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**Retrieval-induced forgetting in repressors, defensive high anxious, high anxious and
low anxious individuals**

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Abstract

Previous research has indicated that repressors forget more negative memories which may be due to enhanced inhibitory abilities. To investigate this issue the retrieval practice paradigm was modified for use with neutral and negative personality traits. In Experiments 1 and 2, participants chose neutral and negative traits which were self descriptive and then performed retrieval practice on the neutral traits. Repressors and low anxious participants were found to demonstrate forgetting of negative traits with repressors forgetting more negative traits than low anxious participants. In Experiment 2 the inhibitory account was tested by comparing retrieval practice with re-presentation. Retrieval practice led to forgetting but re-presentation did not. In Experiment 3 forgetting of neutral traits was evident in the repressors and low anxious groups but repressors did not exhibit increased forgetting. In Experiment 4 the cue independent method was used to examine inhibition for neutral material. All groups demonstrated forgetting but repressors did not demonstrate enhanced inhibition. These findings indicate that repressors demonstrate enhanced forgetting only for self referential negative information.

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During the course of our lives we are confronted by traumatic events and threats to our sense of self. It is becoming increasingly clear that different individuals react to such threats in different ways with some individuals showing high levels of resilience, moving on from the threat relatively quickly and with no apparent disruption to their life, while others exhibit signs of distress and depression and find it difficult to function on a day to day basis. On the other hand, others suffer for a brief period of time while some suffer for more protracted periods of time or more intensely (Bonanno, 2004, 2005).

One such coping strategy for dealing with personal threats is repressive coping. Repressive coping is a habitual coping style and is viewed as a long-term trait like phenomenon that reflects an avoidant processing style (Byrne, 1964; Weinberger, Schwartz, & Davidson, 1979). Repressors report low levels of anxiety, despite being physiologically reactive, but high levels of defensiveness (Coifman, Bonanno, Ray, & Gross, 2007; Pauls & Stemmler, 2003).

It has been suggested that avoidant coping strategies derive from a desire to protect the self (Sherman & Cohen, 2002). Consistent with this view repressive coping is most likely to manifest itself in situations that threaten the self (e.g., Barger, Kircher, & Croyle, 1997; Pauls & Stemmler, 2003). For example, repressors show biased recall from emotional events when given negative feedback but only when the link between feedback and recall is made explicit (Mendolia, Moore, & Tesser, 1996). In addition, memory performance was found to decline in repressors in the face of evaluations of failure (Mendolia, 1999). These findings suggest that repressive coping occurs as a means of protecting the self from threatening information by maintaining low levels of negative affect (Derakshan & Eysenck, 1999; Weinberger & Davidson, 1994).

Repressive coping is also thought to occur in an automatic manner that is relatively distinct from intentional avoidant behaviours such as thought and emotional suppression (e.g., Myers, Vetere, & Derakshan, 2004; Wegner, 1994). For example, in dichotic listening tasks, which measure automatic biases in attention, repressors exhibit greater ability to attend away from threatening stimuli (Bonanno, Davis, Singer, & Schwartz, 1991). Likewise, a similar pattern occurs on Stroop tests (Jansson, Lundh, & Oldenburg, 2005). Conversely, repressors do not differ from nonrepressors on indices of intentional emotional control or avoidance (Bonanno et al., 1995; Myers et al., 2004).

In the past repressive coping has typically been viewed as a maladaptive way of coping with threatening and stressful situations (Schwartz, 1990), and repressive coping can be associated with poorer long-term health outcomes (Jensen, 1987). However, more recently, repressive coping has been associated with resilience in the face of ill health. For example, following a myocardial infarction repressors showed less acute stress disorder and post-traumatic symptoms than nonrepressors suggesting that repressive coping may act as a stress buffer (Ginzburg, Solomon, & Bleich, 2002). Likewise, repressive coping has been found to be associated with lower self reported pain and depression in lung cancer outpatients (Prasertsri, Holden, Keefe, & Wilkie (2011), and fewer symptoms of grief and depression in the bereaved (Bonanno et al., 1995, 1999; Bonanno & Field, 2001).

Despite the positive contribution to overcoming ill health repressive coping is also associated with memorial costs. Repressors have been found to have impaired memory performance on certain tasks such as reporting fewer negative childhood and adult memories (Davis, 1987; Davis & Schwartz, 1987; Myers & Brewin, 1994), repressors

take longer to retrieve negative memories but not positive memories (Myers & Brewin, 1994; Myers, Brewin, & Power, 1992; Myers & Derakshan, 2004), and the age of their first negative memory is significantly older in repressors (Myers & Brewin, 1994). Similarly, when repressors are asked to encode negative information self referentially they show impaired memory performance in comparison to nonrepressors (Myers & Brewin, 1995).

It has been suggested that repressors tend to report summarised accounts of personal memories which lack contextual detail as a way of avoiding negative emotions associated with negative, distressing or traumatic memories (Singer & Salovey, 1993). Over time, and with much practice, this avoidance develops into a pervasive overgeneral cognitive style. Consistent with this theory, repressors show overgeneral memory to personal events (Blagov & Singer, 2004), and suggests that repressors avoid unwanted affective responses by avoiding thinking about details from emotional events.

Repressors also show enhanced abilities to suppress their most anxious memory in the short-term; that is, they show very few intrusions during the thought suppression phase and very few thoughts in the post-suppression phase (Barnier, Levin, & Maher, 2004; Geraerts, Merckelback, Jelicic, & Smeets, 2006), although a small rebound effect has been detected by others but which is significantly smaller than for nonrepressors (Geraerts, Merckelbach, Jelicic, & Haberts, 2007). This superior suppression ability appears to be related to working memory capacity with repressors exhibiting a larger working memory capacity than nonrepressors (Geraerts et al., 2007). It has, however, been suggested that there are long-term costs to this enhanced suppression skill. After a 7

day interval repressors had more thoughts about their anxious memory than their nonrepressor counterparts (Geraerts et al., 2006).

One mechanism that has been suggested to underlie repressors suppression abilities is retrieval inhibition and may indicate that repressors have enhanced inhibitory abilities (Myers, Brewin, & Power, 1998; Myers & Derakshan, 2004). On the list method directed forgetting paradigm repressors have been found to be better than nonrepressors at forgetting negative self descriptive information (Myers et al., 1998; Myers & Derakshan, 2004) suggesting that repressors are better at inhibiting negative material than nonrepressors. Similarly, using the Think/No-think task, Hertel and McDaniel (2010) have found that only repressors benefit from positive distracters that were given to participants during the suppression phase to aid the forgetting of negative information. This finding is again suggestive of repressors having a superior ability to inhibit negative material.

Recently the ability of the directed forgetting paradigm to measure retrieval inhibition has been questioned. It has been suggested that poorer memory for List 1 items may be due to the context at recall being a better match to the context at encoding of List 2 items more so than List 1 items; that is, the forget cue leads to individuals to establish a new context after encoding List 1 items which ultimately leads to poorer recall of List 1 items due to a mismatch between encoding and retrieval contexts. To examine this issue, Sahakyan & Kelley (2002) had participants imagine what they would do if they were invisible following encoding of List 1 items. They found forgetting of List 1 items following the internal context manipulation that was equal to that found with a forget cue.

