of empirical research spanning 20 years to support the finding across numerous populations (see Van Vreeswijk & De Wilde, 2004 for meta analysis and Williams et al., 2007; Sumner, 2012 for reviews). Although the strongest association for the OGM phenomenon has been found in depression (Williams et al., 2007) a similar relationship has also been observed in people with post-traumatic stress disorder (PTSD) and other conditions where trauma is thought to play a role such as Schizophrenia, borderline personality disorder and eating disorders (for a review see Moore & Zoellner, 2007).

Moreover, increased OGM has been found to be not only a feature or symptom of current depression but a potential diathesis or trait-like vulnerability underlying the development and onset of depression; that is, OGM appears to be independent of current depression status (Brittlebank et al., 1993). Several longitudinal studies have shown that higher levels of OGM in those who are not depressed (or are currently in remission) can predict the onset and/or recurrence of depression (Kleim & Ehlers, 2008; Sumner, Griffith, Mineka, et al., 2011). Moreover, baseline OGM status has also been shown to predict the severity and course of depression at follow-up (Sumner, Griffith, & Mineka, 2010; Sumner, Griffith, Mineka, et al., 2011; Van Daele, Griffith, Van den Bergh, & Hermans, 2014).

The CaR-FA-X Model

Although the literature demonstrating an association between OGM and depression is strong, the specific underlying mechanisms involved in the development and maintenance of this cognitive phenomenon remains unclear. Conway and Pleydell-Pearce's (2000) self-memory system (see Figure 1) suggests that retrieval of a specific episodic memory in response to a cue word ('happy') requires a top-down approach in autobiographical memory whereby a person must initially scan through broader, more conceptual themes ('my time at university') before filtering down to event-specific knowledge ('the day I graduated university with all my friends'). Using this model of autobiographical memory as a basis, and their review of the OGM literature, Williams et al. (2007) proposed a three-component model identifying processes assumed to be related to OGM namely: (1) Capture and Rumination (CaR), (2) Functional avoidance (FA) and (3) Executive control (X), i.e. the CaR-Fa-X model. Here, they postulate that OGM occurs when one (or more) of the three CaR-FA-X

mechanisms interferes with the retrieval of autobiographical memory (Williams et al., 2007; Williams, 2006).

The CaR mechanism suggests that high levels of rumination disrupts the retrieval process during its early stages preventing an individual from filtering down past the broader themed memories to event-specific information. Cue words that are more self-relevant to the individual (i.e. 'failure') are thought to evoke stronger emotional responses ('I always fail at everything') which distracts (or captures) the person before they are able to find a specific memory, causing them to retrieve an overgeneral memory instead of a specific one (see Figure 1). Over time this process becomes an automatic feature of person's cognitive style (Williams et al., 2007; Williams, 2006).

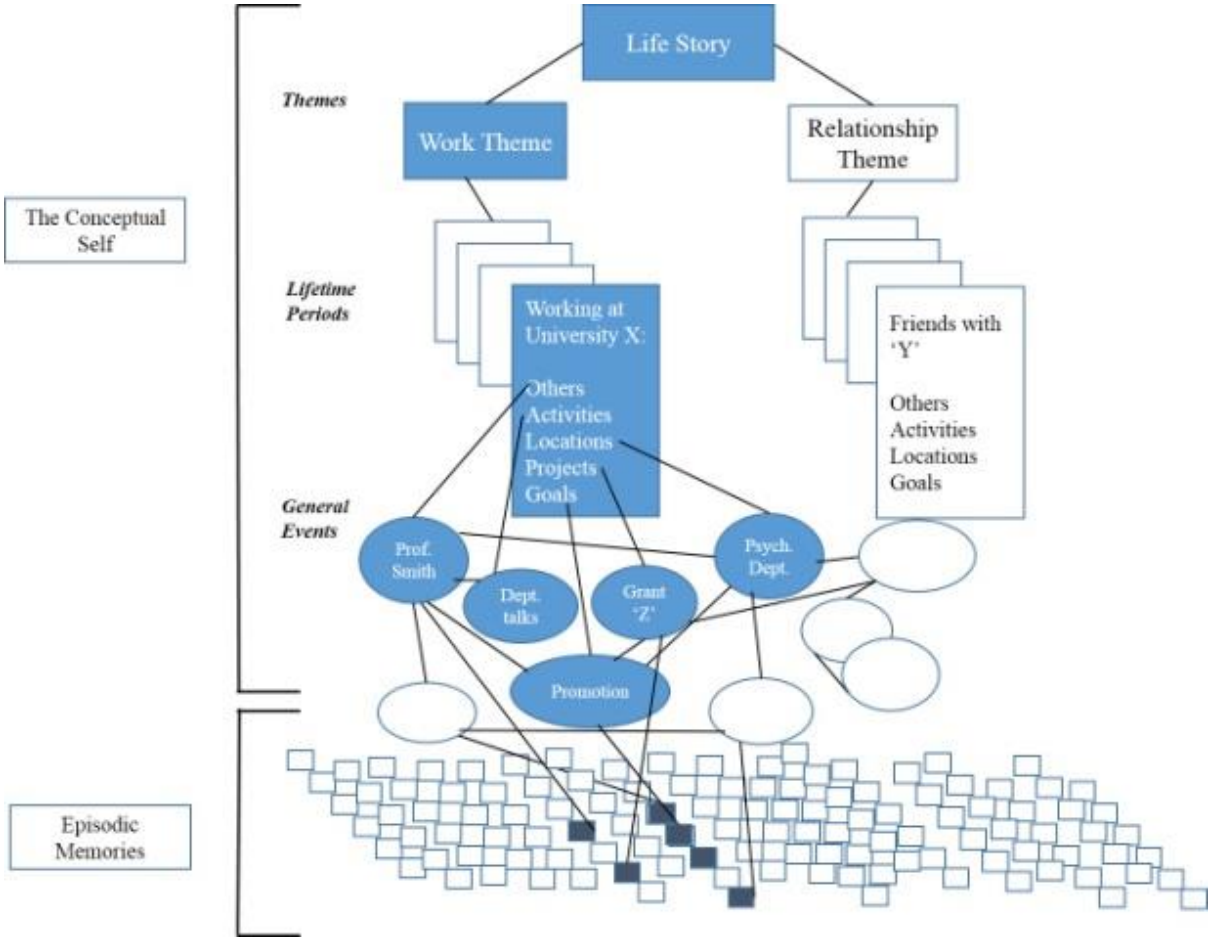

Figure 1. Hierarchy of autobiographical memory representations (Conway, 2005). Reproduced here with permission.

FA encompasses a large body of literature centring around avoidance as a function of regulating negative affect (for reviews see Moore & Zoellner, 2007; Sumner, 2012). People exposed to adversity, particularly in early childhood are thought to develop a more overgeneral retrieval style that serves as an avoidance strategy to the emotional distress experienced from accessing specific memories which may be painful or upsetting (Conway & Pleydell-Pearce, 2000). Over time, the act of repeatedly avoiding specific memories becomes more automatic making them more likely to retrieve overgeneral rather than specific memories (Williams et al., 2007). Although there is good evidence for the role of FA in OGM, there is less support for the notion that a history of *early* trauma is a key component of the functional avoidance mechanism (Sumner et al., 2012).

