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Trait anxiety, working memory capacity, and the effectiveness of memory suppression

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We aimed at replicating the finding that humans are able to suppress unwanted memories, and tested whether this ability varies with individual differences in working memory capacity, trait anxiety and defensiveness. In a think/no-think experiment, participants either recalled or suppressed previously learned words for 0, 8 or 16 times. Suppression did not have an overall detrimental effect on later recall performance. However, higher recall rates after repeated suppression were exclusively predicted by higher trait anxiety. These results are discussed in relation to current theories on anxiety and executive control.

Key words: Memory control, think/no-think, anxiety, working memory, repressive coping.

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INTRODUCTION

In our subjective experience, forgetting often appears to be dysfunctional and it is disturbing not to be able to retrieve some desired information. On the other hand, sometimes it is beneficial to forget unwanted memories that would interfere with current motivational and cognitive goals. For example, forgetting may be functional in order to avoid the retrieval of competing information in selective remembering or when being reminded of experiences we prefer not to think about (cf. Levy & Anderson, 2002).

Anderson and Green (2001) have shown that it is possible to forget unwanted memories by repeatedly excluding them from conscious awareness (see also, e.g., Anderson, Ochsner, Kuhl *et al*., 2004; Depue, Banich & Curran, 2006). However, the reliability of this finding has been challenged by a number of studies that failed to replicate the detrimental effect of repeated suppression on subsequent memory performance. For example, Bulevich, Roediger, Balota, and Butler (2006) were unable to find lower memory performance for previously suppressed items, despite using identical stimulus material and procedures as Anderson and Green (2001). One potential explanation for the instability of the effects is that individual differences may influence the effectiveness of memory suppression.

Levy and Anderson (2008) suggest that the absence of suppression effects may be due to individual differences in executive control function. Consistent with this idea, previous studies have shown that individuals with high working memory capacity report a lower number of intrusions during the suppression of a single thought (e.g., Brewin & Beaton, 2002). We would thus expect memory suppression to be more effective with high working memory capacity.

Several studies report that individuals engaging in a repressive coping style have a greater ability to deliberately suppress negative material (see Derakshan, Eysenck & Myers, 2007, for review). More successful suppression for repressors when compared to truly high and low anxious individuals has been shown in directed forgetting (e.g., Myers, Brewin & Power, 1998), and thought suppression studies (Barnier, Levin & Maher, 2004). Geraerts, Merckelbach, Jelicic, and Habets (2007) found facilitated suppression of negative autobiographical thoughts in repressors. However, the authors also showed enhanced executive control functioning for repressors as obtained with neutral material. Furthermore, performance in executive control tests mediated the relationship between repressive coping and suppression effects (Geraerts *et al*., 2007). Hertel and McDaniel (2009) recently conducted an adaptation of the think/no-think paradigm, comparing repressors and non-repressors in their ability to suppress negative material. In addition to unaided intentional suppression, a condition where suppression is aided with emotionally positive substitutes was included. The authors found memory performance to be reduced in both, unaided and aided suppression conditions. Repressors were found to be specifically better in suppressing unwanted memories in the aided condition (Hertel & McDaniel, 2009). However, it remains an open question whether higher memory suppression effects for repressors are mediated by higher executive control functioning. Furthermore, Hertel & McDaniel (2009) only included negative material in their study. This is in line with previous studies, suggesting that repressors show a selective capability to inhibit negative self-referential information (e.g., Myers & Derakshan, 2004). However, it appears to be crucial to investigate the interaction of repressive coping style with memory suppression also with neutral material, as this allows for evaluating the possibility that repressors generally have a higher ability to suppress unwanted memories. This holds especially in the light of the study by Geraerts *et al.* (2007), reporting generally better

executive control functioning in repressors and its mediating effects on thought suppression.

In contrast, Derakshan and Eysenck (1998) found repressors, but also truly low anxious individuals to be less susceptible to high working memory load in a verbal reasoning task. In the study by Barnier *et al*. (2004), both defensiveness and trait anxiety, but not their interaction, predicted better suppression of unwanted thoughts. This suggests that superior suppression results from fewer conscious anxiety-related thoughts and worries that deplete resources from executive control functioning (see Eysenck, Derakshan, Santos & Calvo, 2007, for review). Following this idea, both truly low anxious individuals and repressors should benefit in the think/no-think task, since both experience low anxiety.