This suggests that directed forgetting effects can be due to a change of internal context rather than retrieval inhibition.

There is, however, another method of measuring retrieval inhibition; that is, the retrieval practice paradigm (Anderson, Bjork, & Bjork, 1994). In this paradigm participants are presented with word pairs drawn from different categories (e.g., FRUIT- apple, orange, banana, pear; BIRD- blackbird, robin, pheasant, swallow). In the retrieval practice phase participants are asked to retrieve half the items from half the categories (i.e., FRUIT-ap____: FRUIT-or____). Retrieval practice leads to the production of three item types: practiced items from practiced categories (i.e., Rp+ items; e.g., apple, orange); unpracticed items from practiced categories (i.e., Rp- items; e.g., banana, pear); and unpracticed items from unpracticed categories (i.e., Nrp items; e.g., BIRD category). Following a distracter task participants are cued to retrieve all items from all categories. Retrieval practice typically produces two effects. Firstly, retrieval practice improves memory for practiced Rp+ items in comparison to Nrp baseline items (i.e., retrieval practice effect). Secondly, retrieval practice leads to poorer memory for unpracticed Rp- items in comparison to Nrp items. This latter effect is known as retrieval-induced forgetting.

It has been suggested that retrieval-induced forgetting may be due to inhibitory processes. During retrieval practice Rp- items compete for retrieval with the Rp+ items leading to interference. To resolve this retrieval competition inhibitory processes are activated and targeted at the Rp- items reducing their level of activation below baseline levels (e.g., Anderson et al., 1994; Anderson & Spellman, 1995; Saunders & MacLeod, 2006).

Evidence for inhibition comes from cue-independent studies. Inhibitory theories propose that the memorial representation of the Rp- items is actively inhibited. This means that if a new cue (i.e., independent cue) is used at recall that differs from that used during retrieval practice the Rp- item will still fail to be recalled. Non-inhibitory theories, conversely, propose that interference builds up between the retrieval practice cue and the Rp- item. When a new cue is used at test it will circumvent this interference and the Rp- item will be retrieved. Findings indicate that when independent cues are used at test retrieval-induced forgetting is still found (Anderson & Spellman, 1995; MacLeod & Saunders, 2005; Saunders & MacLeod, 2006) indicating that the memorial representation of the Rp- item is inhibited rather than blocked through interference (but see Camp, Pecher, & Schmidt, 2005, 2007; Camp, Pecher, Schmidt, & Zeelenberg, 2009; Perfect et al., 2004; Williams & Zacks, 2001).

Further evidence for inhibition comes from the finding that only strong competitors are subject to retrieval-induced forgetting (Anderson et al., 1994). Strong competitors are likely to come to mind during retrieval practice and interfere with the retrieval of the target items. Inhibitory processes are, thus, exerted to resolve this competition and decrease the activation levels of these items. Weak competitors, on the other hand, are unlikely to come to mind during retrieval practice and therefore create little interference. Thus, there is no need to inhibit these items as there is little retrieval competition to resolve.

Finally, retrieval-induced forgetting is only activated in response to retrieval; re-presentation does not produce the effect (Anderson, Bjork, & Bjork, 2000). It has been suggested that retrieval practice activates the target items plus related competitors and

these competitors create competition at retrieval resulting in interference. Inhibitory processes are activated to resolve this competition. Re-presentation, on the other hand, re-presents the target items and it is likely that sufficient cue-specific information is presented to allow for access to the target items without activating the competing items. Thus, inhibitory processes are not required during re-presentation as there is little retrieval competition to resolve. Recently, however, Raaijmakers and Jakab (2012) have tested the retrieval versus re-presentation issue and have found that re-presentation can lead to retrieval-induced forgetting. One issue here may be the form that re-presentation takes. Anderson and colleagues (2000) and Raaijmakers and Jakab re-presented the Rp+ item and participants were required to retrieve the category cue name. This may be an important feature of re-presentation as the spreading inhibition account of retrieval-induced forgetting proposed by Saunders and MacLeod (2006) suggests that retrieval of the category cue is likely to activate related concepts, raise their level of activation and lead to competition among activated concepts. Support for this account comes from the finding by Saunders, Kosnes, and Fernandes (2009) that re-presentation that contains covert retrieval can lead to retrieval-induced forgetting. On the other hand, re-presentation of the Rp+ item without retrieval of the category cue should be less likely to lead to retrieval-induced forgetting as it re-presents specific cue related content to allow for the specific retrieval of the Rp+ item without activating Rp- items to competitive levels (e.g., Sharman, 2011).

Although evidence for the inhibitory theory of retrieval-induced forgetting is gradually increasing alternative noninhibitory theories have been proposed. These accounts suggest that the retrieval practice of Rp+ items strengthens these items and their

retrieval early in the recall list leads to them blocking later recall of the weaker Rp- items (MacLeod et al., 2003; Perfect et al., 2002). However, retrieval-induced forgetting has been found when Rp- items are outputted before Rp+ items (e.g., Anderson et al., 1994; Anderson & Bjork, 1994). While the debate concerning inhibitory versus noninhibitory processes continues, with proponents of either side finding evidence for their favoured theory, it is likely that both processes contribute to retrieval-induced forgetting. It is possible that the likelihood of finding evidence for one process over the other is dependent on the specific conditions present at study, retrieval practice and recall.

Given the prevalence of inhibitory processes in long-term memory (e.g., Barnier, Hung, & Conway, 2004; Ciranni & Shimamura, 1999; MacLeod, 2002; Sharman, 2011), and repressors expertise in suppressing negative material, it may be the case that repressors show enhanced retrieval-induced forgetting but only for negative information. For repressors, negative memories may constitute “strong” memories that are highly competitive. Specifically, strong competitors, as measured via taxonomic strength, have been found to be particularly susceptible to retrieval-induced forgetting (Anderson et al., 1994) because they create heightened levels of retrieval competition between target and competitors. For repressors, negative memories may be particularly high in retrieval competition leading to the possibility that if inhibitory control failed the negative memories would surface within conscious awareness – a situation which repressors are likely to avoid at all costs. If this is the case then repressors may show enhanced retrieval-induced forgetting for negative information particularly that which is self threatening. Possible self threatening information could include self descriptive personality traits. Repressors may find negative information concerning themselves to be

the type of information that they would prefer to avoid thinking about. To avoid this information from entering conscious awareness repressors may be particularly likely to inhibit it.

To investigate whether repressors are experts in inhibitory control a series of experiments were designed. In Experiments 1-2 participants viewed a series of neutral and negative personality traits and selected the 10 most self referential (i.e., 10 neutral and 10 negative). Participants then performed retrieval practice on the 10 neutral traits that they had selected (i.e., retrieval practice condition) or engaged in an unrelated distracter task (i.e., control, Nrp condition), thus making the 10 self referential neutral traits the Rp+ items and the 10 self referential negative traits the Rp- items. Thus, the paradigm that will be used differs from the typical retrieval practice paradigm whereby the Nrp baseline is usually within subjects. As there is the possibility that inhibition may spread from the negative Rp- items to the Nrp category the design was between subjects; that is, Rp+ and Rp- items were measured in one group of participants and Nrp items were measured in a control group (see also Fernandes & Saunders, in press for a similar technique). Following retrieval practice or distracter participants were cued to recall the 10 neutral and 10 negative self descriptive traits that they selected at the beginning of the experiment.