The third component relates to impaired executive control (X) also thought to play a role in overgeneral memory (Malone, 2013; Williams et al., 2007). According to Conway and Pleydell-Pearce's self-memory system model (2000) generative retrieval (like all effortful cognitive tasks) relies on a degree of executive resource. For instance, working memory is required to hold a search term in mind whilst the person scans through memories, simultaneously evaluating their relevance. Irrelevant cognitive material or memories that do not meet the search criteria (i.e. overgeneral, repetitions, associate) need to be inhibited. Other aspects of executive functioning implicated in overgeneral memory include attention, concentration, initiation and verbal fluency. Several studies have shown that deficits across one or all of these areas can disrupt the memory retrieval process, in particular placing individuals at higher risk of the 'capture' errors discussed above (Sumner, 2012; Williams et al., 2007). Although impaired executive functioning is a feature of depression the relationship between executive control and OGM has been shown to remain stable even after depressed mood is controlled for, suggesting that it is a mechanism of OGM rather than a mere symptom of depression (Dalgleish et al., 2007; Sumner, Griffith, & Mineka, 2011).

Testing the CaR-FA-X model

As indicated OGM and depression has been a major research paradigm for over 20 years with the theoretical basis for the CaR-FA-X model being proposed nearly ten years ago in 2007 (Williams et al., 2007). Since then however, little progress has been made in testing the model as a whole. Despite the wealth of research contributing to the evidence base for OGM most studies to date have only looked at one (or in some cases two) aspects of the model. A recent review of the CaR-FA-X literature recommended more studies that assess all three components together to evaluate their relative contribution in influencing the relationship between OGM and depression (Sumner, 2012). Since then, Sumner et al. (2014) have published the first empirical study attempting to fill this gap in research. Using data from a longitudinal study they examined cross-sectional associations between

OGM and the CaR-FA-X mechanisms using structured equation modelling. The sample consisted of young adults at high risk of developing emotional disorders. Over half of the participants had a history of major depressive disorder (MDD) and the authors investigated each of the CaR-FA-X mechanisms separately for those with and without a history of MDD.

The study found greatest support for the relationship between OGM and the CaR and X mechanisms of the model, that is, lower levels of executive control and higher levels of rumination were significantly associated with OGM. However, the interactions for these findings differed between the two groups. In line with theory those without a reported history of MDD showed greater OGM when rumination (CaR) was high and executive control (X) low. In contrast however those with a history of MDD were more overgeneral when both X and CaR were low meaning impaired executive control was only associated with OGM at low levels of rumination. FA was not significantly associated with OGM in either group. The authors reasoned that these unexpected findings may have been due to them not measuring current depressive symptomology since neither group could be explored in terms of current emotional status or how this may have affected the findings (Sumner et al., 2014). Furthermore, their operationalization of the measures of CaR, FA and X may have lacked validity. For instance, their measure of CaR (The Ruminative Response Scale; RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003) only assessed rumination and not the cognitive capacity demand of this process. Also their assessment of X utilised a generic executive control test (a verbal fluency task) rather than executive processes that might be more related to executive control of emotionally related information (Sumner et al., 2014).

Understanding the mechanisms involved in influencing the relationship between OGM and depression could help inform more specific interventions and in the development of preventative

strategies in those at risk for developing depression. In addition, knowledge about the processes taking place during episodes of depression could help tailor clinical treatments to better meet the needs of depressed patients.

Aims and Hypothesis

The aim of this cross-sectional quantitative study is to address some of the methodological limitations of the Sumner et al. (2014) study, in order to conduct a rigorous test of the CaR-FA-X model.

In line with previous research it was hypothesised that 1) OGM will be positively correlated with current depression, 2) CaR will be positively associated with OGM, 3) FA will be positively associated with OGM and 4) X will be negatively associated with OGM. The main study hypothesis will be to explore 5) the relative contribution of each of the CaR-FA-X mechanisms to OGM and 6) look at CaR-FA-X and OGM in relation to depression.

Method

Participants

A total of 87 adult volunteers aged 18-65 years were recruited to take part in the study between November 2015 and March 2016. The sample comprised staff (N = 30) and students (N = 57) from the University of Liverpool who responded to an electronic advertisement posted on the announcement page of the university intranet. Participants over the age of 18 years and fluent in spoken and written English were considered eligible to take part. All 87 of the participants who completed data collection were included in the final analysis. The sample was predominantly female (83%) with a mean age of 29 (range = 18-65). The majority of the sample identified as White British

(76%) or from another white background (7%), 3% were Chinese, 6% identified as Asian/British Asian, 2% were white/black African/Caribbean, 3% Arab and 3% described themselves as from a different ethnic background.

Materials/measures

The Centre for Epidemiologic Studies Depression Scale -Revised (CESD-R*;* Radloff, 1977)*:* A short (20 items) structured self-report tool designed to measure current depressed symptomatology within a non-clinical sample. Participants are asked to rate aspects of their mood and functioning over 'the past week or so' using a 5-point Likert scale ranging from 'not at all, or less than one day' to 'nearly every day for 2 weeks'. Scores range from 0-60 with higher scores indicating higher levels of depressed mood. Scores above 16 are indicative of subthreshold depression (Radloff, 1977). The CES-D is reported to be a highly reliable measure for use in the general population with studies reporting an average alpha coefficient of .85-.90 (Radloff, 1977; Van Dam & Earleywine, 2011). In the current study internal consistency was calculated at .89.

The Autobiographical Memory Test (AMT) (Williams & Broadbent, 1986): was used as a measure of OGM. The AMT is the most widely used measure of memory specificity in the autobiographical memory literature and has a reported reliability coefficient of .79 (Griffith et al., 2012; Heron et al., 2012). An analysis of the tests psychometric properties have shown the AMT to operate well over a wide range of scores, consistent with the aim of deriving a continuous measure of overgeneral memory (Heron et al., 2012). Participants were presented with 18 cue-words (positive, negative and neutral) and asked to generate a specific personal memory for each. The test was delivered face to face by one researcher. Each response was coded according to one of five categories (specific, extended, categoric, associate, omission; see Appendix E for a list of cue words). Memories were scored as specific if they referred to a personal event lasting less than a day ('the day we got our

dog'); memories which spanned a period greater than a day were scored as extended ('when I travelled in Thailand'); summaries or groups of related events were recorded as categoric ('when I used to take swimming lessons'). Responses that related to personal characteristics or semantic associations rather than personal memories were scored as 'associative' ('dogs tend to be loyal don't they'). In line with the task instructions responses were scored as omissions if they 1) were provided outside of the 30 second time limit, 2) occurred over the past seven days and 3) were repeated more than once. AMT data was audio recorded and a sample was checked by a second researcher to ensure consistency. Interrater reliability was found to be kappa = .810 (95% CI, .710 to .912), p = < .0005), highlighting a substantial level of agreement between scorers (Landis & Koch, 1977).

The Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011) was chosen to measure the CaR mechanism. The PTQ is a 15-item measure scored on a 5-point Likert scale ranging from 'never' to 'almost always'. Scores range from 0-60 with higher scores reflecting higher levels of perseverative thinking. Participants are asked to rate their responses to items relative to 'typical' thinking styles. Questions relate to 5 subscales which include thoughts that are repetitive ('the same thoughts keep going through my mind again and again'), intrusive ('thoughts come into my mind without me wanting them to'), difficult to disengage from ('I can't stop dwelling on them'), unproductive ('I keep asking myself questions without finding an answer') and capturing mental capacity ('my thoughts prevent me from focusing on other things). The measure has been found to have high internal consistency (α = .95) (Ehring et al., 2011). Within the current study internal consistency was .91.

