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RESEARCH PAPER

Maladaptive emotion regulation strategies mediate the relationship between biased cognitions and depression ☆

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Abstract

Introduction: Depression has previously been found to emerge from and be perpetuated by negative cognitive biases. However, a plethora of underlying psychological mechanisms are likely to be involved in the relationship. The current study investigated whether maladaptive cognitive emotion regulation strategies such as self-blame, rumination, and catastrophising may mediate the link between negative cognitive biases and depression.

Methods: Participants (*n* = 251) completed the study via the internet data collection software, Pavlovia. The Self-Referent Encoding Task was used to measure self-referential and memory biases while maladaptive emotion regulation strategies and depression were assessed using the Cognitive Emotion Regulation Questionnaire and the Depression Anxiety Scales, respectively.

Results: Results showed that maladaptive strategies mediate the relationship between cognitive biases and depression. The tendency to blame oneself for playing an influential role in a negatively perceived life event seems to play a key role in the negative cognitive bias-depression relationship.

Conclusion: Therapists should consider focusing their efforts on reducing self-blame when clients demonstrate evidence of self-referential and memory bias. Interventions may include refocusing blame on others, rather than the self.

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Introduction

The need to develop knowledge supportive of effective mental health interventions has arguably never been as important as it is now, in the years following the global pandemic. Numerous academic publications have highlighted the impact of the pandemic on mental health worldwide (Hossain et al., 2020). This trend is also evident in the increased number of incidences of depression, a clinical condition which is in part characterised by anhedonia, insomnia, and omnipresent negative beliefs about the self (Ettman et al., 2020; Tolentino & Schmidt, 2018). One research-based remedy for the condition, Cognitive Behaviour Therapy, can be used to help depressed individuals by increasing their understanding of the psychological processes that are implicated in the maintenance of negative self-beliefs. Relatedly, the task of therapeutic modification of these beliefs and, consequently, the effectiveness of treatment, is greater if clients have a deeper understanding of these same processes (Gautam et al., 2020; Huibers et al., 2021). The current research explores how some of these processes are related to the maintenance of depression, with the aim of improving psychological interventions.

Self-schema and bias in depression

Theoretical frameworks explaining the emergence and maintenance of depression emphasise the influential role of lifetime adversity. According to Beck and colleagues (e.g., Dozois & Beck, 2008), adverse personal circumstances can give rise to negative self-judgments, judgments about the future, and the world we live in. These beliefs form a negative self-schema which can subconsciously affect how the brain attends to, interprets, and encodes information. In other words, they result in a cognitive bias (Everaert & Koster, 2020). Performance on tasks designed to assess biases in psychological processes towards various stimuli can be used to measure a negative self-schema (Phillips et al., 2010). Such tests have shown that depressed individuals are more likely to attend to and (correctly) recall negatively valenced information than individuals with negligible levels of depression symptomatology (Duque & Vázquez, 2015; Dainer-Best et al., 2018). Likewise, negative self-schema manifests itself in an atypical tendency to process information related to, or directed towards oneself in a biased manner. For example, higher scores on measures of depression are associated with more frequent self-endorsement of negatively valenced adjectives (Dainer-Best et al., 2018). Overall, negative self-schemas or cognitive biases can be seen as influencing emotional processes, which in turn can thereby exacerbate depression symptomatology (Dozois & Beck, 2008). The current paper explores whether the links between biased self-reference and depression, and biased memorisation of information and depression, are interlinked with processes of maladaptive cognitive emotion regulation.

Cognitive emotion regulation

Emotion regulation strategies are biopsychological functions which ultimately aim to modulate personal emotional experiences (Brzozowski, 2018). There is a broad range of strategies which can be used implicitly and explicitly (Braunstein et al., 2017). Implicit strategies are generally not regarded as subject to conscious awareness and deliberate control, while explicit strategies are subject to conscious awareness and some cognitive and volitional control. For example, an automatic shift of attention away from a disturbing stimulus towards a positive or neutral stimulus constitutes an implicit emotion regulation strategy. On the other hand, considering the intentions of someone's actions by entertaining alternative explanations for their motives constitutes an explicit emotion regulation strategy (Braunstein et al., 2017). This study examines explicit emotion regulation strategies, which are more adaptable for modification due to their conscious, cognitive nature, presenting potential avenues for therapeutic interventions.