In Experiment 2 we tested the inhibitory theory of retrieval-induced forgetting by comparing retrieval practice with re-presentation. If repressors demonstrate enhanced inhibitory control of negative information then it will only be manifest in the retrieval practice condition; re-presentation of the self descriptive traits will re-present sufficient

cue related information to allow for their selective retrieval without raising the levels of competition for competing items.

In Experiment 3 and 4 we tested the theory that repressors will only show enhanced inhibitory control for negative information by, first, examining inhibition of neutral traits, and secondly, using the typical retrieval practice paradigm with neutral information using the independent cue method to directly test for inhibition.

EXPERIMENT 1: RETRIEVAL-INDUCED FORGETTING IN REPRESSORS

METHOD

Participants and design

Two hundred and forty participants (104 males, 136 females, *M* age = 22.0 years) volunteered to participate in the study in exchange for course credit. The study had a between subjects design with participants evaluated for repressive coping style leading to four levels: repressor, low anxious, high anxious, and defensive high anxious.

Participants were assigned to one group based on their performance on the STAI- Trait and the Marlowe-Crowne (MC; Crowne & Marlowe, 1960) social desirability scale (e.g., Saunders, Worth, & Fernandes, 2012) as indicated by the criteria used by Weinberger and colleagues (1979). Participants who scored low on the STAI and MC were classified as low anxious, participants who scored low on the STAI but high on the MC were classed as repressors, participants who scored high on the STAI and low on the MC were classed as high anxious, and participants who scored high on the STAI and high on the MC were classed as defensive high anxious. Participants were assigned to their group based a two-thirds split of the data. Participants who scored under 34 (lower bound) on the STAI were

classed as low anxious and participants who scored under 14 (lower bound) on the MC were classed as low defensive. Conversely, participants who scored over 45 (upper bound) on the STAI were classed as high anxious and participants who scored over 18 (upper bound) were classed as high defensive. A second between subjects factor was retrieval practice. There were 21 repressors in the retrieval practice condition and 20 repressors in the control condition, and there were 25 low anxious participants in the retrieval practice condition and 24 participants in the control condition. There were 24 high anxious participants in the retrieval practice condition and 25 participants in the control condition, and, finally, there were 20 high defensive participants in the retrieval practice condition and 21 participants in the control condition. Classification of group membership was assessed after completion of the experiment and, therefore, this is why there are unequal numbers in each group.

The design was between subjects. Participants either engaged in retrieval practice (i.e., Rp+ neutral and Rp- negative items) or worked on anagrams (i.e., Control condition, Nrp items).

Materials and procedure

Participants arrived at the laboratory and were greeted by a female experimenter. Participants first completed the STAI and MC questionnaires before being presented with 50 personality traits – 25 which were negative and 25 which were neutral (see Appendix A). Traits were selected from N.H. Anderson's (1968) likeability scale. The average likeability rating for the negative traits was 159.96 and the average likeability rating for the neutral traits was 383.68. Participants were instructed to choose 10 neutral and 10

negative traits which they thought described themselves. Participants in the retrieval practice condition then performed retrieval practice on the 10 neutral traits (i.e., Rp+ items) that they had selected. This manipulation meant that the 10 negative traits that participants selected constituted the Rp- group. The remaining 15 neutral and 15 negative traits were discarded for each participant. Participants were then presented with a unique word stem consisting of two or three letters that prompted the neutral trait. Participants wrote down their answers. They performed retrieval practice on the 10 neutral traits that they had selected as being self descriptive three times each. In the control group (i.e., Nrp) participants worked on anagrams for 5 minutes. Thus, no relevant retrieval practice was conducted in this condition. On completion, all participants worked on anagrams for a further 5 minutes. Participants then had to recall all 10 negative and 10 neutral self descriptive traits that they had selected at the beginning of the experiment. Participants were presented with a unique word stem for each trait and cued to recall the trait. Negative traits were cued before neutral traits so that any retrieval-induced forgetting of negative traits could not be due to the stronger Rp+ items (i.e., neutral items) blocking access to the weaker negative (i.e., Rp-) items. On completion, participants were thanked, debriefed and dismissed.

Results and discussion

Retrieval practice success rate: The retrieval practice success rate for neutral traits was 70.75% in the repressor group, and 72.25%, 69.45% and 72.95% in the low anxiety, high anxiety and defensive high anxious groups, respectively. No differences in retrieval practice success rates were detected, $F(3, 87) = .44, ns$.

Choice of traits: The average likeability of the neutral traits chosen by the repressor, low anxiety, high anxiety and defensive high anxious groups was 384.39, 384.75, 387.19, and 381.68, respectively. No differences were detected between the groups, $F(3, 176) = .32$, *ns*. The average likeability of the negative traits chosen by the repressor, low anxiety, high anxiety and defensive high anxious groups was 155.89, 156.07, 154.54 and 156.74, respectively. No differences were detected between the groups, $F(3, 176) = .39$, *ns*.

Retrieval practice effect: A 2 (item type: Rp+ neutral or Nrp neutral) x 4 (group: repressor, low anxious, high anxious, or defensive high anxious) between subjects ANOVA was conducted and revealed an effect of item type, $F(1, 172) = 33.47$, $p < .001$, $\eta^2 = .16$, suggesting a difference between Rp+ neutral and Nrp neutral items, see Table 1. No effect of group was detected, $F(3, 172) = 1.32$, *ns*, and no interaction between item type and group was found, $F(3, 172) = .54$, *ns*, suggesting similar facilitation in each group. Follow up independent t-tests confirmed that more Rp+ neutral items were recalled than Nrp neutral items in the repressors group, $t(39) = 2.19$, $p < .05$, $\eta^2 = .11$; low anxious, $t(47) = 3.45$, $p < .001$, $\eta^2 = .20$; high anxious, $t(47) = 2.37$, $p < .05$, $\eta^2 = .11$; and defensive high anxious, $t(39) = 3.55$, $p < .001$, $\eta^2 = .24$.

Retrieval-induced forgetting: A 2 (item type: Rp- negative or Nrp negative) x 4 (group: repressor, low anxious, high anxious, or defensive high anxious) between subjects ANOVA was conducted. It revealed an effect of item type, $F(1, 172) = 5.72$, $p < .02$, $\eta^2 = .03$, suggesting a difference between Rp- negative and Nrp negative items. An effect of

group was also found, $F(3, 172) = 5.30, p < .01, \eta^2 = .08$, indicating that performance varied across groups, and a significant interaction between item type and group was found, $F(3, 172) = 15.48, p < .001, \eta^2 = .21$, indicating that levels of retrieval-induced forgetting differed across groups. Significant retrieval-induced forgetting effects were found in the repressors group (Rp- negative $M = .28$; Nrp negative $M = .64$), $t(39) = -7.32, p < .001, \eta^2 = .58$, and the low anxious group (Rp- negative $M = .46$; Nrp negative $M = .67$), $t(47) = -3.62, p < .01, \eta^2 = .22$. No retrieval-induced forgetting effect, but rather a facilitation effect, was found in the high anxious (Rp- negative $M = .68$; Nrp negative $M = .55$), $t(47) = 1.89, p = .06, \eta^2 = .07$, and in the defensive high anxious group (Rp- negative $M = .69$; Nrp negative $M = .55$), $t(38) = 2.07, p < .05, \eta^2 = .10$.