The Acceptance and Action Questionnaire version 2 (AAQ-II; Bond et al., 2011) was used to measure FA. The AAQ-II is a widely used measure of experiential avoidance and psychological inflexibility (Bond et al., 2011). The measure consists of 10 items which are marked on a 7-point Likert scale ranging from 'never true' to 'always true'. For seven of the ten items higher scores are indicative of

higher levels of experiential avoidance ('my painful memories prevent me from having a fulfilling life') while low scores reflect greater acceptance and action. For three of the items the scale is reversed with lower scores reflecting greater avoidance ('I am in control of my life'). These three items were re-coded for the purpose of analysis so that the highest possible score on the measure (70) reflected higher levels of experiential avoidance. Studies on the psychometric properties of the AAQ-II indicate consistent reliability with a mean alpha coefficient of .84 (.78-.88) and the 3 and 12 month test-retest reliability is .81 and .79 respectively (Bond et al., 2011). Internal consistency for the current study was .85 comparable with previous studies (Maestas & Rude, 2012; Raes, Williams, & Hermans, 2009).

The Emotional Stroop Task (Wentura, Rothermund, & Bak, 2000) was used as a measure of the X mechanism within the CaR-FA-X model. A recent study found high test re-test reliability coefficients for the emotional Stroop task (*rs* = .86 to .92; Strauss, Allen, Jorgensen, & Cramer, 2005).

A software program was used to administer the task which participants completed on a computer. A series of 125 words appeared on the monitor one at a time for 500ms. The words were randomly presented in one of four colours (red, blue, green or yellow) and categorised into positive, negative, neutral, depressive and colour words (25 words in each category). As well as being a test of executive function, the Emotional Stroop task was considered a particularly useful measure to detect attentional bias related specifically to depressive words (Williams, Mathews, & MacLeod, 1996).

Covariates: Demographic data including age, gender and ethnicity were also collected.

Procedure

Sponsorship and ethical approval for the study was granted by the Universities IPHS Ethics Committee (see Appendix F).

In order to attract as diverse a sample a possible, the study was advertised via the central intranet announcement page accessible to all staff and students affiliated with the University of Liverpool. The advertisement contained brief information about the study along with the contact details of the researcher. Those interested in taking part responded to the advertisement via email (N=115) and were sent an information sheet giving more details about the research (see Appendix G). Participants who chose to go ahead with the study (N = 96) were booked in to meet with the researcher for data collection, all of which took place on university campus and lasted approximately 20-30 minutes per participant. A final N = 87 consented to take part in the study and completed all measures (N = 9 either cancelled or did not attend for data collection). Data was collected by a single researcher using a combination of electronic (self-complete) questionnaires (CESD-R, PTQ, AAQ-II and demographics), a computer-based reaction time task (Emotional Stroop) and a face-to-face administered AMT.

After consenting to take part participants completed the self-report measures immediately followed by the Emotional Stroop. Task instructions were presented visually on the screen. Participants were told they would be presented with a succession of words appearing in one of four colours (red, blue, yellow and green) each of which corresponded with a key on the keyboard. Coloured stickers were used to help participants remember which key corresponded with which colour. Participants were asked to work quickly and accurately pressing a key on the keyboard that corresponded with the colour of the letters whilst ignoring the meaning of the word. Ten practice trials were used to allow the participant to get used to the task before starting the main trial.

On completion of the Stroop task participants completed the AMT. Task instructions were explained verbally by the researcher following a pre-defined script (see Appendix E) along with definitions and examples of both specific and overgeneral memories. Participants practiced retrieving specific

memories on three words (ladder, chicken, tired) and were given feedback on their responses to ensure they fully understood the task requirements, no further feedback was given beyond the practice trials. Eighteen cue words (positive, negative and neutral; appendix X) were presented to each participant one at a time, words were presented visually (on laminated cards) and orally (by the researcher). Words were matched for frequency and emotionality.

Participants were given 30 seconds to think of a specific personal memory related to the cue word. Response times were recorded as soon as the participant began to describe their memory.

On completion of the AMT participants were debriefed and invited to ask the researcher any questions about the research. All participants received a £5 high street voucher to thank them for their time and were given the option to receive a copy of the research findings when available.

Power calculation

Power analysis for the study was based on a requirement to conduct both correlational and regression analyses. Following the recommendations of (Cohen, 1988) the power analysis was based on a medium effect size for both the correlational analysis and regression analysis (with 2 predictors and 2 covariates), stipulating an alpha of 0.05 and power of 0.8, yielding the following samples size requirements: 84 participants for bivariate correlations (two tailed) and 71 participants for the regression analysis.

Data analysis strategy

All statistical procedures were carried out using SPSS 22. Data underwent preliminary analysis to check for errors, outliers and to explore the normality of the distribution across variables. These

were found to be within acceptable levels for all of the key variables. A linear regression was run to check for multivariate outliers, one case was found to be more than 3 standard deviations away from the residual mean and was excluded from analysis. No missing data was identified during screening.

OGM was computed by combining the total number of extended and categoric memories retrieved per participant in line with previous research (Griffith et al., 2012). Total scores were also computed for current depression (CESD-R), CaR (PTQ) and FA (AAQ-II).

Data from the Emotional Stroop task was computed after practice trials, errors and outliers (i.e. reaction times less than 300ms or greater than 1750ms) were removed in line with guidance from a previous study (Smith & Waterman, 2003). In order to explore the nature of the Stroop effect, bias scores were calculated for each of the four word categories (i.e. mean reaction time for neutral words minus mean reaction time for positive, negative, depressive and colour words). The four bias scores were entered into a within subjects repeated measures ANOVA to analyse mean reaction times across groups relative to the neutral condition. Although there were no significant differences between groups there was a marked trend towards participants responding more slowly to colour-themed words (7ms slower) and quicker to positive words (5.9ms faster) compared to the neutral condition. Unexpectedly, mean reaction times for depressive and negative words were also marginally quicker compared to the neutral condition (3.1ms and 1.1ms respectively). As such the bias scores for colour-themed words were used as the primary outcome measure for executive control (X) since this condition appeared to be the most sensitive measure of executive function.

In order to carry out the planned regression analysis (1) CaR-FA-X on OGM and (2) CaR-FA-X with OGM on depression correlational analysis was used to explore the potential influences of covariates.

No significant associations were found between age and gender in relation to OGM or depression and so these variables were not included in the analysis.

Hypotheses 1-4 were tested using bivariate correlational analyses. Two hierarchical regression analyses were planned to firstly explore the relative contribution of each of the CaR-FA-X mechanisms to OGM (hypothesis 5), and then to explore the contributions of OGM and CaR-FA-X to current depressed mood (hypothesis 6).