In the present study, we aimed at replicating the findings of Anderson and Green (2001), by showing that repeated suppression leads to a linear decline in subsequent recall performance. Additionally, we took into account the continuous measures of trait anxiety, defensiveness, and their interaction term representing the tendency to engage in repressive coping. We also measured working memory capacity. This allowed us to investigate the relative or independent influence of these variables in predicting effective memory suppression (cf. Brewin & Beaton, 2002). The continuous approach chosen in the present study permits only limited conclusions regarding the interaction of memory suppression with clinically relevant anxiety and more prominent manifestations of repressive coping style. However, our approach enables a test of the hypothesis that inconsistencies in finding suppression effects in think/no-think studies including comparable student samples are due to differences in personality variables (cf. Levy & Anderson, 2008).We also included categorical analyses comparing subsamples selected on the basis of cutoff scores on the covariate measures, in order to increase comparability with previously published research on repressive coping style and working memory capacity (e.g., Barnier *et al*., 2004; Geraerts *et al*., 2007; Rosen & Engle, 1998).

METHOD

Participants

Fifty participants (34 female) between 17 and 34 years (M = 25) completed the whole experiment. One multivariate outlier was excluded from all analyses investigating memory performance, for showing a standardized Pearson residual of < -4 in an initial analysis of variance (ANOVA) for the no-think condition. Three participants were excluded from all analyses involving trait anxiety, for showing STAI values of more than 2 *SD* above the mean. Operation span data of five participants were lost. This resulted in n = 41 for the regression analysis.

We segregated our sample into subgroups showing high and low scores on the covariate measures by applying median splits (see Table 1). We grouped participants into individuals showing high and low working memory capacity (high and low spans). We also identified different coping style groups (cf. Weinberger, Schwartz & Davidson, 1979), comprising repressors (low trait anxiety, high social desirability scores), low anxious (low trait anxiety, low social desirability), defensive high anxious (high trait anxiety, high social desirability), and high anxious individuals (high trait anxiety, low social desirability). We also grouped participants that showed high and low trait anxiety, without regarding social desirability scores.

Materials

Word pairs. Twenty-five critical and seven filler German word pairs were used in the present study. Word pairs were combined of weakly related words (cf. Anderson & Green, 2001). Semantic relatedness was subjectively evaluated by the authors. All words were controlled for emotional valence, arousal, concreteness and meaningfulness on the basis of scores published in a standardized database (Hager & Hasselhorn, 1994). The possible range in all dimensions reaches from −20 to +20 for all dimensions, with zero signifying neutral emotional valence and medium parameter values for all other dimensions. All words were selected for being emotionally neutral in valence (Left-hand words: M = *0*.15, *SD* = 1.77; Right-hand words: M = 0.34, *SD* = 0.96). The words were also controlled for emotional arousal (Left-hand words: M = −0.38, *SD* = 3.45;

Table 1. *Recall slopes and test scores according to subject groups*

	Recall slope	OSPAN	STAI	SES-17
Low spans	0.089 (0.184) n = 19	10.50 (2.59) n = 20	36.37 (6.79) n = 19	9.45 (3.00) n = 20
High spans	0.000 (0.179) n = 21	23.19 (4.75) n = 21	33.74 (5.63) n = 19	8.52 (2.42) n = 21
Repressors	0.000 (0.216) n = 7	16.13 (6.92) n = 8	29.13 (3.27) n = 8	12.13 (1.64) n = 8
Low anxious	0.000 (0.141) n = 9	16.00 (4.93) n = 7	30.11 (3.48) n = 9	5.89 (1.45) n = 9
High anxious	0.103 (0.168) n = 11	19.90 (8.91) n = 10	41.18 (2.68) n = 11	6.00 (1.55) n = 11
Defensive high anxious	0.184 (0.134) n = 10	13.75 (4.83) n = 8	41.25 (5.19) n = 10	11.20 (0.63) n = 10
Low trait anxiety	-0.020 (0.157) n = 21	16.85 (6.96) n = 20	29.73 (3.07) n = 22	8.86 (3.09) n = 22
High trait anxiety	0.141 (0.155) n = 21	17.17 (2.91) n = 18	41.21 (3.96) n = 21	8.48 (2.91) n = 21

Note: M and *SD* (in parentheses) of recall slopes and covariate measures for each subgroup of n as obtained by median splits.