Do repressors demonstrate more inhibition?: To examine whether repressors demonstrate more retrieval-induced forgetting than low anxious participants a series of independent t-tests were conducted on the data in the retrieval practice condition. It revealed that repressors reported fewer Rp- items than low anxious participants, $t(44) = -3.14, p < .01, \eta^2 = .18$. Conversely, high anxious participants reported more Rp- items than low anxious participants, $t(47) = 3.23, p < .001, \eta^2 = .18$, as did defensive high anxious participants, $t(43) = 3.29, p < .001, \eta^2 = .20$.

In Experiment 1 we found that repressors and low anxious participants demonstrated retrieval-induced forgetting of negative self referential traits but high anxious and defensive high anxious participants demonstrated facilitation of negative traits. In addition, further analysis showed that repressors forgot significantly more negative self referential traits than low anxious participants, while high anxious and

defensive high anxious participants remembered more negative self referential traits than low anxious participants. Given that output order at final recall was controlled so that weaker Rp- items were remembered before stronger Rp+ items, these findings are suggestive of enhanced inhibitory processing in repressors while high anxious and defensive high anxious participants exhibit deficiencies in inhibitory control.

While the findings of Experiment 1 are suggestive of enhanced inhibitory control in repressors the experimental paradigm utilised was not one to directly test inhibition. One possible way of testing for inhibition is to compare retrieval practice with re-presentation. It has been suggested that retrieval-induced forgetting is a retrieval-specific process (Anderson et al., 2000), and that selective retrieval practice activates Rp- items leading them to compete for retrieval. Re-presentation, on the other hand, presents sufficient cue-related information to allow for the specific retrieval of the Rp+ items without activating Rp- items to competitive levels. If this is the case then retrieval-induced forgetting in Experiment 2 should only be found in the retrieval practice conditions, and enhanced inhibition of Rp- items by repressors should also only be present in the retrieval practice condition.

EXPERIMENT 2: DO REPRESSORS DEMONSTRATE ENHANCED RETRIEVAL-INDUCED FORGETTING FOLLOWING RE-PRESENTATION?

METHOD

Participants and design

Two hundred and ninety two (122 males, 170 females, *M* age = 21.9 years) volunteered to participate in the study in exchange for course credit. Participants were naïve of the

aims of the experiment and had not taken part in Experiment 1. Participants were assigned to one group based on their performance on the STAI- Trait and the MC social desirability scale. The same cut off points on the STAI and MC were used as in Experiment 1 leading to an approximate two-thirds split in the data (i.e., highest and lowest scorers). This meant that there were 18 repressors in the retrieval practice and control condition, 20 low anxious participants in the retrieval practice and 22 in the control condition, 19 high anxious participants in the retrieval practice and 21 in the control condition, and 15 high defensive participants in the retrieval practice and control condition. In the re-presentation condition, there were 17 repressors, 20 low anxious participants, 20 high anxious participants, and 14 high defensive participants.

The design was between subjects. Participants either engaged in retrieval practice (i.e., Rp+ neutral and Rp- negative items), or re-presentation (i.e., Rp+ neutral and Rp- negative items) or worked on anagrams (i.e., Control condition, Nrp items).

Materials and procedure

The same materials and procedure as Experiment 1 were used with the inclusion of a re-presentation condition. During re-presentation participants were presented with the neutral traits that they had chosen during the study phase of the experiment. Participants were asked to write down the trait that was shown to them.

Results

Retrieval practice success rate: The retrieval practice success rate for neutral traits in the retrieval practice condition was 71.45% in the repressor group, and 72.35%, 73.65% and

72.95% in the low anxiety, high anxiety and defensive high anxious groups, respectively. No differences in retrieval practice success rates were detected, $F(3, 70) = .04$, *ns*.

Choice of traits: The average likeability of the neutral traits chosen by the repressor, low anxiety, high anxiety and defensive high anxious groups was 382.31, 381.41, 384.07, and 384.19, respectively. No differences were detected between the groups, $F(3, 288) = 1.06$, *ns*. The average likeability of the negative traits chosen by the repressor, low anxiety, high anxiety and defensive high anxious groups was 156.41, 154.00, 156.73, and 156.18, respectively. No differences were detected between the groups, $F(3, 288) = .13$, *ns*.

Retrieval practice effect: A 3 (practice: retrieval, re-presentation or control) x 4 (group: repressor, low anxious, high anxious, or defensive high anxious) between subjects ANOVA was conducted and revealed an effect of practice, $F(2, 208) = 16.38$, $p < .001$, $\eta^2 = .14$, suggesting a difference between Rp+ neutral and Nrp neutral items, see Table 2. No effect of group was detected, $F(3, 208) = .49$, *ns*, and no interaction between practice and group was found, $F(6, 208) = .17$, *ns*, suggesting similar facilitation in each group. Follow up independent t-tests confirmed that more Rp+ neutral items were recalled than Nrp neutral items in the repressors group, retrieval practice: $t(34) = 2.55$, $p < .02$, $\eta^2 = .16$; re-presentation: $t(33) = 2.95$, $p < .01$, $\eta^2 = .21$; low anxious retrieval practice: $t(40) = 2.48$, $p < .02$; $\eta^2 = .13$; re-presentation: $t(40) = 2.21$, $p < .05$, $\eta^2 = .11$; high anxious retrieval practice: $t(38) = 2.41$, $p < .02$, $\eta^2 = .13$; re-presentation: $t(37) = 2.28$, $p < .05$, $\eta^2 = .12$; and defensive high anxious retrieval practice: $t(28) = 2.08$, $p < .05$, $\eta^2 = .13$; re-presentation: $t(28) = 2.74$, $p < .01$, $\eta^2 = .21$.