Results

Descriptive statistics for the study's main variables were explored and are presented in Table 1. Mean scores on the CESD-R for the current sample (M = 13.2) were within the predicted range for non-clinical samples with scores of 16 and above being indicative of subthreshold depression (Radloff, 1977). Thus, on average the current sample reported low levels of depressive symptomology with mean scores falling within a sub-clinical range. Mean scores for OGM were also comparable to other studies within the literature that have used non-clinical samples (Williams, Teasdale, Segal, & Soulsby, 2000; Heeren et al., 2009; Latorre et al., 2015) though markedly lower than mean scores reported from clinical samples (Van Vreeswijk & De Wilde, 2004). Mean scores on the AAQ-II in the current sample were notably higher than average reported norms for non-clinical populations (*M* = 18.51, *SD* = 7.05) and were instead more in line with the reported averages seen in clinical populations (*M* = 28.3, *SD* = 9.9; Bond et al., 2011). Mean scores on the PTQ in the current sample were in line with average scores for non-clinical samples *M* = 28.4, *SD* = 13.23) reported elsewhere in the literature (Ehring et al., 2011). Mean reaction times for each of the word

categories on the Emotional Stroop task were relative to those reported in similar studies (Smith & Waterman, 2003).

Table 1. Descriptive statistics for study variables (N=87)

	Mean	Standard Deviation
Depression (CESD-R)	13.2	10.66
OGM (AMT)	5.39	3.41
CaR (PTQ)	27.36	8.02
FA (AAQ-II)	29.18	8.02
X (Colour Stroop MRT)	-8.39ms	64.01

Note. CESD-R = Center for Epidemiologic Studies Depression Scale – Revised; OGM = Overgeneral Memory as measured by the AMT = Autobiographical Memory Test; CaR = Capture and Rumination, PTQ = The Perseverative Thinking Questionnaire; FA = Functional Avoidance, AAQ -II = The Acceptance and action questionnaire; X = Executive control, MRT = mean reaction time. Figures for the Stroop task are measured in milliseconds and represent the mean reaction time bias i.e. MRT for colour words minus MRT for neutral words.

A bivariate correlational analysis highlighted a significant positive correlation between OGM and depression (r (84) = .21, $p < .05$) suggesting overgenerality is associated with greater levels of depressed mood (hypothesis 1). Both CaR (r (84) = .47, $p < .01$) and FA (r (84) = .59, $p < .01$) were also significantly correlated with depression indicating that higher levels of perseverative thinking or rumination are associated with increased depressive symptoms (hypotheses 2 and 3). A positive correlation between CaR and FA was also observed (r (84) = .62, $p < .01$). There was no significant relationship between depression and X (hypothesis 4) nor any significant associations found between X and either CaR or FA.

There were no significant correlations between OGM and any of the CaR-FA-X mechanisms (CaR; r (84) = .15, $p > .05$, FA; r (84) = .19, $p > .05$, X; r (84) = -.03, $p > .05$) that is, there was no relationship

between perseverative thinking, experiential avoidance or executive functioning in relation to overgenerality (see Table 2 for correlational analysis).

Table 2. Intercorrelations between depression, overgeneral autobiographical memory and mechanisms of the CaR-FA-X model

	Depression CESD-R	Total OGM	CaR (PTQ)	FA (AAQ-II)	X (Emotional Stroop)
Depression CESD-R	1				
Total OGM (AMT)	.212*	1			
CaR (PTQ)	.465**	.149	1		
FA (AAQ-II)	.587**	.188	.620**	1	
X (Colour Stroop)	.09	-.03	.001	-.08	1

Note. CESD-R = Center for Epidemiologic Studies Depression Scale – Revised; OGM = Overgeneral Memory as measured by the AMT = Autobiographical Memory Test; CaR = Capture and rumination; PTQ = The Perseverative Thinking Questionnaire; FA = functional avoidance; AAQ-II = The Acceptance and action questionnaire; X = executive control. Correlations for the Emptional Stroop task refer to the total bias between mean reaction times in response to colour words compared to neutral words.
* correlation significant at the .05 level; ** correlation significant at the .01 level

Since none of the CaR-FA-X variables were found to be significantly related to OGM the first planned regression analysis was not carried out. Similarly, since X was not associated with either depression or OGM it was excluded from further analysis. Instead a two stage hierarchical multiple regression analysis was conducted to explore the relative contribution of OGM and the CaR-FA-X variables in predicting current depression. Depression score was entered as the dependent variable with OGM being entered at Stage one; CaR and FA at Stage two. The variables were entered in this order to reflect the current view that OGM is a concept in its own right and to explore the additional contributions of CaR and FA to depression over and above OGM. The regression statistics are reported in Table 3.

Table 3. Summary of hierarchical regression analysis for variables predicting current depression

Variable	B	SE(B)	β	*t*	*R*	R^2	ΔR^2
Step 1	8.77	1.98	-	4.44***	.26	.07	.07
OGM	.75	.31	.26	2.4*	-	-	-
Step 2	-11.81	3.59	-	-3.29***	.62	.38	.32
OGM	.41	.26	.14	1.57	-	-	-
CaR	.28	.14	.22	2*	-	-	-
FA	.51	.14	.41	3.58***	-	-	-

Note. OGM = overgeneral memory, CaR = capture and rumination, FA = functional avoidance.

* = p<.05, ***p<.01

The hierarchical multiple regression revealed that at Stage one OGM contributed significantly to the regression model ($F(1, 84) = 5.87$, $p < .02$, $R^2 = .07$) accounting for 7% of the variation in current depression. Introducing CaR and FA at Stage two explained an additional 32% of the variance and this change in R^2 was significant ($\Delta F(2, 82) = 20.8$, $p < .001$ $\Delta R^2 = .32$). However, when CaR and FA were added to the model OGM was no longer a significant predictor of current depression. Together the three independent variables accounted for 39% of the variation in depression score with FA being the strongest predictor overall.

Discussion

The aim of the present study was to explore the relationships between overgeneral autobiographical memory, depressive symptoms and the three components of the CaR-FA-X (Williams et al., 2007; Williams, 2006). In particular, the study aimed to investigate the relative contribution of each of the CaR-FA-X mechanisms in predicting OGM as well as the relative contribution of OGM and CaR-FA-X in predicting current depression.

In line with previous research (Sumner, 2012; Van Vreeswijk & De Wilde, 2004; Williams et al., 2007) OGM and depression were found to be positively correlated, that is, those with higher levels of current depression were more overgeneral in their retrieval of episodic memories. Significant positive associations were also found between both CaR and FA in relation to depression, again in line with findings from previous studies (Sumner, 2012). Similar to the recent finding by Sumner et al. (2014) CaR and FA were significantly correlated with each other suggesting that those with higher levels of perseverative thinking and rumination scored higher on measures of experiential avoidance and in turn, had higher levels of depression. In contrast to existing research however this study found no relationship between executive control and depression nor were there any associations between OGM and any aspect of the CaR-FA-X model. Hierarchical regression analyses identified OGM as a significant predictor of depression, however this was no longer significant when CaR and FA were added to the model, suggesting the latter two variables are more important in explaining depression than the construct of OGM.

Executive control and depression

The lack of relationship between X and depression does not fit with the predictions of the CaR-FA-X model, nor does it reflect the widespread finding that poorer executive functioning is a feature of current depression (Malone, 2013). It is possible that the measure of X within the present study did not adequately capture deficits in executive functioning. The Emotional Stroop task was selected due to its ability to not only capture the executive processes thought to contribute to OGM (i.e. working memory, attention and inhibition), but also because it allowed additional exploration of the

impact of depression-themed words on performance. Unexpectedly, no such differences in performance were noted for the current sample though there was a trend towards participants responding more slowly to colour-themed words compared to any other word category. The Colour-Stoop task is a widely used measure in studies exploring the relationship between executive function and depression (Malone, 2013). In addition, two studies within the OGM literature have also used this test as a measure of X, both of which found a positive relationship between performance on the Stroop task and depression (Hamid Taher Neshat-Doost, Dalgleish, & Golden, 2008; Spinhoven, Bockting, Kremers, Schene, & Williams, 2007). Samples from both studies were either currently depressed or had a history of MDD suggesting that the lack of association seek in this study may reflect the overall low levels of depression within the sample.