Right-hand words: $M = -3.06$, $SD = 1.47$), concreteness (Left-hand words: $M = -1.31$, $SD = 9.12$; Right-hand words: $M = -5.37$, $SD = 8.73$), and meaningfulness (Left-hand words: $M = -3.55$, $SD = 1.33$; Right-hand words: $M = 1.01$, $SD = 5.99$). Furthermore, words were controlled for frequency of occurrence (Left-hand words: $M = 227$, $SD = 647$; Right-hand words: $M = 866$, $SD = 1067$; Meier, 1967) and word length (Left-hand words: $M = 6.56$, $SD = 1.64$; Right-hand words: $M = 5.80$, $SD = 1.80$). The word pairs were distributed into five sets that did not differ in the controlled parameters for left- and right-hand words, as assessed with two one-way ANOVAs ($Fs(4,24) < 2.423$, *n.s.*). The five sets were counterbalanced with the five experimental conditions across participants.

Personality tests. German versions of the State Trait Anxiety Inventory (STAI; Laux, Glanzmann, Schaffner & Spielberger, 1981), and of the Social Desirability Scale-17 (SES-17; Stöber, 2001) were applied to assess the participants' level of trait anxiety and defensiveness.

The German STAI trait-anxiety form shows a test-retest reliability between 0.68 and 0.77 in men and between 0.87 and 0.96 in women and internal consistency with Cronbach's alpha of about 0.9 in both men and women (Laux *et al*., 1981). The STAI trait-anxiety scale shows satisfactory validity, correlating with other measures of anxiety, neuroticism and depressiveness, but not with divergent scales such as openness to experience, intelligence tests and social desirability (Laux *et al*., 1981). The STAI trait-anxiety form is composed of 20 statements from which 13 are formulated in the direction of anxiety (e.g. "I get in a state of tension or turmoil as I think over my recent concerns and interests") and 13 in the opposite direction (e.g. "I feel rested"). On a four-point scale, subjects are asked to rate on a dimension of frequency how well these statements characterize how they feel in general, ranging from "(1) almost never" to "(4) almost always". Possible scores can reach from 20 to 80, with 20 signaling virtual absence and 80 a clinically relevant intensity of anxiety.

The SES-17 is developed from the Marlow-Crowne Social Desirability Scale (Crowne & Marlowe, 1960). The SES-17 is a reliable measure of social desirability showing a test-retest correlation of .82 across four weeks and internal consistency with Cronbach's alpha = 0.72 (cf. Stöber, 2001). The scale shows convergent validity with other measures of social desirability and it is sensitive to social desirability provoking situations (Stöber, 2001). It correlates non-significantly with trait anxiety, extraversion, neuroticism and openness to experience (Stöber, 2001). Although the SES-17 apparently loads higher on impression management than on self-deception (Stöber, 2001), and repressors being characterized as deceiving themselves rather than others (e.g., Myers & Derakshan, 2004), the use of the SES-17 seems justified, as different measures of social desirability are not found to selectively affect the classification of repressors (Furnham, Petrides & Spencer-Bowdage, 2002). The final version of the SES-17, used in the present study, consists of 16 statements in German language of which 10 describe socially desirable behavior and personality characteristics (e.g., "I always admit my mistakes openly and face potential negative consequences") and six are formulated in the opposite direction (e.g., "I take out my bad moods on others now and then"). Participants are asked to decide whether a statement describes them, by checking the word "true" or "false", printed next to the statement. Scores can reach from 0 to 16, with high scores revealing a strong tendency to perceive/ present oneself in a desirable way (Stöber, 2001).

Working memory test. To measure working memory capacity, a version of the Operation Span Test (OSPAN) was used (cf. Rosen & Engle, 1998). In this version, participants are instructed to read simple mathematical equations followed by a one-syllable word. Participants have to judge whether the equations are correct and simultaneously memorize the presented word. After one block, consisting of two to six equation-word strings, participants are prompted to recall all words presented since the last block in correct word order. The total number of words from correctly recalled trials constitutes the final score. Scores on this measure can range from 0 to 42, with high scores signifying high working memory capacity.

