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The relationship between mental toughness and cognitive control: Evidence from the item-method directed forgetting task

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Abstract

Previous research by the authors (Dewhurst, Anderson. Cotter, Crust, & Clough, 2012) found that mental toughness, as measured by the Mental Toughness Questionnaire 48 (MTQ48; Clough, Earle, & Sewell, 2002), was significantly associated with performance on the list-method directed forgetting task. The current study extends this finding to the item-method directed forgetting task in which the instruction to Remember or Forget is given after each item in the study list. A significant positive association was found between the correct recognition of Remember words and the emotional control subscale of the MTQ48. Neither the Sports Mental Toughness Questionnaire (Sheard, Golby, & van Wersch, 2009) nor the Big Five Inventory (McCrae & Costa, 1987) accounted for significant variance in the recognition of Remember or Forget words. The findings are discussed in terms of the relationship between mental toughness and cognitive control.

Keywords: Mental toughness, cognitive control, directed forgetting

The Relationship between Mental Toughness and Cognitive Control: Evidence from the Item-Method Directed Forgetting Task

Why are some individuals better than others at coping with competitive or pressurised situations? One factor that has been shown to confer an advantage in such situations is 'mental toughness' (e.g., Clough, Earle, & Sewell, 2002; Jones, Hanton, & Connaughton, 2002; Weinberg, Butt, & Culp, 2011). This psychological construct is associated with attributes such as resilience, self-belief, and the ability to cope under pressure. In a recent review, Lin, Mutz, Clough, and Papageorgiou (2017) defined mental toughness as "an umbrella term that entails positive psychological resources, which are important across a range of achievement contexts" (pp.1-2). Contexts in which mental toughness has been shown to have positive effects include sport (e.g., Crust & Azadi, 2010; Kaiseler, Polman, & Nicholls, 2009; Levy, Polman, Clough, Marchant, & Earle, 2006), the workplace (Marchant et al., 2009), education (St Clair-Thompson et al., 2015), and the military (Godlewski & Kline, 2012). More generally, mental toughness has been shown to be positively related to life satisfaction and negatively related to depressive symptoms (Gerber et al., 2013).

Despite the numerous studies highlighting the benefits of mental toughness, there is as yet no objective understanding of the psychological processes that underpin this important construct. Definitions of mental toughness are typically couched in terms of related concepts such as hardiness and resilience. In an attempt to move beyond circular definitions, Dewhurst, Anderson, Cotter, Crust, and Clough (2012) presented behavioural evidence that mental toughness is associated with cognitive inhibition. Cognitive inhibition is a component of the broader concept of cognitive control (see Abrahamse, Braem, Notebaert, & Verguts, 2016, for a recent review) and was defined by MacLeod (2007) as "the stopping or overriding of a mental process, in whole or in part, with or without intention" (p.5). Crucially, cognitive inhibition can be measured objectively using behavioural tasks.

Dewhurst et al. (2012) investigated the relationship between mental toughness and cognitive inhibition using a variant of the list-method directed forgetting paradigm, originally developed by Bjork (1970). Participants studied a list of words in anticipation of a memory test and were then told to forget them and concentrate on learning a second list. After presentation of the second list, participants were asked to recall both lists (i.e., including the list they were instructed to forget). Mental toughness (as measured by the Mental Toughness Questionnaire 48 [MTQ48] developed by Clough et al., 2002; see Clough & Strycharczyk, 2012, for a review) was found to predict performance on the directed forgetting task. Specifically, regression analyses showed no influence of mental toughness on recall of list 1, but mental toughness positively predicted recall of list 2. The interpretation of this pattern was that mentally tough participants were able to inhibit list 1 and focus on the encoding of list 2. This effect was driven by the commitment subscale of the MTQ48, suggesting that it was the ability to focus on current goals (see Clough & Strycharczyk) that led to the enhanced recall of list 2.

Dewhurst et al. (2012) discussed the benefits of forgetting in pressurised domains such as sport and education, where dwelling on a mistake can undermine subsequent performance. The finding that mental toughness was associated with the ability to prevent unwanted information (list 1) from affecting current goals (encoding list 2) is consistent with findings that mental toughness confers an advantage in such situations. A limitation of the list-method directed forgetting task, however, is that it measures only a single instance of forgetting. In contrast, the item-method directed forgetting task, in which the instruction to remember or forget is presented after each study item, measures the ability to forget multiple stimuli and allocate attentional strategies over a sustained period of time (see MacLeod, 1999, for a comparison of the item- and list-methods of directed forgetting). We used the list-method in our previous research because the effects have been attributed to cognitive

inhibition (Bjork, Bjork, & Anderson, 1998), which we hypothesized would be influenced by dispositional factors such as mental toughness. In contrast, performance in the item-method task has previously been explained in terms of reduced rehearsal of items that participants are instructed to forget (e.g., Bjork, 1970), which we hypothesized would not be influenced by dispositional factors.