Most cognitive emotion regulation strategies are seen as beneficial to mental health. However, research indicates that the use of some of the strategies can be detrimental to mental health (Joormann & Siemner, 2011; Joormann & Stanton, 2016). For example, scores on depression questionnaires have been positively correlated with explicit cognitive emotion regulation strategies: self-blame (blaming oneself for one's personal situation), rumination (compulsively thinking about one's situation to understand feelings), and catastrophising (exaggerating and feeling helpless about a situation) (Garnefski & Kraaij, 2007; Sullivan et al., 1995). Therefore, self-blame, rumination, and catastrophising are maladaptive cognitive emotion regulation strategies which are related to depression.

Research identifies two types of self-blame: behavioural and characterological. Behavioural self-blame attributes negative events to one's own changeable actions, occasionally linked to positive psychological traits. Characterological self-blame, on the other hand, is seen as a stable trait, blaming oneself for possessing inadequate characteristics that cause negative events (Duncan & Cacciatore, 2015). Our study focuses on characterological self-blame due to its maladaptive nature. This type of self-blame shares similarities with negative self-referential and memory biases, but is under cognitive control, unlike biases which are largely subconscious. In contrast, rumination and catastrophising can be described as attempts to comprehend or exaggerate negative personal situations, and to a lesser extent than self-blame, involve viewing oneself as inadequate (Watkins & Roberts, 2020; Sullivan et al., 1995). This distinction makes rumination and catastrophising different from negative self-schema. Thus, self-blame may act as a mediator between self-schema and rumination and catastrophising, playing a pivotal role in linking self-referential and memory biases to depression.

Summary and hypotheses

The current study uses the Self-Referent Encoding Task (SRET; Derry & Kuiper, 1981) to measure self-reference and memory biases. During the SRET, participants endorse adjectives as either relevant or not relevant self-descriptions (i.e., self-reference bias) and later recall as many previously displayed adjectives as possible (i.e., memory bias). Frequent endorsement and recollection of

negative adjectives are believed to be proxies of respondents' negative beliefs about themselves (i.e., negative self-schema). We expected that these proxies of negative self-schema would predict scores on self-blame as both concepts are self-judgments. Scores on self-blame should, in turn, be expected to predict rumination and catastrophising simultaneously (i.e., in parallel). This is because individuals who engage in self-blame would also be expected to ruminate about the situation to understand their circumstances (Garnefski & Kraaij, 2007). On the other hand, self-blame can lead to catastrophic interpretations of the event because it can trigger feelings of helplessness (Sullivan et al., 1995). Finally, rumination and catastrophising are expected to be predictive of depression scores as both focus thoughts and feelings on negative life events. The current study set out to assess the validity of this proposed pattern of relationships using a statistical mediation model.

Method

Participants

Initially, the study sample consisted of 306 university students. After the data filtering procedure (described underneath), the size of the sample was reduced to 251. Additionally, demographic data were not obtained for 44 participants because of an error in the programming of the testing sequence.[1] The 207 participants for which demographic data were collected are mainly female (both gender and biological sex) undergraduate students who had lived in the United Kingdom for at least 12 months prior to partaking in the study, are not in an intimate relationship, use English as their first language, and have no experience of attending psychotherapy.

Procedure

A range of studies were advertised on an online platform accessible to university students, and our study was among them. After reading brief information about the study, students had to select a link redirecting them to Pavlovia — an online testing platform (Open Science Tools, 2019). Thereafter, they had to read the participant information sheet and consent to take part. After providing consent, all participants completed the Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2007) and the Depression Anxiety Scales (DASS; Lovibond & Lovibond, 1995; more information on both scales below). A one-minute optional rest break was then provided. After this, participants completed the word endorsement phase of the Self-Referent Encoding Task (SRET; Derry & Kuiper, 1981; Dainer-Best et al., 2018), followed by the digit symbol distraction test (DSST; McLeod et al., 1982) for 90 seconds, after which their memory for the adjectives that were presented in the SRET was tested (SRET recall task; Bradley & Mathews, 1983). This was followed by demographic and disturbance items that sought to determine whether partici-

pants had completed the experiment in an undistracting environment (Crossey et al., 2021). Lastly, participants read the debrief section. For successful completion, participants received partial credits towards the total number required to progress through the year. Ethical approval for this research was granted by the University of Birmingham Science, Technology, Engineering and Mathematics Ethical Review Committee.