Design and procedure

Think/no-think experiment. First, participants were instructed to memorize all word pairs, presented for 5000 ms each, separated by a fixation cross (500 ms). Subsequently, all left-hand words (cues) were presented together with a question mark for 3000 ms each. Participants were instructed to answer with the appropriate right-hand word (response). Correct recall terminated the presentation of the cue word and triggered the next trial starting with a fixation cross (500 ms). If the participant responded incorrectly or outside the time-limit, the correct response replaced the question mark for 1000 ms. If subjects recalled less than 50%, two additional cycles followed, the first comprising only word pairs that had not been correctly recalled in the first place, and the second including all word pairs.

In the beginning of the think/no-think phase, participants were informed that in this phase, they were to be presented with the left hand words again, but that not every stimulus required them to respond with the right hand word. They were instructed to give the correct response as quickly as possible only when encountering a word in green color. When encountering a cue word written in red, they were asked to try to suppress the affiliate and avoid thinking about it. It was emphasized that the right hand word should not enter consciousness at all. Participants were discouraged from closing their eyes or remove their gaze from the stimulus, and were instructed to focus on the screen and actively suppress the right hand word. They were warned that they would hear an error signal, in case they failed to give the correct answer in a think trial or when they responded to a red cue word. A brief practice session on filler items followed, consisting of ten think and five no-think trials. After the practice phase, participants were asked if they understood the task correctly and when necessary, comprehension errors were corrected and instructions were verbally repeated by the experimenter.

Following practice, participants were presented with the cues of 20 critical word pairs, 10 assigned to think and no-think conditions each. Half of the cues in each condition were repeated 8 times and the other half 16 times. Five word pairs were not manipulated during the think/no-think phase, constituting the baseline condition. One hundred and twenty think trials using the filler items were added (cf. Anderson & Green, 2001). In both, think and no-think trials a blank screen (400 ms), a fixation cross (200 ms), and a cue word (4000 ms) sequentially appeared. In the think condition, the cue was shown in green. If the participant responded correctly, the next trial was initiated immediately. In the no-think condition, the cue appeared in red for the whole 4000 ms. Omitted or incorrect responses to think cues and any response to no-think cues triggered an immediate beep signal.

Finally, participants' memory for all response words shown during the learning phase was tested by presenting the cues in black colour, for 4000 ms each, separated by a fixation cross (500 ms). Participants were asked to respond with the first word coming to mind that appears to be the correct affiliate, disregarding any previous instructions. In contrast to the random presentation used in the previous phases, stimuli were presented in half-randomized order in the recall test, controlling for the average test position of no-think items across participants.

Response accuracy was recorded by the experimenter in all phases.

RESULTS

Questionnaires

Participants' mean scores in the STAI trait anxiety measure were found to be corresponding to Stanine scores of five in the reference norms for both men and women ($M = 35.20$, $SD = 6.42$, $Md = 35$, Range: 24–52; Laux *et al*., 1981). SES-17 scores in the current sample were slightly higher than the theoretical mean ($M = 8.67$, $SD = 2.83$, $Md = 9$, Range: 3–14). OSPAN scores were as follows, $M = 17.15$, $SD = 7.31$, $Md = 16$, Range: 4–33. No norms were available for this test.

Memory performance

Statistical analyses were carried out separately for no-think and think items. This strategy was chosen because both conditions were compared against the zero-repetition baseline condition, that is, the items that were initially learned, but not manipulated during the think/no-think phase. It can be assumed that baseline items show a weakening of trace strength over the think/no-think phase. Memory representations of no-think items are expected to show an additional decrease in memory performance due to the repeated attempts to suppress. Think items, in contrast, were expected to show an increase in recall performance as compared to baseline, due to repeated retrieval practice during the think/no-think phase. Greenhouse-Geisser corrections were used where sphericity assumptions were violated as indicated by Mauchly's test. Corrected p and *MSE* values are reported together with uncorrected degrees of freedom. Significance level was set as $\alpha = 0.05$.