Retrieval-induced forgetting: A 3 (practice: retrieval, re-presentation or control) x 4 (group: repressor, low anxious, high anxious, or defensive high anxious) between subjects ANOVA was conducted. It revealed an effect of practice, $F(2, 208) = 5.41, p < .01, \eta^2 = .05$, suggesting that practice affected the items in different ways. An effect of group was also found, $F(3, 208) = 6.88, p < .001, \eta^2 = .09$, indicating that performance varied across groups. A significant interaction between practice and group was also found, $F(6, 208) = 8.12, p < .001, \eta^2 = .19$, indicating that levels of retrieval-induced forgetting differed across groups. Follow up independent t-tests found significant retrieval-induced forgetting effects in the retrieval practice condition of the repressors group (Rp- negative $M = .29$; Nrp negative $M = .64$), $t(34) = -6.31, p < .001, \eta^2 = .54$, and the low anxious group (Rp- negative $M = .44$; Nrp negative $M = .65$), $t(40) = -3.63, p < .001, \eta^2 = .25$. No retrieval-induced forgetting effect was found in the retrieval practice condition of the high anxious group (Rp- negative $M = .71$; Nrp negative $M = .64$), $t(38) = 1.12, ns$, and in the defensive high anxious group a facilitation effect was found for Rp- items (Rp- negative $M = .69$; Nrp negative $M = .57$), $t(28) = 2.64, p < .01, \eta^2 = .29$. No retrieval-induced forgetting effects were found following re-presentation: repressors, $t(33) = -.53, ns$; low anxious, $t(40) = -.66, ns$; high anxious, $t(37) = -.03, ns$; and defensive high anxious, $t(28) = .60, ns$.

We also conducted a between subjects ANOVA comparing retrieval-induced forgetting in the retrieval practice and re-presentation conditions for repressor and low anxious participants. They revealed that there was an effect of practice type in the repressor, $F(2, 66) = 22.82, p < .001, \eta^2 = .06$, and in the low anxious group, $F(2, 80) =$

22.44, $p < .01$, $\eta^2 = .03$, indicating that retrieval practice and re-presentation had differential effects on recall.

Do repressors demonstrate more inhibition?: To examine whether repressors demonstrate more retrieval-induced forgetting than low anxious participants a series of independent t-tests were conducted on the data in the retrieval practice condition. It revealed that repressors reported fewer Rp- items than low anxious participants, $t(36) = -2.69$, $p < .01$, $\eta^2 = .17$. Conversely, high anxious participants reported more Rp- items than low anxious participants, $t(39) = 4.23$, $p < .001$, $\eta^2 = .31$, as did defensive high anxious participants, $t(33) = 4.71$, $p < .001$, $\eta^2 = .41$.

In Experiment 2 we directly tested the inhibitory theory of retrieval-induced forgetting by comparing retrieval practice with re-presentation. Retrieval practice led to retrieval-induced forgetting of negative traits but only in the repressor and low anxiety groups; re-presentation did not initiate retrieval-induced forgetting in any group. Repressors were also found to forget more negative traits than low anxious participants, and this finding coupled with the test between retrieval practice and re-presentation, is suggestive of enhanced inhibitory control in the repressor group.

One of the shortcomings of this approach to examining repressors ability to inhibit self referential information is that the negative and neutral items are not counterbalanced in the retrieval practice group; that is, Rp+ items are always neutral and Rp- items are always negative. To address this issue in Experiment 3 we will reverse the negative and neutral items so that Rp+ items are negative and Rp- items are neutral to

examine whether repressors have enhanced retrieval-induced forgetting abilities of neutral material.

EXPERIMENT 3: RETRIEVAL-INDUCED FORGETTING OF NEUTRAL INFORMATION IN REPRESSORS

Participants and design

Two hundred and eighty five participants (129 males, 156 females, M age = 21.3 years) volunteered to participate in the study in exchange for course credit. Participants were naïve of the aims of the experiment and had not taken part in Experiment 1 or 2.

Participants were assigned to one group based on their performance on the STAI- Trait and the MC social desirability scale. The same cut off points on the STAI and MC were used as in Experiment 1 and an approximate two-thirds split of the data was performed. This meant that there were 21 repressors in the retrieval practice condition and 23 in the control condition, 24 low anxious participants in the retrieval practice condition and 22 in the control condition, 24 high anxious participants in the retrieval practice condition and 22 in the control condition, and 19 high defensive participants in the retrieval practice condition and 20 in the control condition.

The design was between subjects. Participants either engaged in retrieval practice (i.e., Rp+ negative and Rp- neutral items), or worked on anagrams (i.e., Control condition, Nrp items).

Materials and procedure

The same materials and procedure as Experiment 1 was used with the exception that negative traits were used during retrieval practice. This means that the Rp+ items are negative and the Rp- items are neutral to examine whether repressors have increased retrieval-induced forgetting for neutral material relevant to the self.

Results

Retrieval practice success rate: The retrieval practice success rate for neutral traits was 71.85% in the repressor group, and 70.55%, 70.35% and 72.75% in the low anxiety, high anxiety and defensive high anxious groups, respectively. No differences in retrieval practice success rates were detected, $F(3, 84) = .25, ns$.

Choice of traits: The average likeability of the neutral traits chosen by the repressor, low anxiety, high anxiety and defensive high anxious groups was 386.01, 385.61, 386.5, and 386.1, respectively. No differences were detected between the groups, $F(3, 171) = .09, ns$. The average likeability of the negative traits chosen by the repressor, low anxiety, high anxiety and defensive high anxious groups was 157.89, 156.06, 156.36, and 157.2, respectively. No differences were detected between the groups, $F(3, 171) = .39, ns$.

Retrieval practice effect: A 2 (item type: Rp+ negative or Nrp negative) x 4 (group: repressor, low anxious, high anxious, or defensive high anxious) between subjects ANOVA was conducted and revealed an effect of item type, $F(1, 168) = 32.55, p < .001, \eta^2 = .16$, suggesting a difference between Rp+ negative and Nrp negative items, see Table 3. No effect of group was detected, $F(3, 168) = .23, ns$, and no interaction between

item type and group was found, $F(3, 168) = .41$, *ns*, suggesting similar facilitation in each group. Follow up independent t-tests confirmed that more Rp+ negative items were recalled than Nrp negative items in the repressors group, $t(42) = 3.79$, $p < .001$, $\eta^2 = .25$; low anxious, $t(44) = 2.57$, $p < .01$, $\eta^2 = .13$; high anxious, $t(44) = 2.74$, $p < .01$, $\eta^2 = .15$; and defensive high anxious, $t(37) = 3.57$, $p < .001$, $\eta^2 = .26$.

Retrieval-induced forgetting: A 2 (item type: Rp- neutral or Nrp neutral) x4 (group: repressor, low anxious, high anxious, or defensive high anxious) between subjects ANOVA was conducted. It revealed an effect of item type, $F(1, 168) = 37.69$, $p < .001$, $\eta^2 = .19$, suggesting a difference between Rp- neutral and Nrp neutral items. No effect of group was found, $F(3, 168) = .48$, *ns*, indicating that performance did not vary across groups, and no interaction between item type and group was found, $F(3, 168) = .44$, *ns*, indicating that levels of retrieval-induced forgetting did not differ across groups. Significant retrieval-induced forgetting effects were found in the repressors group (Rp- neutral $M = .50$; Nrp neutral $M = .60$), $t(42) = -3.11$, $p < .01$, $\eta^2 = .19$, and the low anxious group (Rp- neutral $M = .44$; Nrp neutral $M = .62$), $t(44) = -4.08$, $p < .01$, $\eta^2 = .27$. Retrieval-induced forgetting was also found in the high anxious (Rp- neutral $M = .47$; Nrp neutral $M = .60$), $t(44) = -3.31$, $p < .01$, $\eta^2 = .20$, and in the defensive high anxious group (Rp- neutral $M = .45$; Nrp neutral $M = .55$), $t(37) = 2.05$, $p < .05$, $\eta^2 = .10$.