Measures

Cognitive emotion regulation questionnaire (CERQ; Garnefski & Kraaij, 2007)

The CERQ is a self-rating measure which quantifies nine cognitive emotion regulation strategies. Three of these strategies are considered maladaptive, namely self-blame (attributing negative events to one's own perceived shortcomings), rumination (persistently analysing one's circumstances to understand emotions), and catastrophising (magnifying a situation's severity and perceiving oneself as powerless in it). The authors of the scale found that the remaining strategies (acceptance, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, and blaming others) had no or negative correlations with depression, suggesting they may be adaptive or neutral in their impact. Respondents are asked to respond to 36 self-report questions on a 5-point Likert scale assessing what they think after experiencing a threatening or stressful event. The current research analysed responses to questions measuring self-blame (alpha = 0.75), rumination (alpha = 0.83), and catastrophising (alpha = 0.79), that is, different maladaptive emotion regulation strategies (Garnefski & Kraaij, 2007).

Depression anxiety stress scales (DASS-21; Lovibond & Lovibond, 1995)

The short version of the popular DASS consists of 21 items measuring three psychological characteristics, namely depression, anxiety, and stress. Each subscale consists of seven statements describing psychophysiological experiences. Respondents are asked to indicate on a 4-point Likert scale the frequency of encountering each of the listed experiences over the previous week. Internal consistency of the scale is high with alpha scores ranging from 0.87 to 0.79 (Norton, 2007). The current research analysed responses for depression (alpha = 0.83) as stated in the rationale.

Self-referent encoding task - word endorsement (SRET word endorsement; Derry & Kuiper, 1981; Dainer-Best et al., 2018)

The SRET adjectives endorsement phase consists of a practice sequence and main sequence. The practice sequence consists of 5 emotionally neutral words, whereas the main sequence contains 40 positive (e.g., admired) and 40 negative (e.g., afraid) adjectives as listed in Auerbach et al. (2015). Instructions were presented on-screen throughout the task and asked participants to categorise each adjective

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[1] It is likely that, due to the homogeneity of the targeted sample, the demographics of the sample for which the data was lost did not deviate from those of the correctly collected sample.

as either relevant to self by pressing "p" on the keyboard or not relevant to self by pressing "q". Participants had unlimited time to respond to each adjective. Each response was followed by a 1500 ms interval during which no words were presented. Each word was displayed once only, with one word presented in white font at a time, set against a grey background. Word presentation order was randomised separately for each participant to reduce order effects. The number of remaining adjectives was displayed throughout the task. Responses (i.e., endorsements) and decision times were recorded for later analysis.

Digit symbol substitution task (DSST; McLeod et al., 1982)

Nine abstract symbols paired with corresponding numbers were displayed at the top of a screen for ninety seconds. The corresponding countdown timer was displayed in the top right corner. During that time, the symbols were displayed at random, one at a time, in the centre of the screen. The participants were instructed to promptly press the number key corresponding with the symbol at which point the symbol was replaced with another one. The task has been used in research elsewhere to investigate associative learning. The DSST was used as a distraction task in the present study, which was responsible for inducing a time delay between the main SRET sequence and the SRET recall task.

Self-referent encoding task - word recall (SRET recall; Bradley & Mathews, 1983)

In this task, participants were asked to recall as many words from the main SRET sequence in three minutes as possible and write these into a text box, separating each adjective with a comma. The instructions were displayed above the text box for the duration of the task. A countdown timer was presented in the top right hand corner of the screen.

Data analysis

The data were extracted, filtered, and analysed using RStudio software (RStudio Team, 2020) and tidyverse software (Wickham, 2019). To ensure the reliability of responses for the SRET, button-press responses with latencies less than 200 ms or more than three median absolute deviations (MADs) from the median response time (for the sample) were excluded from further analysis. A participant's data were also excluded from the analysis altogether if more than 10 % of their response latencies fell under 200 ms or more than 15 % of these were either less than 200 ms or more than three MADs from the median. The number of correctly recalled positive and negative adjectives was calculated and stored in dedicated variables. The integrated R language boxplot function detected no outliers in SRET word endorsement, recall, and the remaining psychological variables of interest. Lastly, participants who indicated that they were "very disturbed" or who reported completing the experiment on a handheld device in the disturbance questionnaire, were excluded from the analysis (see also

Crossey et al., 2021). The original sample size was 306; the data filtering procedure reduced the sample size to 251.