The CaR-FA-X model and OGM

Although two large reviews of the OGM literature have found good overall support for each of the three mechanisms of the CaR-FA-X model in relation to OGM (Sumner, 2012; Williams et al., 2007), lack of research testing all three components together has made it difficult to establish credence for the model as a whole. With the exception of one other (Sumner et al., 2014) this study was the first to empirically test all three mechanisms of the CaR-FA-X model in relation to OGM and depression.

The present study found no significant associations with any element of the CaR-FA-X model in relation to OGM suggesting that, whilst OGM is related to depression, this relationship is not mediated by CaR, FA or X, as suggested by the CaR-FA-X model (Williams, 2006). These results partly contrast with the recent findings of Sumner et al. (2014) who found support for the relationship between CaR and X in relation to OGM. Our results are however consistent with their finding that OGM is not related to FA.

In particular, the results of the current regression analysis suggest that the individual components of the CaR-FA-X model (in this case only CaR and FA) may better explain and predict the course of

depression without the need for OGM as a separate construct. Although this study did find a significant (but weak) association between OGM and depression the relationship was no longer significant when CaR and FA were entered into the model, highlighting them as being more closely linked to depression. These results are supported by findings from a meta-analysis of the OGM literature which found only a small relationship overall between OGM and the course and severity of depression (Sumner et al., 2010).

Though several studies have documented OGM to be a predictor of the course and severity of depression (Sumner et al., 2010) results from the current study question the need for OGM suggesting that cognitive processes associated with rumination and functional avoidance are well placed to explain both current depression severity and vulnerability factors for future episodes of depression.

Despite being in their early stages of development several studies have suggested that there is some clinical benefit to targeting OGM through interventions designed to improve memory specificity for the treatment of depression (Dalgleish et al., 2014; Eigenhuis, Seldenrijk, van Schaik, Raes, & van Oppen, 2015; Moradi et al., 2014; H. T. Neshat-Doost et al., 2012; Raes et al., 2009). Inconsistencies in the results of these studies have led researchers to question which aspects of the memory specificity interventions are important for clinical change. The results from this study suggest that improvements in OGM and depression may arise from such interventions indirectly targeting cognitive processes such as rumination and avoidance rather than OGM per se. In a study exploring the effects of an expressive writing intervention on memory specificity, Maestas & Rude (2012) found that non-depressed students who engaged in an expressive writing task demonstrated increased specificity at follow-up compared to controls. They found that this relationship was mediated by improvements in FA suggesting that manipulation of OGM may involve targeting the cognitive processes underlying it. A further study found that participants' disclosure of specific autobiographical memories increased over the course of therapy leading to a decrease of

overgeneral memories regardless of therapy outcome (Boritz, Angus, Monette, Hollis-Walker, & Warwar, 2011).

Clinical implications

Despite this study finding limited support for the role of OGM as a predictor of depression over and above cognitive processes such as rumination and avoidance, a better understanding of the mechanisms involved in the development and maintenance of depression will help improve the treatment options available to patients. Studies investigating memory specificity training programmes (MEST) have yielded some significant findings to support their use in the treatment of depression (Dalgleish et al., 2014; Eigenhuis et al., 2015; Moradi et al., 2014; H. T. Neshat-Doost et al., 2012; Raes et al., 2009). Whether the success of these interventions lies in their ability to modify OGM or processes such as rumination and avoidance may be irrelevant if the treatments themselves are effective and can offer a brief, cost-effective option for people with depression.

Strengths and limitations

Overall the current study provided a well-structured, rigorous test of the CaR-FA-X model. The use of the PTQ as a measure of CaR was a particularly useful addition to the research since its inclusion of questions specifically related to 'capture' provide a more rigid measure of the CaR mechanism compared to previous studies which have tended to use measures solely concerned with rumination (Van Vreeswijk & De Wilde, 2004).

Data for the study was all collected face-to-face by a single researcher following pre-defined scripts ensuring a high level of consistency, minimising the risk of bias and ensuring there was no missing data.

Whilst the present study deliberately opted to use a non-clinical sample in order to explore correlational patterns of the key variables across a continuum, the sample overall reported very low levels of current depression and it is therefore possible that the study did not capture some of the relationships more typical of a clinical population (i.e. the role of executive functioning). It would be interesting to see the results of a similar study carried out in a clinical setting. Biases in the sample (location, predominantly young, female and White British) may also limit the generalisability of results.

Although it was felt that there was a good rationale for using the Emotional Stroop task as a measure of executive control, results from this study (particularly in relation to depressed-themed words) did not capture the intended effect. Whilst we feel it would be premature to disregard this measure from future studies in the area we acknowledge that results from the Emotional Stroop task may have failed to capture impaired executive functioning in the current sample.

There is considerable variation in the format, delivery and scoring of the AMT which has been shown to create disparity between studies using the measure (Heron et al., 2012; Van Vreeswijk & De Wilde, 2004). Whilst the current study followed guidelines from a previous paper published by the author of the measure (Williams et al., 2000) it is possible that our operationalisation of the AMT may have led to an overly-stringent measure of OGM (for instance not counting omissions as overgeneral scores, only allowing 30 seconds for a response instead of 60 seconds) that potentially underestimated levels of overgenerality in the current sample.

Future research

Replicating this study with a more varied sample would be a beneficial next step in further exploring the validity of the CaR-FA-X model. It would be interesting to explore the model in relation to a clinical population.

Conclusions

This study provided a unique contribution to the overgeneral memory literature through the empirical test of the CaR-FA-X model in relation to OGM and current depression. Results from a non-clinical population demonstrated positive associations between OGM and depression, capture and rumination and depression and functional avoidance and depression. CaR and FA were also positively related. Although there was some evidence of OGM being related to depression the results indicated that perseverative thinking styles and rumination, along with experiential avoidance better predict depression outcome.

This early investigation of the CaR-FA-X model does not support the notion that OGM is a distinct construct in predicting depression outcome. Rather, OGM results from underlying cognitive processes thought to contribute to the development and maintenance of depression. Although some recent intervention studies have shown some benefit to targeting memory specify in the treatment of depression, results from this study suggest that the clinical benefits of such interventions lie in them indirectly targeting cognitive processes such as perseverative thinking, rumination and functional avoidance.

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Appendix A

Literature review protocol

Title:

What impact do interventions specifically designed to increase Autobiographical Memory Specificity have on depression? A systematic review.

Notes:

There's lots of evidence to say increased OGM (or decreased AMS) is strongly associated with depression and also a known risk factor. Have interventions designed to manipulate or improve specificity worked and have they had a positive influence on depression outcome?