Do repressors demonstrate more inhibition?: To examine whether repressors demonstrate more retrieval-induced forgetting than low anxious participants a series of independent t-tests were conducted. They revealed no differences between repressors and

low anxious participants in the proportion of Rp- neutral items reported, $t(43) = 1.06$, ns. Likewise, no differences were found between low and high anxious participants in the proportion of Rp- neutral items reported, $t(46) = .54$, ns, or between low anxious and defensive high anxious, $t(41) = .28$, ns.

In Experiment 3 repressors were not found to have enhanced retrieval-induced forgetting abilities for neutral self referential material. Likewise, high anxious and defensive high anxious participants did not have any difficulty in forgetting neutral information.

Although the findings of Experiment 3 indicate that repressors do not have enhanced retrieval-induced forgetting abilities for neutral material we have not tested whether inhibition is involved in the forgetting of neutral material. Rather than repeat Experiment 2 with neutral Rp- items we have instead opted to examine the inhibitory account of retrieval-induced forgetting for neutral information using the cue independent test as this is seen by a number of retrieval-induced forgetting researchers as the “gold standard” for measuring inhibition as it avoids the correlated costs and benefits problem (Anderson & Levy, 2010). It is expected that repressors will show retrieval-induced forgetting for neutral material but that they will not exhibit enhanced forgetting compared to low anxious participants.

EXPERIMENT 4: CUE-INDEPENDENT FORGETTING

Participants and design

One hundred (45 males, 55 females, M age = 21.9 years) volunteered to participate in exchange for course credit. Participants were naïve of the aims of the experiment and had

not taken part in Experiment 1, 2 or 3. The study had a 2 (item type: Rp- and Nrp) x4 (group: repressor, low anxious, high anxious, or defensive high anxious) within subjects design. Participants were assigned to one group based on the same criteria leading to an approximate two-thirds split of the data as that outlined for Experiment 1. This meant that there were 17 repressors, 17 low anxious participants, 16 high anxious participants, and 17 defensive high anxious participants.

Materials and procedure

The materials and procedure were taken from Aslan, Bäuml and Pastötter (2007) with the exception that Green –police was replaced with Green-emerald. Participants were greeted at the laboratory by a female experimenter and asked to study a booklet containing 32 category cue exemplar word pairs presented with each word pair presented on a separate sheet of paper. Participants studied each word pair for 5 seconds each and the order of word pairs was randomized for each participant. After completing the study phase participants moved on to the retrieval practice phase whereby participants were cued to retrieve half of the exemplars (i.e., 2 items) from half of the categories (i.e., 4 categories). Participants were presented with the category cue and the first two letters of the exemplar and given 5 seconds to respond. Participants practiced each item three times. After completing the retrieval practice phase participants worked on an anagram task for 60 seconds. In the recall phase, recall for Rp- and Nrp items were tested using a cued recall procedure. Participants were presented with an independent probe which consisted of a new never before seen cue (e.g., COFFEE – SP_____) along with the first two letters of the target word. Following Aslan and colleagues procedure only Rp- and Nrp items were

tested to prevent stronger Rp+ items blocking access to weaker Rp- items. Participants were given 5 seconds per item.

Results

Retrieval practice success rate: The retrieval practice success rate was 78.25% in the repressor group, and 76.75%, 77.80% and 76.25% in the low anxiety, high anxiety and defensive high anxious groups, respectively. No differences in retrieval practice success rates were detected, $F(3, 63) = .22, ns$.

Retrieval-induced forgetting: A 2 (item type: Rp- or Nrp) x 4 (group: repressor, low anxious, high anxious, or defensive high anxious) within subjects ANOVA was conducted. It revealed an effect of item type, $F(1, 62) = 59.95, p < .001, \eta^2 = .49$, but no interaction between item type and group, $F(3, 62) = .09, ns$, see Table 4, suggesting that levels of retrieval-induced forgetting did not differ across groups. Significant retrieval-induced forgetting effects were found in the repressors group (Rp- $M = .46$; Nrp $M = .70$), $t(16) = -3.89, p < .001, \eta^2 = .49$, the low anxious group (Rp- $M = .45$; Nrp $M = .67$), $t(16) = -5.40, p < .001, \eta^2 = .65$, the high anxious (Rp- $M = .49$; Nrp $M = .70$), $t(15) = -2.86, p < .01, \eta^2 = .35$, and in the defensive high anxious group (Rp- $M = .48$; Nrp $M = .69$), $t(16) = -4.17, p < .001, \eta^2 = .51$.

Do repressors demonstrate more inhibition?: To examine whether repressors demonstrate more retrieval-induced forgetting than low anxious participants an independent t-test was conducted. It revealed no differences in the reporting of Rp- items

between repressors and low anxious participants, $t(32) = .76$, *ns*. No differences were detected between high anxious and low anxious participants, $t(30) = .39$, *ns*, and between defensive high anxious and low anxious participants, $t(32) = .52$, *ns*.

In Experiment 4 we tested repressors' memory abilities; firstly, that repressors only show enhanced forgetting abilities for negative self referential information, and we used the cue independent technique to directly test for inhibition. We found that all participants demonstrated a significant retrieval-induced forgetting effect using the independent cue technique providing further evidence to support this techniques ability to measure inhibition, but we found no evidence of enhanced inhibition in the repressors group or indicators of deficient inhibitory control in the high anxious and defensive high anxious groups.

General Discussion

Previous research has indicated that repressors have enhanced abilities to forget negative material (Myers et al., 1992; Myers & Derakshan, 2004) and increased inhibitory control over emotionally negative and self referent material (Hertel & McDaniel, 2010; Myers et al., 1998). This increased inhibitory control has, however, only been measured in intentional suppression paradigms and doubt has recently been cast over the role of retrieval inhibition in directed forgetting (Sahakyan & Kelley, 2002). The current series of experiments aimed to examine in more detail whether repressors have enhanced inhibitory control over negative self referential information through utilising the retrieval practice paradigm.

Both repressors and low anxious participants demonstrated retrieval-induced forgetting but repressors forgot more negative Rp- items than low anxious participants in Experiments 1 and 2. One reason for the decreased recall of Rp- items in repressors is that negative material may be “stronger” in memory than for low anxious participants. Strong competitors have been previously found to be subject to greater inhibition than weak items (Anderson, Bjork & Bjork, 1994). Negative information may be increasingly competitive in long-term memory in repressors such that it strongly competes with target memories to be retrieved. Should inhibitory control fail the negative memories would surface in conscious awareness – a situation that would be highly unpleasant for such avoidant individuals as repressors. To combat this extensive competition inhibitory processes are activated and suppress the negative memories resulting in fewer memories being reported.