The independent variables, the SRET word endorsement composite and the word recall composite, were derived by subtracting the count of negative words from the positive words in the self-referent and recall tasks, respectively. Each variable reflects the balance of positive and negative words endorsed and recalled. Generally, higher scores indicate a stronger tendency towards positive self-referencing and better memory recall of positive words.

Hayes PROCESS R based macro (model 81; Hayes, 2022) was used to perform two mediation analyses, one with SRET word endorsement (indexing self-reference bias) and one with SRET word recall (indexing memory bias), each set as independent variables. Both models ultimately predicted depression scores. Model 81 includes three mediators connected by serial and parallel pathways. The first of the mediators (self-blame) impacts and is serially linked to the remaining two, parallel mediators (rumination and catastrophising). Figs. 1 and 2 graphically illustrate the sequential chains of relationships. The model was set to calculate the indirect and direct effect sizes, covariance coefficients for all variables, and to account for heteroscedasticity (HC3; Long & Ervin, 2000).

Percentile confidence intervals were calculated for the indirect effects using 5000 bootstrap sampling cases. Lower and upper percentile bands were set to 2.5th and 97.5th (i.e., 95 % CI). Indirect pathways were deemed robust when confidence intervals did not include zero. The current findings related to indirect effects are discussed based on the outcomes of the bootstrapping procedure as advised by Igartua and Hayes (2021). The authors argue that the bootstrapping approach does not suffer from assumptions of the normal theory approach, whereby the latter unrealistically assumes the normality of the sampling distribution of the indirect effects. However, the authors of the current paper decided to include statistical information about both approaches to also confirm the significance of relationships between specific variables.

Results

Sample characteristic

For the experimental sample, the mean scores for all variables, except catastrophising, were within one standard deviation of the previously reported normative scores. Scores for catastrophising were notably higher than the respective normative values. The values shown in Table 1 suggest that the current sample may consist of individuals with a poorer psychological presentation than university students in the Netherlands and the United States of America.

Mediation analysis of direct and indirect effects between word endorsement and depression