Recall scores from the final memory test, as shown in Fig. 1, were submitted to repeated measures ANOVAs with the factor Repetition (0, 8, 16). This showed a significant main effect of Repetition for think items, $F(2, 96) = 9.238$, $MSE = 0.028$, $p < 0.001$, $\eta^2 = 0.161$. The increase in memory performance with repeated retrieval-practice attempts followed a linear pattern, as revealed by a planned contrast analysis, $F(1, 48) = 18.182$, $MSE = 0.028$, $p < 0.001$, $\eta^2 = 0.275$. For no-think items, no significant effect of Repetition was obtained, $F(2, 96) = 1.588$, $MSE = 0.037$, *ns*, $\eta^2 = 0.032$, but the numerical rise in recall performance followed a marginally significant linear pattern as revealed by the contrast analysis, $F(1, 48) = 3.266$, $MSE = 0.032$, $p < 0.078$, $\eta^2 = 0.064$.

Categorical and continuous analyses

We tested for the effects of repressive coping style, trait anxiety, and working memory capacity on memory suppression in two different ways. First, we applied univariate ANOVAs in order to compare the groups separated by median splits (see Table 1). Second, we tested the influence of working memory capacity, trait anxiety and repressive coping style in a multiple regression analysis.

In all between-subject and regression analyses investigating effects of individual differences on memory suppression, the dependent variable was constructed to represent a linear slope in recall performance across number of repetitions. This was achieved by multiplying individual recall scores after 0, 8, and 16 suppression attempts with the transformation weights used in the linear contrast analysis (−0.707, 0, 0.707, respectively). The transformed data were summed to a single score, intended to give an account of increase or decrease in memory performance as a function of number of previous suppression attempts. Positive values on this variable represent a linear rise in recall performance, while negative scores signify a linear decline, that is, successful, incremental below-baseline suppression.

The only effect in the between-subject analyses was a significant difference in recall slopes between the high and low trait anxious groups as obtained by the median split on trait anxiety scores without taking into account social desirability, $F(1,40) = 11.294$, $p < 0.002$. Recall slopes differed neither between coping styles $F(3,33) = 2.683$, *n.s.*, nor between high spans and low spans, $F(1,38) = 2.422$, *n.s.* No significant difference in working memory capacity was obtained when comparing coping style groups $F(3,29) = 1.266$, *n.s.*, and when comparing high and low trait anxious subjects, omitting control for social desirability, $F(1,36) < 1$, *n.s.*

It may be the case that the non-significant results obtained in the between subject analyses depended on the relatively small group sizes obtained by the median splits. In order to be able to take into account the whole sample and thus, increase sensitivity, we conducted multiple regression analyses. We entered OSPAN, STAI, SES-17 and the STAI × SES-17 interaction scores as predictors, to estimate the main and interaction effects on recall slopes, based on centralized variables (Cohen & Cohen, 1983). The regression model explained a significant proportion of variance in the recall slopes, adj. $R^2 = 0.160$, $F(4, 36) = 2.905$, $MSE = 0.027$, $p < 0.036$. Only trait anxiety predicted a linear increase in recall performance, $B = 0.014$, $\beta = 0.486$, $t(36) = 3.178$, $p < 0.004$, explaining $R^2 = 0.212$ of the whole unadjusted $R^2 = 0.244$ (see Fig. 2). In contrast, working memory capacity explained only

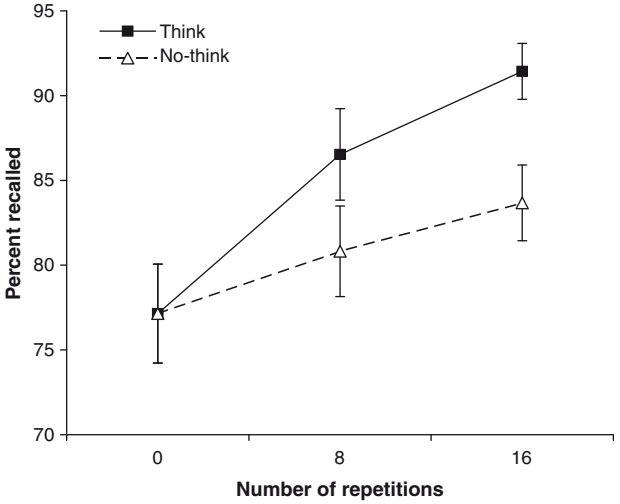

Fig. 1. Mean recall performance as a function of the number of repetitions and condition ($n = 49$). Error bars signify standard errors of the mean.