PICO

Population: adults with depression

Intervention: anything designed to improve AMS (or reduce OGM)

Comparator: The stated interventions compared with each other, placebo or no intervention

Outcomes: changes in depressed status (as a result of improved AMS)

Settings: clinical and non-clinical (but with depression)

Study design: comparison/intervention studies

Type of review:

Systematic, with narrative discussion

Inclusion Criteria:

- Adults (18+)
- Quantitative studies
- Depression as an outcome
- Use of the AMT as a measure
- Pre/post studies
- An intervention designed to improve specificity in some way
- Clinical and non-clinical samples but must be currently depressed

Exclusion criteria:

- Under 18's
- Qualitative or case studies
- Protocol's, discussion or review papers, books
- Studies that don't measure depression as an outcome
- Studies that don't measure AMT
- Samples that are not currently depressed (i.e. in remission)
- Sample's whose depression is caused by bereavement (want more longstanding depression)

Search strategy:

Search terms:

- Overgeneral memory
- Overgeneral autobiographical memory
- Autobiographical memory specificity
- Autobiographical retrieval
- Memory specificity/ memory specificity training
- MEST
- Depression/depress
- Autobiographical memory test

Databases:

- Medline, psycARTICLES , psycINFO, Scopus, Web of Science (platforms: OVID & Epsco)
- Check Scopus for unpublished papers

Other sources:

- Hand search reference lists from key texts
- Contact key authors
- Screen the article titles, then abstracts, then look for specific papers
- Check BABCP and ECCBP/WCCBP and check most recent conference abstracts
- ClinicalTrials.gov for current or ongoing trials

Appendix B

Systematic review full search procedure

All search terms applied to abstract, title and key words

No limitations to date, language or document type

Dates searches: from (not specified) To 19.09.2015

Database	Search terms	hits
Medline	("overgeneral memor*" OR "overgeneral autobiographical memor* OR "autobiographical memor* specificity" OR "memor* specificity") AND (depress*)	352
psycARTICLES	"	37
psycINFO	"	215
Scopus	"	529
Web of science	"	265
		Total: 1398

Hand searched references	N/A	2
ClinicalTrials.gov	Overgeneral memory Autobiographical memory specificity	1
Foreign papers (English abstract)		4 (all three authors contacted via email)

Original number	**Number removed**	**Reason for removal**	**New number**
1398 (+2 from HS) 1400	928	Duplicates	472
472	424	Abstracts screened	48
48	4	Unable to obtain English copy	44
44	30	Full paper screen	14

Hand searches

Reference	**Found in paper**	**Reason for removal**
Guided self-help concreteness training as an intervention for MD in primary care: a phase II randomized controlled trial (2012)	As above	No measure of AM Inappropriate design/intervention
Improvements in Autobiographical memory in schizophrenia patients after a cognitive intervention 2008	Effects of event-specific memory training on autobiographical memory retrieval and depressive symptoms in schizophrenic patients (2012)	Included

Appendix C

Bibliographic details and reasons for exclusion

Full text screens - EXCLUSIONS

Paper reference	Reason for removal
Adaptive and maladaptive self-focus in depression (2004)	Although they did attempt to improve AMS they didn't measure depression post intervention and didn't discuss how changes in AM status affected mood Inappropriate design/intervention
The Benefits of Expressive Writing on Autobiographical Memory Specificity: A Randomized Controlled Trial (2012)	Specifically excluded people currently experiencing depressive symptomology Inappropriate sample/population
Cognitive Functioning in Patients Remitted from Recurrent Depression: Comparison with Acutely Depressed Patients and Controls and Follow-up of a Mindfulness-Based Cognitive therapy trial (2013)	No specific attempt to improve specificity. Non-clinical sample (in remission). Didn't expect changes in depression after MBCT. Inappropriate design/intervention
Cognitive mechanisms involved in therapeutic change for depression (2013)	Book chapter. Not a study. Inappropriate design/intervention

Concreteness Training Reduces Dysphoria: Proof-of-Principle for Repeated Cognitive Bias Modification in Depression (2009)	Didn't measure AM (no AMT) Inappropriate design/intervention
Depressive rumination reduces specificity of autobiographical memory recall in acquired brain injury (2008)	Participants were not excluded if they weren't depressed (although a large proportion of the sample happened to be depressed). Did not measure depression post treatment and, although they did aim to manipulate AM there was no real focus on how that then affected depression Inappropriate design/intervention
Does overgeneral autobiographical memory result from poor memory for task instructions? (2008)	No measure of depression after intervention. Sample were not depressed. Although intervention did aim to improve specificity it wasn't really a clinical intervention and the authors were not concerned how this improved specificity influenced depression. Inappropriate design/intervention
Efficacy of **memory specificity training** (MEST) on underlying mechanisms of overgeneral autobiographical **memory** (OGM) in people with major depression and childhood traumatic experience (2015)	No English version available (author contacted) No English version
The Effect of Reminiscence Group Work on Life Satisfaction, Self-Esteem and Mood of Ageing People with Intellectual Disabilities (2009)	No intervention designed to improve specificity. No measure of depression. Inappropriate design/intervention
Effectiveness of a specific cueing method for improving autobiographical memory recall in patients with schizophrenia (2014)	Sample were not depressed (excluded if scored >8 on BDI). No focus on how improving specificity could influence depression. Inappropriate sample/population
The effects of analytical and experiential rumination on autobiographical memory specificity in individuals with a history of major depression (2007)	Sample were not currently depressed (Mean BDI scores of 3.73). Although their intervention did aim to manipulate specificity it didn't focus on how this affected depression. Also baseline measures were taken, the sample were given an 8 minute task and then mood and AMS were assessed immediately afterwards – perhaps not long enough to assume an effective intervention? Inappropriate sample/population
The effects of mindfulness on executive processes and autobiographical memory specificity (2009)	No measure of depression. Sample weren't depressed. Inappropriate sample/population
Effects of Mindfulness on Meta-Awareness and Specificity of Describing Prodromal Symptoms in Suicidal Depression (2010)	No AMT. Focus of study was more on specificity of participants' description of their suicidal symptoms not the effect of specificity on depression. This paper was produced as part of a larger study, another paper of which has been included in the review (effects of mindful-based cognitive therapy). Inappropriate design/intervention

Effects of Ruminative and Distracting Responses to Depressed Mood on Retrieval of Autobiographical Memories (1998)	No AMT. No specific manipulation of AMS and no investigation of how this would affect depression. Inappropriate design/intervention
The effects of rumination and distraction on overgeneral autobiographical memory retrieval during social problem solving (2006)	Bigger focus on problem solving. Half sample were 'dysphoric' and half not. Did not measure AM before intervention (only after) and did not use AMT. Inappropriate design/intervention
Effects of sad mood on autobiographical memory in older adults with and without lifetime depression (2010)	Not an intervention to improve AMS as such but rather how induced sad mood would affect specificity. Wouldn't be considered an effective clinical intervention. Inappropriate design/intervention
The effects of self-focused rumination on global negative self-judgements in depression (2005)	No measure of AM. No intervention designed to improve specificity. Inappropriate design/intervention
Enhancing Autobiographical Memory Specificity Through Cognitive Training: An Intervention for Depression Translated From Basic Science (2013)	Adolescent sample. Also the sample were depressed because they had all been recently bereaved – would this reflect the markers of a true course of depression? Inappropriate sample/population
Facilitating Adaptive Emotional Analysis: Distinguishing Distanced-Analysis of Depressive Experiences From Immersed-Analysis and Distraction (2015)	Not remotely related to topic. Inappropriate design/intervention
Guided self-help concreteness training as an intervention for MD in primary care: a phase II randomized controlled trial (2012)	No AMT Inappropriate design/intervention
The impact of rumination on memory for self-referent material (2007)	No measure of AM. Intervention not designed to modify AMS. Inappropriate design/intervention
Life Review Based on Remembering Specific Positive Events in Active Aging (2015)	Relevant study but non-clinical sample used (CES-D scores at baseline *m*=12.66 in experimental group and 10 for control group. Need >16 for clinical significance). Inappropriate sample/population
Life review in patients with schizophrenia: Effects on mood state and autobiographical memory (2013)	Article only available in Spanish. Contacted author – replied to say no English translation. Attempted to translate via web but translation difficult to interpret. No English version
Memoria autobiográfica **y entrenamiento** en revisión de vida como método de mejora del estado de ánimo en la vejez / Autobiographical memory and training in life review as a method of mood improvement	Unable to get English version of paper No English version