Direct pathway analysis
Values shown in Table 2 indicate that the direct effect of SRET word endorsement on depression scores is significant. Meaning that individuals who endorsed few positive and
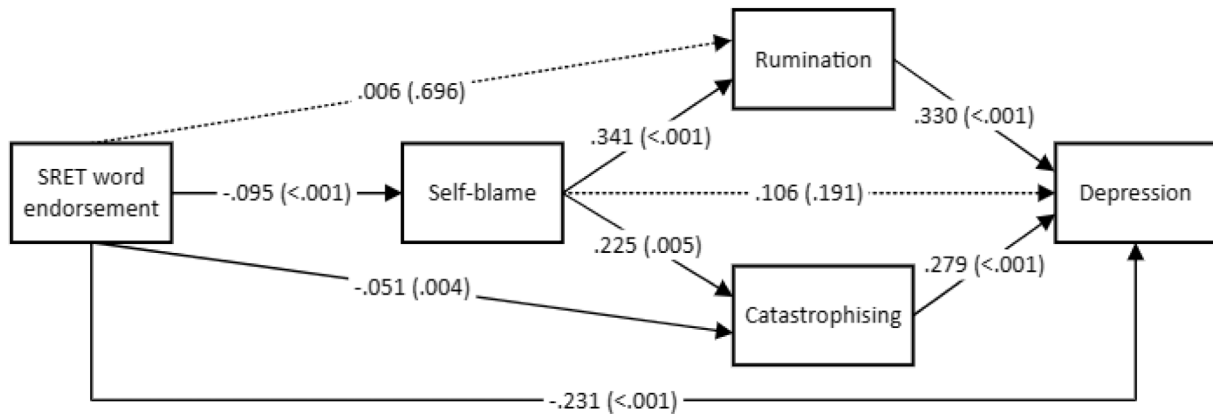
Fig. 1   Mediation by Self-Blame, Rumination, and Catastrophising in SRET Word Endorsement Effects on Depression. *Note:* Solid lines represent significant relationships. Half dash lines represent non-significant relationships. The values correspond with those listed in Table 2 and represent the strength of coefficients and p-values (in parentheses).
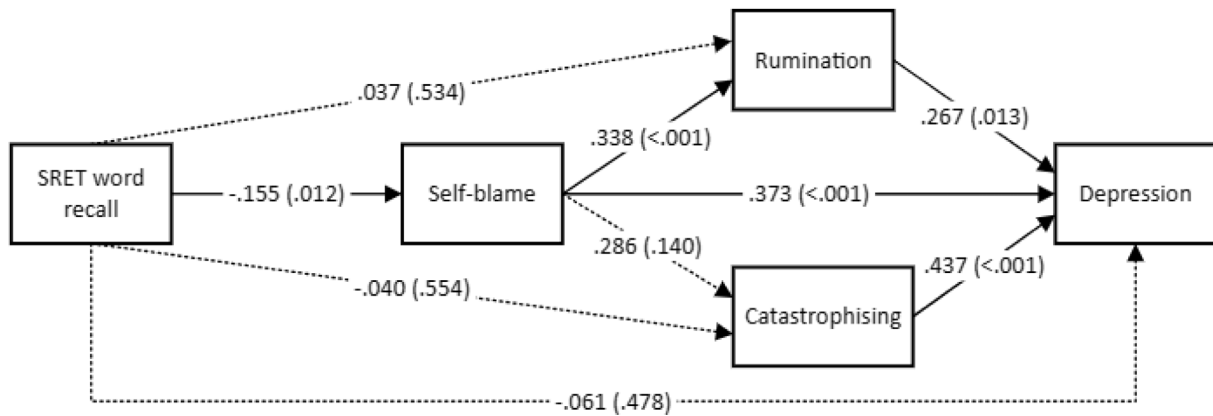
Fig. 2   Mediation by Self-Blame, Rumination, and Catastrophising in SRET Word Recall Effects on Depression. *Note:* Solid lines represent significant relationships. Half dash lines represent non-significant relationships. The values correspond with those listed in Table 4 and represent the strength of coefficients and p-values (in parentheses).

Table 1   Psychological characteristics of the sample.

Psychological Characteristics	Descriptive Statistics		Normative Values	
	M	*SD*	*M*	*SD*
SRET				
Negative words endorsed	9.311	7.594	5.41	5.36
Positive words endorsed	22.446	6.856	20.38	7.09
Endorsement Composite	13.135	11.433	NA	NA
Negative words recall	4.705	3.973	2.81	2.91
Positive words recall	6.649	4.699	7.39	3.42
Recall Composite	1.944	2.923	NA	NA
DASS-21				
Depression	8.570	4.893	4.27	4.32
CERQ				
Self-blame	12.873	3.091	9.9	3.2
Rumination	14.980	2.824	11.2	3.8
Catastrophising	10.968	3.156	6.2	2.6

Note: Normative values taken from: SRET — university students in the USA (Dainer-Best et al., 2018); DASS-21 — university students in the USA (Norton, 2007); CERQ — university students in the Netherlands (Van den Berg et al., 2018). The Endorsement and Recall Composite variables were calculated by subtracting the number of negative words from the number of positive words obtained during the self-referent and recall tasks, respectively. NA — Not available.

Table 2 Regression Coefficients, Standard Errors, and Model Summary for Models Using SRET Word Endorsement Composite as IV.

Antecedent	Consequent										
	M1 (self-blame)			M2 (rumination)			M3 (catastrophising)			Y (DASS depression)		
	Coeff.	SE (HC3)	P	Coeff.	SE (HC3)	p	Coeff.	SE (HC3)	p	Coeff.	SE (HC3)	p
X (SRET word endorsement)	−0.095	0.016	<0.001	0.006	0.016	0.696	−0.051	0.017	0.004	−0.231	0.020	<0.001
M1 (self-blame)	—	—	—	0.341	0.068	<0.001	0.225	0.079	0.005	0.106	0.081	0.191
M2 (rumination)	—	—	—	—	—	—	—	—	—	0.330	0.085	<0.001
M3 (catastrophising)	—	—	—	—	—	—	—	—	—	0.279	0.079	<0.001
Constant	14.12	0.290	<0.001	10.50	1.022	<0.001	8.739	1.145	<0.001	2.220	1.597	0.165
	$R^2 = 0.123$			$R^2 = 0.133$			$R^2 = 0.111$			$R^2 = 0.500$		
	$F_{(HC3; 1, 249)} = 32.377, p <.001$			$F_{(HC3; 1, 248)} = 13.087, p <.001$			$F_{(HC3; 1, 248)} = 12.569, p <.001$			$F_{(HC3; 4, 246)} = 78.213, p <.001$		