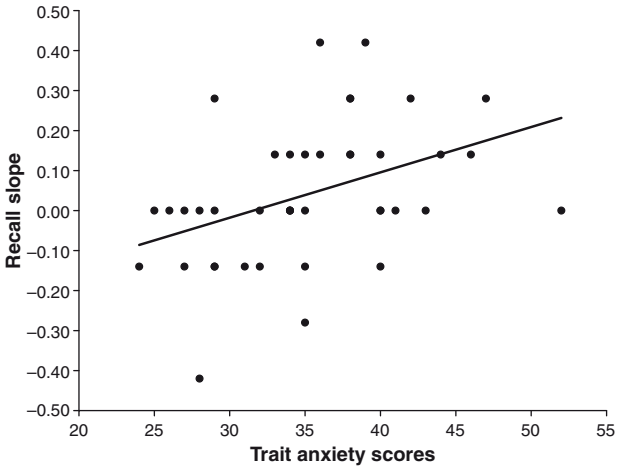

Fig. 2. Scatterplot between trait anxiety scores and slope in recall performance for suppressed items (Pearson $r = 0.41$, $p < 0.005$, $n = 41$).

$R^2 = 0.003$, social desirability $R^2 = 0.061$, and the interaction term of trait anxiety and social desirability explained $R^2 = 0.016$ of the total unadjusted R^2, $ts(36) < 1.701$, *n.s.*

For comparison, we conducted an analogous analysis using the same predictor variables, but with the recall slope for the think condition as the dependent variable. The regression term was non-significant, adj. $R^2 = 0.011$, $F(4, 36) = 1.115$, $MSE = 0.025$, *n.s.*, unadjusted $R^2 = 0.11$, showing that the personality variables uniquely related to memory performance after suppression.

Correlation analyses did not reveal significant relationships between the independent variables (see Table 2). Thus, there was no indication that the effects of trait anxiety on memory suppression were mediated by the other covariate measures (cf. Baron & Kenny, 1986; Geraerts *et al*., 2007).

DISCUSSION

We were unable to replicate the findings of Anderson and Green (2001). Recall rates did not decline below baseline as a function of repeated suppression, despite the fact that the design of the present experiment was close to the think/no-think studies by Anderson and Green (2001) and Anderson *et al*. (2004). Our results contrast with a variety of studies reporting impaired memory performance for no-think items (e.g., Anderson *et al*., 2004; Depue *et al.*, 2006). However, our results are in line with a number of studies failing to replicate the think/no-think effect (e.g., Bulevich *et al*., 2006; Mecklinger, Parra & Waldhauser, 2009). It appears that the parameters that lead to or counteract suppression effects deserve further investigation (cf. Bulevich *et al*., 2006). Relatively long suppression intervals in the think/no-think phase, in combination with only few stimulus word pairs that were potentially highly integrated due to overlearning, may have counteracted effective suppression (cf. Conway, Harries, Noyes, Racsma'ny & Frankish, 2000; Lee, Lee & Tsai, 2007). Since it is conceivable that semantic relatedness of the word material may moderate the no-think effect, it would be advisable for future studies to control this parameter by means of more objective measures, such as Latent Semantic Analysis (Landauer & Dumais, 1997). Although previous studies report participants to be relatively compliant in following the think/no-think instructions (Hertel & McDaniel, 2009), the inclusion of post-experimental questionnaires could have helped to identify whether the current lack of effects was due to ineffective suppression strategies of participants (cf. Hertel & Calcaterra, 2005).

Working memory capacity did not predict performance in the think/no-think task. As elaborated by Miyake, Friedman, Emerson, Witzki, Howerter, and Wager (2000), the OSPAN test mainly involves the updating functions of the central executive, while suppression presumably relies on the inhibition function. Future research should consider employing more strictly inhibition-related executive control tests. However, Brewin and Beaton (2002) found OSPAN scores to predict the frequency of intrusions during the actual suppression of a single thought. On the other hand, the authors found no relationship between working memory capacity and the number of intrusions after active suppression has ended (Brewin & Beaton, 2002). Similarly, in the think/no-think paradigm, effects of working memory capacity may be more obvious during the no-think task itself than during the subsequent retrieval of suppressed memories.