In Experiment 2 the inhibitory theory of retrieval-induced forgetting was tested by comparing retrieval practice with re-presentation. During retrieval practice presentation of the cue causes negative traits to compete for retrieval with the target trait leading to their inhibition. Conversely, re-presentation presents sufficient cue-related information to allow for selective retrieval of the target without activating the negative traits and, thus, inhibitory processes are not activated (Anderson et al., 2000). We found retrieval-induced forgetting following retrieval practice in the repressor and low anxious groups but not following re-presentation. This finding is suggestive that we are activating inhibitory processes in the retrieval practice condition; specifically, that during retrieval practice of neutral traits the negative traits come to mind and are inhibited. We also used a cued recall task that cued negative Rp- items before neutral Rp+ items so that we could

discount the possibility of output interference contributing to the retrieval-induced forgetting effect; that is, stronger Rp+ items blocking access to weaker Rp- items. Thus, we have proved one method of testing the inhibitory theory of retrieval-induced forgetting, and the control of output order so that weaker Rp- items are reported before stronger Rp+ items excludes the possibility of output interference contributing to the retrieval-induced forgetting effect which is a strong non-inhibitory contender.

In Experiments 3 and 4 we tested the theory that repressors only show enhanced inhibitory control for negative self referential information by having participants practice negative Rp+ items (Exp 3) and utilising the independent cue method with neutral material (Exp 4; Hertel & McDaniel, 2010; Myers et al., 1992; Myers et al., 1998; Myers & Derakshan, 2004). We found that repressors demonstrated a significant retrieval-induced forgetting effect but that they did not report fewer Rp- items in comparison to low anxious participants. Thus, repressors increased inhibitory control over negative memories does not extend to neutral material.

The findings of increased inhibitory control in response to negative memories rather than neutral memories suggests that repressive coping is most likely to manifest itself when there is a direct threat to the self (Barger et al., 1997; Pauls & Stemmler, 2003). When confronted by negative emotional material that is self referent repressors suppress this information. Previous research has indicated that repressors intentionally suppress this material to prevent it entering conscious awareness (e.g., Myers et al., 1998; Myers & Derakshan, 2004) but the current findings suggest that negative memories can be removed from awareness through the retrieval process; that is, remembering a neutral memory leads to inhibition of related negative memories. It may even be the case that

inhibitory control is so efficient in repressors that negative memories are stifled before they even enter conscious awareness.

Increased inhibitory control over negative memories in repressors is likely to be due to avoidant coping. Negative memories elicit unwanted negative affect in repressors – a situation which they wish to avoid at all costs. One way to avoid unwanted negative affect is to suppress the memories. With autobiographical memories this may be achieved through retrieving categoric or general memories (i.e., memories which lack specific temporal and contextual detail; Blagov & Singer, 2004), or through suppressing features of the memory or the whole memory in its entirety. It is unlikely, however, that overgeneral memory can account for the current findings. Typically, overgeneral memory is found for positive, negative and neutral autobiographical memories (Williams et al., 2007) whereas the current findings suggest that increased inhibitory control is found only for negative memories. One interesting possibility for future research would be to examine whether mindfulness could overcome this enhanced forgetting of negative self referential information given that mindfulness is incompatible with repression and inhibition. Given that reduced memory for negative self referential information is a form of avoidance, and mindfulness is useful as a technique for overcoming mindfulness, it is possible that it could reduce or even reverse inhibition of negative self referential information.

Although we suggest that inhibitory control over negative self-referential memories in repressors is enhanced, as evidenced by the comparison between retrieval practice and re-presentation in Experiment 2, we urge a note of caution. Recently, the retrieval specificity assumption of retrieval-induced forgetting has been challenged.

Raaijmakers and Jakab (2012) found that re-presentation of neutral word pairs can lead to retrieval-induced forgetting shedding doubt on Anderson and colleagues (2000) original finding. It should be noted, however, that Raaijmakers and Jakab did not control for output order at final recall so it remains a possibility that output interference contributed to the retrieval-induced forgetting effect. Conversely, Sharman (2011) has found that watching an experimenter perform actions on an object, a similar set-up and, perhaps, a more realistic demonstration of re-presentation in action, did not lead to retrieval-induced forgetting although, again, order at final recall was not controlled for (and would be extremely difficult in an object-action paradigm). Only subsequent research, and close inspection of the experimental setup and inhibitory theory, will uncover whether re-presentation does, or does not, lead to retrieval-induced forgetting.

We also found that high anxious and defensive high anxious participants demonstrated facilitation in recall of negative self referential information, and the finding that high anxious participants remembered more negative Rp- items replicates previous findings by Saunders (2012) using the same between subjects paradigm with self referential traits. There has been some contention in the literature as to whether high anxious individuals exhibit a memory bias for self threatening information. While some have found an increase in recall for this type of information (Nugent & Mineka, 1994; Reidy, 2004; Reidy & Richards, 1997a, 1997b), others have failed to do so (Dalglish, 1994; Mathews, Mogg, May & Eysenck, 1989; Nugent & Mineka, 1994; Richards & French, 1991), although a meta-analysis of the literature indicates that high anxious individuals, as measured as trait rather than state anxiety, do tend to report more negative self threatening information than low anxious and this is particularly the case in panic

disorder (but not Generalised Anxiety Disorder, Mitte, 2008). One possibility for the divergence in findings is that the studied materials may need to be particularly self referential for individuals to interpret them as self threatening. Thus, if materials are chosen by the experimenter rather than the participant it may be that anxious participants do not find the materials particularly self threatening or self referential.

Of relevance for the current studies examination of retrieval-induced forgetting is the finding by Mitte (2008) that implicit tests and recognition tests do not tend to lead to memory bias in high anxious participants. There is some indication that retrieval-induced forgetting is present on implicit tests (Bajo, Gomez-Ariza, Fernandez & Marful, 2006; Veling & van Knippenberg, 2004; but see Butler, Williams, Zacks & Maki, 2001; Perfect, Moulin, Conway & Perry 2002) and recognition tests (Gomez-Ariza, Lechuga, Pelegrina & Bajo, 2005; Hicks & Starns, 2004; Racsmany, Conway, Garab & Nagymate, 2008), and it has been suggested that this is consistent with the inhibitory account (but see Verde, 2012 for issues related to dual process theory and recognition tests). These findings by Mitte, however, suggest that should future researchers wish to study further the possibility that high anxious participants have an inhibitory deficit for negative self referential information that utilising implicit or recognition tests may be unlikely to be a fruitful approach.

The current set of experiments is suggestive that repressors exhibit increased retrieval-induced forgetting for negative self-referential information and that inhibitory processes may be the underlying mechanism. Given that the boundary conditions of repressors enhanced retrieval-induced forgetting skills have been defined future research should seek to confirm that inhibition is, indeed, the underlying mechanism. One

possibility is the use of independent cues, as used in Experiment 4, but applied to negative self-referential information. It should be noted, however, that while numerous laboratories have found evidence for the cue-independent nature of retrieval-induced forgetting (Anderson & Bell, 2001; Anderson & Spellman, 1995; Huddleston & Anderson, 2012; Hulbert, Shivde & Anderson, 2012; MacLeod & Saunders, 2005; Saunders & MacLeod, 2006; Veling & van Knippenberg, 2004), others have failed to replicate the effect (Perfect et al., 2004; Verde & Perfect, 2011; Williams & Zacks, 2001). Thus, although demonstrating cue-independence in repressors remains a goal of future research it is likely that a more global approach to the question of inhibitory skill in repressors will be required and, therefore, should demonstrate enhanced inhibition through a variety of methods and techniques.