Note: HC3 = Heteroscedasticity correction (Long & Ervin, 2000).

many negative words (strong self-reference bias) can be characterised as having prevalent negative beliefs about themselves (score higher on depression) even when controlling the statistical effects of the mediators (maladaptive emotion regulation). This finding also suggests that other factors may play a role.

Indirect pathway analysis

Results of the indirect pathway analysis as shown in Table 2 indicate a significant influence of mediators on the link between SRET word endorsement and depression. Individuals with strong self-reference bias tend to frequently blame themselves for their unfavourable situation (self-blame). Consequently, this tendency increases the possibility of both excessive dwelling on the situation (rumination) and exaggerating and feeling helpless about a situation (catastrophising) leading to stronger symptoms of depression. Hence, a strong self-reference bias can elevate maladaptive emotion regulation strategies which ultimately exacerbate depressive characteristics.

Bootstrapping analysis of indirect paths

Results of the bootstrapping analysis, shown in Table 3, further support the notion that negative self-referent bias can elevate self-blame, which in turn can impact rumination and catastrophising. The two latter variables also determine scores on depression. However, catastrophising can act as a standalone mediator, whereas the remaining emotion regulation strategies cannot.

Mediation analysis of direct and indirect effects between word recall and depression

Direct pathway analysis

Contrary to expectations, the direct effect of SRET word recall on depression scores is not significant, as depicted in Table 4. Hence, it cannot be said that individuals who recall few positive and many negative words (strong negative memory bias) can be characterised as having prevalent negative self-beliefs (score higher on depression) even while holding the statistical effects of the mediators constant (maladaptive emotion regulation).

Indirect pathway analysis

The indirect relationship between SRET word recall and depression scores is significantly and sequentially mediated by self-blame and rumination. In other words, a stronger negative memory bias leads to more frequent use of blaming oneself for an unfavourable personal situation as an emotion regulation strategy (self-blame). Consequently, greater levels of self-blame increase the likelihood of rumination over the situation as an emotion regulation strategy, leading to increased depression symptomatology. Contrary to expectations, no significant links were found between these same mediators and catastrophising.

Bootstrapping analysis of indirect paths

Results of the bootstrapping analysis shown in Table 5 support a chain of relationships involving memory bias, self-blame, simultaneous rumination and catastrophising, and

Table 3 Partially Standardised Bootstrapping Values for Indirect Effects of SRET Word Endorsement Composite on Depression.

Path Index	Variables in Path	Effect	BootSE	BootLLCI	BootULCI
Ind1	X -> self-blame -> Y	−0.010	0.008	−0.028	0.004
Ind2	X -> rumination -> Y	0.002	0.005	−0.008	0.013
Ind3	X -> catastrophising -> Y	−0.014	0.007	−0.030	−0.004
Ind4	X -> self-blame -> rumination -> Y	−0.011	0.004	−0.019	−0.004
Ind5	X -> self-blame -> catastrophising -> Y	−0.006	0.003	−0.012	−0.001

Note: 5000 bootstraps, X = SRET word endorsement, Y = DASS depression, Ind = indirect path.

finally depression. However, only self-blame can act as a standalone mediator, whereas the remaining emotion regulation strategies cannot.

Discussion

The current study set out to explore the mediational role of maladaptive cognitive emotion regulation strategies in the sequential relationship between self-reference and memory biases, and self-reported depression scores. Results of two, conceptually different mediation analyses, support the notion that these biases exacerbate self-blame, which in turn is serially linked to both rumination and catastrophising. Furthermore, both rumination and catastrophising influence self-reported scores on depression. These findings are consistent with previously published research suggesting that depression is correlated with cognitive biases and maladaptive emotion regulation strategies (Dozois & Beck, 2008; Garnefski & Kraaij, 2007; Sullivan et al., 1995).