(2008)	
Mindfulness-Based Cognitive Therapy Reduces Overgeneral Autobiographical Memory in Formerly Depressed Patients (2000)	Sample not currently depressed (in remission) Inappropriate sample/population
Narrative and emotion integration in psychotherapy: Investigating the relationship between autobiographical memory specificity and expressed emotional arousal in brief emotion focused and client-centred treatments of depression (2011)	No intervention to modify AM. Inappropriate design/intervention
Non-ruminative processing reduces overgeneral autobiographical memory retrieval in students (2008)	Non-clinical sample. Intervention not designed to improve AM as such. Inappropriate sample/population
Reduced memory specificity predicts the acquisition of problem solving skills in psychoeducation (2013)	Non-clinical sample. No intervention to modify AM. Didn't measure AMS post intervention. Inappropriate sample/population
Reduced specificity of autobiographical memories following a negative mood induction (2006)	Intervention designed to induce negative mood to see what affect this has on AMS. Not clinically relevant. Non-clinical sample. Inappropriate sample/population
Reminiscence with different types of autobiographical memories: Effects on the reduction of depressive symptomatology in old age. (2010)	Excluded due to not being able to get English version No English version
Retrieval-induced forgetting of autobiographical memory details (2006)	Healthy sample. No measure of depression. Inappropriate sample/population
Rumination and overgeneral autobiographical memory (2007)	In experiment 1 they didn't measure AMT at baseline, only after the intervention, so no comparison. In experiment 2, although they measured AMT pre & post they're not really putting forward a clinical intervention designed to improve depression. There is little (to no) focus on how improved specificity affected depressed symptomology. Inappropriate design/intervention
Rumination relates to reduced autobiographical memory specificity in formerly depressed patients following a self-discrepancy challenge: The case of autobiographical memory	Not currently depressed (in remission) Inappropriate sample/population

specificity reactivity (2012)	
Suppression-Induced Reduction in the Specificity of Autobiographical Memories (2013)	No focus on improving AMS or depression scores. Inappropriate design/intervention

Full text screens – INCLUDED

A pilot randomized controlled trial investigating the efficacy of Memory Specificity Training in improving symptoms of posttraumatic stress disorder (2014)
A program of positive intervention in the elderly: memories, gratitude and forgiveness (2013)
Autobiographical memory in posttraumatic stress disorder before and after treatment (2007)
Can Concreteness Training Alone Reduce Depressive Symptoms? A Randomized Pilot Study Using an Internet-Delivered Protocol (2013)
Changes in Autobiographical Memory specificity following Cognitive Behavior Therapy and Pharmacotherapy for Major Depression (2007)
Decentring and distraction reduce overgeneral autobiographical memory in depression (2000)
Effects of event-specific memory training on autobiographical memory retrieval and depressive symptoms in schizophrenic patients (2012)
Effects of Mindfulness-Based Cognitive Therapy on Specificity of Life Goals (2012)
Feasibility and Effectiveness of memory specificity training in depressed outpatients: A pilot study (2015) Added after search deadline
Improvements in Autobiographical memory in schizophrenia patients after a cognitive intervention (2008) Included after hand searching references
Life Review Therapy Using Autobiographical Retrieval Practice for Older Adults With Depressive Symptomatology (2004)
Life review therapy with older women: an intervention to reduce depression and improve autobiographical memory (2009)
Life review therapy using autobiographical retrieval practice for older adults with clinical depression (2009)
Reducing cognitive vulnerability to depression: A preliminary investigation of Memory Specificity Training (MEST) in inpatients with depressive symptomatology (2009)
Rumination and Overgeneral Memory in Depression: Effects of Self-Focus and Analytic Thinking (2001)

Appendix D

Author Guidelines for: Journal of behaviour therapy and experimental psychiatry

Formatting requirements

There are no strict formatting requirements but all manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions. If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes. Divide the article into clearly defined sections.

Figures and tables embedded in text

Please ensure the figures and the tables included in the single file are placed next to the relevant text in the manuscript, rather than at the bottom or the top of the file.

Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Material and methods

Provide sufficient detail to allow the work to be reproduced. Methods already published should be indicated by a reference: only relevant modifications should be described.

Results

Results should be clear and concise.

Discussion

This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusions

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

References

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct.

Appendix E
Autobiographical Memory Test instructions and cue words

Instructions to Participants

I am interested in your memory for events that have happened in your life. I am going to read to you some words and show you the word on a card at the same time. For each word, I want you to think of a personal memory that the word reminds you of.

The memory can be of an important or trivial event. The memory you give me should be of a specific event - by that I mean an event that lasted less than a day, and occurred at a particular time and place. So, for example, if I said the word "party"- it would not be OK to say, "I always enjoy a good party", because that does not mention a specific event. But it would be OK to say "I enjoyed Jane's party last Halloween" (because that is a specific event).

Also, I don't want you to use the same memory twice. Finally, the memory can be one from any time in your life but not something that happened in the last seven days as these memories are too recent.
You should describe the event to me in enough detail for me to tell that these instructions have been fulfilled.

Ok, let's try some words for practice: ladder
tired
chicken

(Reinforce correct responses in terms of specificity, recency and uniqueness, prompt until 2 correct).

Now we've practised we will move on to the task itself. In this section you will be given 30 seconds to come up with a memory for each cue word presented. You might find it easy to come up with a memory for some words and harder for others and in some cases you may find that no memory

comes to mind. That's ok. However, I'll always give you the whole 30 seconds to try to come up with a memory for each cue. I'm going to record what you say on this Dictaphone to help me remember it and I'll tell you when it is time to move on to the next word.

Do you have any questions?

Ok, so remember, your task is to come up with a memory for each cue word. Each memory should refer to a specific event which lasted less than a day and which occurred more than one week ago and you can only use each memory once. There are 18 cue words so this task should take us no more than 20 minutes.

List of cue words:		
1. Pen	7. Factory	13. Balance
2. Affectionate	8. Loyal	14. Loved
3. Needy	9. Isolated	15. Lonely
4. Green	10. Library	16. Onion
5. Successful	11. Able	17. Determined
6. Inefficient	12. Useless	18. Failure

Appendix F

Sponsorship and ethical approval

Dear Catrin,

I am pleased to inform you that IPHS Research Ethics Committee has approved your application for ethical approval. Details and conditions of the approval can be found below.

Ref: IPHS-1415-VA-181-Eames-Roughley
PI / Supervisor: Catrin Eames

Title: To what extent do mechanisms of the CaR-Fa-X model mediate the relationship between Overgeneral Autobiographical Memory and current depressive symptomatology?