Table 2. *Correlation coefficients between covariate measures and recall slopes in the no-think condition*

	OSPAN	SES-17	STAI	Recall slopes
OSPAN	–	–	–	−0.115
SES-17	−0.074	–	–	0.138
STAI	−0.114	−0.236	–	0.410*
SES-17 × STAI	−0.107	0.060	0.174	−0.024

* $p < 0.05$; Pearson correlations, $n = 41$.

An interesting finding was that higher levels of trait anxiety predicted the ineffectiveness of suppression, as indicated by an increased gain in memory performance with repeated suppression attempts. Except for one person, only participants scoring below the median on the STAI showed the expected pattern of below-baseline decline in recall performance as a function of suppression attempts (see Fig. 2). Against our hypothesis, the tendency to engage in repressive coping, as obtained in between-subject analysis and as represented by the interaction term between trait anxiety and social desirability scores in the regression analysis, showed no relationship with the effectiveness of memory suppression. It appears that it is not repressors' assumed superior ability to inhibit unwanted mental representations that leads to more successful suppression. Rather, it seems that generally higher levels of self-reported anxiety correlate with a paradoxical rise in recall performance after repeated suppression. Experiencing anxiety may be related to lower processing efficiency, depleting resources in executive functioning and, thus, leading to less effective suppression of unwanted memories (see Eysenck *et al*., 2007).

It would be highly interesting to assess the actual efficiency of suppression in the think/no-think paradigm. According to Eysenck *et al*. (2007), higher anxiety disrupts processing efficiency on tasks involving inhibitory control, only indirectly affecting the effectiveness of inhibition. Often, high anxious individuals show comparable task accuracy, but longer processing time when compared to low anxious individuals (cf. Derakshan, Ansari, Hansard, Shoker & Eysenck, 2009; Derakshan & Eysenck, 1998). It has been shown in experimental studies and studies assessing the tendency to engage in thought suppression in everyday life, that anxiety correlates with the use of thought suppression and the experience of more intrusions from unwanted thoughts (cf. Barnier *et al*., 2004; Erskine, Kvavilashvili & Kornbrot, 2007). Based on these findings, highly trait-anxious individuals would be expected to be less efficient and to experience higher problems in suppressing unwanted memories in the think/no-think task, too. In future studies, the inclusion of strategy questionnaires could provide a mean for assessing individual differences in the efficiency of suppression strategies (cf. Hertel & McDaniel, 2009)

Generally, assessing both efficiency and effectiveness of suppression, would allow for a better comparison of suppression processes in the think/no-think paradigm with the paradoxical effects of thought suppression. A considerable number of studies found that deliberate thought suppression can result in a subsequent increase in frequency of previously suppressed thoughts (see Wenzlaff & Wegner, 2002). It seems feasible that memory suppression in the

think/no-think paradigm relies on similar mechanisms as those involved in the suppression of intrusive thoughts (see, e.g., Hertel & Calcaterra, 2005). The trend for a paradoxical effect of memory suppression in the present study would be consistent with such an account. However, in thought suppression studies, participants are typically instructed to monitor their stream of consciousness over relatively long periods of time during the suppression of a single thought (see Wenzlaff & Wegner, 2002). It would be interesting to test whether including a monitoring instruction and increasing the time of cue-dependent suppression would foster rebound effects in the think/no-think paradigm.

In order to draw more general conclusions about the relationship between trait anxiety, coping style and memory suppression, it would be informative to employ a between-subject design with large groups, preselected based on strict cutoff scores on the personality and executive control measures. (cf. Geraerts *et al*., 2007; Hertel & McDaniel, 2009; Rosen & Engle, 1998). Such follow-up studies are especially warranted in the light of the small sample size and the moderate range of trait anxiety in the present study. Furthermore, it would be highly desirable to investigate individual differences in memory suppression of neutral and emotional material. This would help to elucidate the effect of individual differences in basic cognitive control functioning versus their interaction with specific effects of emotional information on cognitive processes (Depue *et al*., 2006; Hertel & McDaniel, 2009). Though preliminary, our results, together with the study by Hertel and McDaniel (2009), provide a starting point for the investigation of the effects of anxiety and coping style on the suppression of unwanted memories.

In conclusion, the findings of the present study suggest that higher levels of trait anxiety, independent of individual defensiveness and working memory capacity, predict higher memory performance after intentional suppression. This result stresses the importance of taking into account individual differences when investigating the intentional suppression of unwanted memories.

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