Previously published research suggests that self-referent and memory bias can in combination precede the occurrence and recurrence of depression in depressed adults (LeMoult et al., 2017). The current study supports these findings by indicating that self-blame, rumination, and catastrophising play a substantial role in the maintenance of depression. Interestingly, the direct relationship between these biases and depression was found only in the number of words endorsed, not in the number of words recalled. This suggests that memory bias might not contribute to the persistence of depression, contrary to previous suggestions. Instead, the relationship appears to be mediated by self-blame, rumination, and catastrophising.

Development and maintenance of depression can be characterised as a self-perpetuating system. Negative self-schemas develop through lifetime adversity and form a cognitive bias through which people attend, interpret, and encode information (Dozois & Beck, 2008; Everaert & Koster, 2020). Cognitive bias tests can be used to index negative self-schemas and provide insights into recipients' perceptions of personal qualities (Dainer-Best et al., 2018). The proportional increase of perceived negative personal qualities over positive personal qualities can result in a belief of personal inadequacy to cope with life events, in other words self-blame. This can aggravate repetitive attempts to understand experiences associated with the situation (rumination; Garnefski & Kraaij, 2007) and feelings of helplessness — a core component of catastrophising (Sullivan et al., 1995). In turn, rumination and catastrophising focus thoughts and feelings on negative life events — a tendency

which constitutes a predominant symptom of depression. This creates a vicious cycle where depressive thoughts perpetuate negative self-schema, worsening the condition. Breaking this cycle is essential to prevent the exacerbation of depression.

Clinical implications

Therapists must often balance the feasibility and likely effectiveness of the methods that form the basis of possible interventions. Cognitive Behaviour Therapy (CBT) comprises various methods of intervention and is often considered to be the gold standard for depression treatment (Butler et al., 2006). It works on the principle that maladaptive thoughts, a type of cognition, can be volitionally modulated in order to reduce their, often deleterious, impact on mental health (Westbrook et al., 2011). Previously published research highlights that cognitive emotion regulation strategies can also be subject to volitional control through mental and physical effort (Gillespie et al., 2018). Hence, in accordance with the current findings, depressed clients experiencing self-referent and memory bias may benefit from interventions targeting maladaptive emotion regulation strategies. However, the effectiveness of this targeted approach should be tested in future research.

Moreover, the present research suggests that the therapeutic focus on bias, for example via the implementation of Cognitive Bias Modification approaches, may not be effective for all types of biases (see also Fodor et al., 2020; Mennen et al., 2019). Therefore, treatment efforts should be directed at cognitions that underpin self-blame and other maladaptive strategies, using Cognitive Behaviour Therapy for instance. Future studies should investigate whether targeting emotion regulation directly is more effective than addressing biases.

How to treat self-blame in depression

The current findings suggest that self-blame can sequentially exacerbate other sub-optimal strategies and depression directly. Due to this propensity, placing a priority on addressing self-blame may be treatment-effective. CBT therapists can use strategies which increase peoples' doubts about maladaptive convictions (Westbrook et al., 2011). Specifically, the client can be encouraged to entertain and pseudo-experimentally test alternative explanations to an encountered dilemma. For example, a study using Mindfulness-Based-Cognitive-Therapy promoted consideration of the role others play in the emergence of unfavour-

Table 4 Regression Coefficients, Standard Errors, and Model Summary for Models Using SRET Word Recall Composite as IV.

	Consequent											
	M1 (self-blame)			M2 (rumination)			M3 (catastrophising)			Y (DASS depression)		
Antecedent	Coeff.	SE (HC3)	P	Coeff.	SE (HC3)	p	Coeff.	SE (HC3)	p	Coeff.	SE (HC3)	p
X (SRET word recall)	−0.155	0.061	0.012	0.037	0.060	0.534	−0.040	0.067	0.554	−0.061	0.086	0.478
M1 (self-blame)	—	—	—	0.338	0.065	<0.001	0.286	0.075	0.140	0.373	0.098	<0.001
M2 (rumination)	—	—	—	—	—	—	—	—	—	0.267	0.107	0.013
M3 (catastrophising)	—	—	—	—	—	—	—	—	—	0.437	0.097	<0.001
Constant	13.17	0.241	<0.001	10.549	0.919	<0.001	7.358	0.986	<0.001	−4.942	1.711	0.004
	R^2 = 0.022			R^2 = 0.367			R^2 = 0.083			R^2 = 0.256		
	$F_{(HC3; 1, 249)}$ = 6.385, p =.012			$F_{(HC3; 1, 248)}$ = 13.402, p <.001			$F_{(HC3; 1, 248)}$ = 7.621, p <.001			$F_{(HC3; 4, 246)}$ = 18.097, p <.001		