First Reviewer: Lucy Frith
Second Reviewer: Geog Mayer
Date of Approval: 19th March 2015

Best wishes,

Vanessa

Vanessa Adams
IPHS Research Ethics Committee

Email: iphsrec@liv.ac.uk

Appendix G

Participant Information Sheet

Title of Research Project: **Autobiographical memory and mood states**

Researchers:

Principle Investigator: Catrin Eames
Co-applicant 1: Pierce O'Carroll
Student Investigator: Kate Roughley

You are being invited to participate in a research study. Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and feel free to ask if you would like more information or if there is anything that you do not understand. Please also feel free to discuss this with your friends, relatives and GP if you wish. We would like to stress that you do not have to accept this invitation and should only agree to take part if you want to.

What is the purpose of the study?

Autobiographical memory relates to our memories for personal experiences, for example, our first day at school or the day we passed our driving test. Research has shown that, when asked, the types of autobiographical memories we generate can differ when in different mood states.

Although there is a lot of research to support this phenomenon, it is still unclear why people in different mood states retrieve personal memories in different ways.

The following study aims to explore factors that are important during the recall of autobiographical memories.

Why have I been chosen to take part?

This study is hoping to recruit 85-100 adult volunteers from a student population. You have been invited to take part because you are a student at The University of Liverpool where the research is taking place.

Do I have to take part?

Participation in the study is completely voluntary and you would be free to withdraw at any time without needing to give a reason.

What will happen if I take part?

If you decide you would like to take part an appointment will be made to meet with the researcher on campus at a time to suit you. There will be an opportunity to ask any questions before you consent to go ahead.

You will then take part in a short memory exercise with the researcher before completing some questionnaires and a cognitive task on a computer.

At the end of the session the researcher will be able to answer any further questions you may have. Your involvement should take no more than 45-60 minutes.

Expenses and/or payments

All participants will receive a £5 high street voucher (www.love2shop.co.uk) to thank them for their time.

Are there any risks in taking part?

Although no specific risks have been identified, participants should make the researcher aware in the unlikely event they experience any discomfort of distress as a result of this study.

Are there any benefits in taking part?

Your involvement in this study provides an important contribution to our understanding of changes in mood states. This has important implications for treatment and prevention strategies in those highlighted as vulnerable.

What if I am unhappy or if there is a problem?

If you are unhappy, or if there is a problem, please feel free to let us know by contacting Dr Catrin Eames (on the contact details below) and we will try to help. If you remain unhappy or have a complaint which you feel you cannot come to us with then you should contact the Research Governance Officer at ethics@liv.ac.uk. When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make:

Dr Catrin Eames
Tel: 0151 794 5534 Email: eamesce@liverpool.ac.uk

Will my participation be kept confidential?

Your data will remain anonymous and once submitted it will not be possible to link your answers with any personally identifiable information.

Anonymised electronic data will be stored on password protected university drives accessible only to the research study team for use on this project and future related projects.

Hard copies of the consent forms will be stored securely and separately to any test data in a locked filing cabinet on university premises and destroyed at the study end date.

What will happen to the results of the study?

The results of this study will be documented in a written report which may be published for academic purposes. Participants will not be identifiable from the results and individual data sets will not be discussed.

The option to receive a copy of this report will be given to all participants at the end of data collection.

What will happen if I want to stop taking part?

Your participation in this project is purely voluntary and you are free to withdraw at any time without having to give reason. However, given the nature of the anonymising process once a participant has submitted their responses it will be impossible to identify or retrieve individual data. For this reason, participants are free to withdraw from the study up until the point that data is submitted to the researcher.

Who can I contact if I have further questions?

Further questions should be directed to the researcher on the contact details below:

Kate Roughley
Email: kate.roughley@liverpool.ac.uk

Appendix H

Summary of findings from Literature Review studies

Intervention was better than control/baseline | No change | Worked but no more than control | Didn't have control group | AMS improved but no effect on dep | Had a control

Author	Year	Intervention	Aims/ research questions	Main findings
Blairy et al.	2008	Cognitive Remediation Therapy Vs control	Does CRT enhance AMS in Schizophrenia patients? What effect does this have on other depression?	The CRT group were sig. more specific than controls. Depressive scores did not change in either group & no relationship between depression & AMS was found
Crane et al.	2012	MBCT Vs waitlist control	Does MBCT improve goal specificity, achievability & AMS?	Those who received MBCT were sig. more specific and increased goal likelihood. Goal Likelihood was also sig. ass with mood increase
Eigenhuis et al.	2015	Memory Specificity Training	Is MEST feasible in outpatient mental health setting? Does it improve AMS and/or decrease depression?	AMS significantly increased after MEST compared to baseline and depression also significantly reduced after treatment. Improvements were maintained at follow-up
Goncalves	2009	Life review Vs control	Does LR reduce depression in older adults?	Sig. increases in AM and reductions in depressive symptoms compared to controls
McBride et al.	2007	CBT Vs ADM	What are the effects of CBT versus ADM on AMS?	Both groups were significantly more specific and less depressed after treatment. CBT participants did recall significantly less extended memories to those in PHT.
Mogoase et al.	2013	Concreteness Training Vs waitlist control	Will CNT reduce depressive symptoms & rumination & increase AMS?	Whilst concreteness did improve, depression & AMS did not improve
Moradi et al.	2014	Memory specificity training Vs control	Does MEST improve AMS in PTSD patients? Does MEST improve symptoms of PTSD?	Those who received MEST were significantly more specific compared to controls & also had fewer PTSD symptoms at post-training & 3-month follow-up
Raes et al.	2009	Memory specificity training	Is group-based MEST a feasible intervention? Can specificity be increased in depressed participants? Explore how increased AMS affect other variables	AMS significantly improved from pre- to post-intervention. Significant reductions in rumination & hopelessness were also found post-treatment
Ramirez et al.	2014	MAPEG program Vs active control	Does the MAPEG programme improve psychological wellbeing & life satisfaction by reducing depression	MAPEG participants were significantly more specific and less depressed compared with controls. Though improvements were lost at 4-month follow-up.
Ricarte et al.	2012	Memory training Vs active control	How will the memory training programme affect AMS in patients with Schizophrenia? How will this affect depression scores?	Participants in the Memory Training group were significantly more specific than controls & depression scores significantly reduced between pre/post test.

Serrano et al.	2012	Life review therapy Vs active control	What are the effects AM retrieval practice on AMS in older adults with Major depression?	LRT group significantly improved on depression measures post-treatment, but these improvements did not statistically differ from active-control group
Serrano et al.	2004	Life review therapy Vs TAU	What are the effects AM retrieval practice on AMS in older adults with depressive symptoms?	LRT participants were significantly more specific and less depressed at post-test compared with controls
Sutherland et al.	2007	Cognitive behavioural therapy	Will CBT reduce OGM in PTSD patients?	AMS was not significantly increased post-treatment. No relationship between depression & AMS was observed
Watkins et al.	2001	Rumination Vs Distraction Vs high/low self-focus	What affect does analytical thinking and self-focus have on OGM and mood?	Low-analysis conditions resulted in reduced OGM from time 1 to time 2. High analysis groups became more OGM. Distraction reduces OGM. Rumination involves more analytical thinking (rather than self-focus)
Watkins et al.	2000	Rumination Vs Distraction	Do decentring prompts reduce OGM?	Order of specificity at 3rd AMT: distraction then decentring, distraction then control, rumination then decentring, rumination then control. Distraction & decentring help but no sig. changes in mood in any group