The materials and procedure used in Experiments 1-3 are a departure from the traditional retrieval practice paradigm and materials and, thus, we urge caution when interpreting the results until future research can replicate and extend the findings. Previous research has used personality traits of fictitious individuals (Macrae & MacLeod, 1999; MacLeod & Macrae, 2001), and the first author has previously found retrieval-induced forgetting using valenced self referential personality traits using the same methodology as Experiments 1-3 (i.e., between subjects design, Saunders, 2012). We have also used the same between subjects design examining whether retrieval-induced forgetting affects future social behaviour (Fernandes & Saunders, in press). Thus, there is some existing evidence for the usefulness of the between subjects retrieval practice methodology, which may be useful in some scenarios were a within subjects design may confound the retrieval-induced forgetting effect, and for the ability to

successfully use self referential information (but see also Macrae & Roseveare, 2002, for potential issues with self referential information). As Macrae and Roseveare (2002) have previously found that self referential information can fail to initiate retrieval-induced forgetting it suggests that there may be boundary conditions as to whether it will initiate or attenuate retrieval-induced forgetting. It remains a possibility that personality factors, self esteem, history of depression and anxiety, as well as issues relating to the exact nature of the self referential quality of the information, may all impact on the likelihood of self referential information initiating retrieval-induced forgetting. For example, how self referential does self referential information have to be? Macrae and Roseveare used an experimental setup whereby participants had to imagine buying a gift for themselves, which failed to initiate retrieval-induced forgetting for the gifts. Yet Barnier, Hung and Conway (2004) found that valenced autobiographical memories initiated retrieval-induced forgetting, and such memories may be considered the most self referential of them all. Only future research will answer the issue of whether self referential information is susceptible to retrieval-induced forgetting, and we suggest that this will be a particularly fruitful avenue of research with major clinical and everyday applications.

We also analysed choice of traits on the possibility that repressors might choose more negative traits to describe themselves. If they were to do so, these negative traits may constitute “strong” information or, at least, stronger than neutral information, and it has been suggested that stronger memories are likely to be more susceptible to retrieval-induced forgetting than weaker memories as they create more competition during retrieval practice. We found no evidence of repressors choosing more negative descriptors of themselves. This, however, may not be surprising given that by the very

nature of being a repressor is to display self presentation strategies to put themselves forward to the public in the best possible light. It may be the case that the act of choosing negative self descriptive traits proved to be a difficult task for the repressors to perform and may have actually activated repressor related self protection strategies thus resulting in the increased retrieval-induced forgetting of negative traits.

Finally, we must consider the clinical implications of the current findings which suggest that repressors may be unlikely to admit to negative features of their personality and, relatedly, have difficulty in retrieving negative affective information from their past. One issue, however, concerns the likelihood of a repressor entering a therapeutic context to address these issues. Given their avoidant nature we doubt that this is likely to be the primary reason a repressor would enter therapy although they may do so for other issues, such as depression or due to difficulties dealing with physical injury or disability. We would, however, suggest that mindfulness may offer possible therapeutic benefits to repressors' low levels of recall of negative self referential information given this techniques ability to address emotional avoidance.

In summary, repressors were found to forget more negative Rp- items than low anxious participants while high anxious and defensive high anxious participants remembered more negative Rp- items. This finding may be due to differential inhibitory control in the four groups.

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Table 1: Mean recall by item type across groups in Experiment 1

	Rp+	Rp-	Nrp (neutral)	Nrp
	(neutral)	(negative)		(negative)
Repressors	.82	.28	.70	.64
	(.20)	(.17)	(.21)	(.15)
High	.81	.68	.63	.55
Anxious	(.14)	(.24)	(.21)	(.22)
Low	.78	.46	.65	.67
Anxious	(.19)	(.22)	(.19)	(.20)
Defensive	.79	.69	.57	.55
High	(.16)	(.24)	(.22)	(.20)
Anxious				

Note. Rp+ = practiced items from practiced category. Rp- = unpracticed items from practiced category. Nrp = unpracticed items from unpracticed category (i.e., control). Standard deviations included in parentheses.

Table 2: Mean recall by item type and practice across groups in Experiment 2

	Retrieval practice		Re-presentation		Control	
	Rp+ (neutral)	Rp- (negative)	Rp+ (neutral)	Rp- (negative)	Nrp (neutral)	Nrp (negative)
Repressors	.77 (.15)	.29 (.15)	.79 (.13)	.61 (.19)	.64 (.16)	.64 (.18)
Low anxious	.79 (.18)	.44 (.18)	.77 (.17)	.62 (.19)	.65 (.18)	.65 (.20)
High anxious	.77 (.18)	.71 (.22)	.75 (.15)	.64 (.16)	.63 (.17)	.64 (.18)
Defensive high anxious	.73 (.13)	.69 (.12)	.77 (.15)	.61 (.22)	.61 (.18)	.57 (.14)

Note. Rp+ = practiced items from practiced category. Rp- = unpracticed items from practiced category. Nrp = unpracticed items from unpracticed category (i.e., control). Standard deviations included in parentheses.

Table 3: Mean recall by item type across groups in Experiment 3.

	Rp+	Rp- (neutral)	Nrp (neutral)	Nrp
	(negative)			(negative)
Repressors	.77	.50	.60	.64
	(.14)	(.18)	(.16)	(.14)
High	.76	.47	.60	.66
Anxious	(.17)	(.19)	(.23)	(.21)
Low	.77	.44	.62	.66
Anxious	(.20)	(.19)	(.20)	(.18)
Defensive	.77	.45	.55	.58
High	(.16)	(.16)	(.22)	(.24)
Anxious				

Note. Rp+ = practiced items from practiced category. Rp- = unpracticed items from practiced category. Nrp = unpracticed items from unpracticed category (i.e., control). Standard deviations included in parentheses.

Table 4: Mean recall by item type across groups in Experiment 4

	Rp-	Nrp
Repressors	.46 (.24)	.70 (.14)
Low anxious	.45 (.17)	.67 (.12)
High anxious	.49 (.21)	.70 (.17)
Defensive high anxious	.48 (.17)	.69 (.15)

Note. Rp- = unpracticed items from practiced category. Nrp = unpracticed items from unpracticed category (i.e., control). Standard deviations included in parentheses.

Appendix A

Negative

Irritable

Tactless

Gloomy

Uninteresting

Fault finding

Neurotic

Hot tempered

Unsympathetic

Immature

Dominating

Envious

Unsocial

Fickle

Boisterous

Suspicious

Pessimistic

Cynical

Boastful

Vain

Reckless

Moody

Rash

Stubborn

Headstrong

Melancholy

Neutral

Positive

Calm

Self assured

Outgoing

Idealistic

Serious

Persuasive

Objective

Fearless

Nice

Agreeable

Charming

Curious

Modest

Decisive

Humble

Practical

Light hearted

Discreet

Informed

Tidy

Popular

Gracious

Average

Cautious