Note: HC3 = Heteroscedasticity correction (Long & Ervin, 2000).

able events (Williams et al., 2020). The change of attribution from self to others was coupled with reductions in activity of the anterior cingulate, a region of the brain associated with emotional processing. Furthermore, there is evidence to suggest that psychological interventions coupled with biofeedback approaches may be particularly effective in reducing self-blame in depressed clients (Jaeckle et al., 2021). These findings were also coupled with expected changes in brain activity. It may be advisable to treat self-blame by helping clients to direct their blame appropriately to relevant others, perhaps linking this approach with tailor-made biofeedback treatment.

Limitations

This study has a number of limitations arising from the fact that it explored the somewhat complex relationships between the psychological phenomena that influence depression. Although the current study explores a series of complicated relationships between various psychological characteristics, there remain various limitations. For example, the link between schemata and self-blame is theorised but not directly researched in this study. However, though the absence of such a relationship would not detract from the results of the current investigation, research elsewhere does provide evidence for its existence suggesting that it too may play a role in the above findings (Hedlund & Rude, 1995). There are also a number of maladaptive (e.g., cognitive) strategies that were not measured by the CERQ and not included in the above mediational model (Gratz & Roemer, 2004). Controlling for the effects of other strategies and psycho-bio-social factors would provide a more comprehensive overview of the mechanisms responsible for depression.

A non-clinical sample was used in the present study. Interestingly, as our descriptive statistics show, the depression levels reported for this sample were higher than the normative values making it, arguably more in-keeping with clinical samples than would otherwise be the case. However, the participants may have chosen to participate primarily to fulfil requirements for university credits, rather than due to a direct interest or personal relevance of the study. This aspect of self-selection could have influenced the sample's characteristics. Lastly, the current findings are based on two separate mediation analyses, one for each type of cognitive bias. Everaert and Koster (2020) propose that cognitive biases may act in combination to exacerbate depressive symptoms. Interestingly, the lack of a direct link between memory bias and depression is consistent with the view that it evokes depression in concert with other factors. Future research into the mechanisms that are responsible for depression should seek to expand the mediation model developed in this study, by including additional mediators and introducing moderators from bio-psycho-social literature.

In conclusion, this study sheds light on the complex interplay between maladaptive cognitive emotion regulation strategies, self-reference, memory biases, and depression. Our findings suggest that self-blame, rumination, and catastrophising significantly contribute to the maintenance of depression, possibly more than memory

Table 5 Partially Standardised Bootstrapping Values for Indirect Effects of SRET Word Recall Composite on Depression.

Path Index	Variables in Path	*Effect*	*BootSE*	*BootLLCI*	*BootULCI*
Ind1	X -> self-blame -> Y	−0.058	0.028	−0.120	−0.010
Ind2	X -> rumination -> Y	0.010	0.019	−0.021	0.057
Ind3	X -> catastrophising -> Y	−0.017	0.030	−0.077	0.043
Ind4	X -> self-blame -> rumination -> Y	−0.014	0.008	−0.032	−0.002
Ind5	X -> self-blame -> catastrophising -> Y	−0.019	0.010	−0.043	−0.003

Note: 5000 bootstraps, X = SRET word recall, Y = DASS depression, Ind = indirect path.

biases alone. The efficacy of CBT in addressing these maladaptive strategies, particularly self-blame, is underscored. While limitations such as the non-clinical nature of our sample and the self-selection bias of participants must be acknowledged, these findings provide a valuable foundation for developing more nuanced and effective treatment approaches for depression.

During the preparation of this work, the author(s) used ChatGPT 4 in order to improve readability and language. After using this tool/service, the author reviewed and edited the content as needed and took full responsibility for the content of the publication.

CRediT authorship contribution statement

Artur Brzozowski: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Writing — original draft, Writing — review and editing. Benjamin Philip Crossey: Conceptualization, Methodology, Writing — review and editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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