Recently, however, Festini and Reuter-Lorenz (2017) proposed a novel account of the item-method task in which forgetting is attributed to an active control process within working memory. Across three experiments, Festini and Reuter-Lorenz found that articulatory suppression during encoding interfered with the forgetting of to-be-forgotten items, which they attributed to interference with this resource-demanding control process. Although there were variations across the three experiments, the basic procedure consisted of a series of trials, designated by Festini and Reuter-Lorenz as working memory (WM) trials, in which two lists of three words were presented side by side for 3 seconds. After a 250 msec interval, the lists were replaced by the instruction to forget, which randomly appeared to the left or right of a fixation point, indicating which list of three words participants were to forget. Participants were then presented with one of the six words and asked to decide whether or not it was a word they had been instructed to forget. Festini and Reuter-Lorenz found that articulatory suppression interfered with forgetting, such that participants were more likely to falsely identify Forget words as Remember words when the task was performed with articulatory suppression. No effects of articulatory suppression were observed in the Remember words.

From the perspective of the current study, the most salient of Festini and Reuter-Lorenz's (2017) findings were observed in yes/no recognition tests administered after completion of the WM trials. Participants were presented with recognition lists containing 24 old items (12 Remember and 12 Forget) and 24 foils. The main finding was that the directed

forgetting effect (better memory for Remember items than Forget items) was eliminated when the items were studied with articulatory suppression. As noted above, Festini and Reuter-Lorenz interpreted this as evidence that successful forgetting in the item-method task reflects the operation of an active control process. This effect was driven by a reduction in correct recognition of Remember words when studied under articulatory suppression, suggesting that the control process serves to allocate attention to Remember items and away from Forget items.

Previous research has shown that the ability to control thoughts and emotions is characteristic of mentally tough individuals (e.g., Clough et al., 2002). The aim of the current study, therefore, was to investigate whether mental toughness predicts performance on the item-method directed forgetting task, as well as the list-method as previously shown by Dewhurst et al. (2012). If forgetting in the item-method task is due to an active control process, then any effects of mental toughness are likely to be observed in the control subscale of the MTQ48. The MTQ48 is particularly useful in this regard as the control subscale is further divided into life control (control of external events) and emotional control (control of one's emotional reactions to events), allowing us to explore different types of control. In order to further investigate the role of control in directed forgetting, we added a second mental toughness measure, the Sports Mental Toughness Questionnaire (SMTQ) developed by Sheard, Golby, and van Wersch (2009), which also includes a control subscale. Although this subscale has been found to have only moderate correlations with the control subscales of the MTQ48 (Crust & Swann, 2011), for the purposes of the current study having a number of measures allowed us to explore more thoroughly the potential relationship between control and directed forgetting. Despite its name, the SMTQ is relevant to other domains besides sport.

A final aim of the current study was to address a criticism made by Delaney, Goldman, King, and Nelson-Gray (2015) that Dewhurst et al. (2012) failed to account for the effects of other personality factors. Delaney et al. argued that the effect of directed forgetting on mental toughness was due to the MTQ48's correlation with the conscientiousness subscale of the Big Five Inventory (BFI; McCrae & Costa, 1987). In order to address this, participants in the current study completed the BFI is addition to the MTQ48 and SMTQ.

In the experiment reported below, participants completed the MTQ48 (Clough et al., 2002), the SMTQ (Sheard et al., 2009, and the BFI (McCrae & Costa, 1987) before taking part in an item-method directed forgetting task in which the instruction to Remember or Forget was presented after each word. This was followed by a test of recognition memory for both the Remember and the Forget words. We used recognition tests rather than the recall tests used in our previous study because Festini and Reuter-Lorenz (2017) found that articulatory suppression affected both Remember and Forget words in the recognition test, but only Forget words in the WM test. Based on our previous research, we predicted that mental toughness would be positively associated with the correct recognition of Remember words. Based on the proposal by Festini and Reuter-Lorenz that forgetting in the item-method paradigm relies on an active control process, we predicted that any effects of mental toughness would be driven by the control subscales of the mental toughness questionnaires.

Method

Participants. Participants were 93 undergraduate students (69 females) from the University of Hull. All were native English speakers in the age range 18-52 (M = 20.13, SD = 4.07). Sample size was based on the findings of Dewhurst et al. (2012; n = 60) that mental toughness accounted for 20% of the variance in recall of the Remember list, with R^2 = .21. Field (2017) suggested R^2 values of .02, .13, and .26 for small, medium, and large effect sizes, respectively. The R^2 reported by Dewhurst et al. is close to the large effect size

suggested by Field, for which he recommended a sample of at least 77 participants. We expected a similar sized effect in the current study, but in order to maximise power we aimed to increase our original sample size by at least 50%. The final total of 93 participants was achieved via opportunity sampling. The participants were tested at individual workstations in groups of up to five and received course credit for their participation. The research was approved by the local ethics committee in compliance with the host institution's *Code of Good Research Practice,* which adheres to the principles of the *Concordat to Support Research Integrity* and the *Declaration of Helsinki.*

Materials and Design. The MTQ48, developed by Clough et al. (2002) consists of 48 statements on six subscales: challenge, commitment, emotional control, life control, confidence in abilities, and interpersonal confidence. Examples of the statements include "Challenges usually bring out the best in me" (challenge), "I usually find something to motivate me" (commitment), "I can usually control my nervousness" (emotional control), "I generally feel in control" (life control), "I generally feel that I am a worthwhile person" (confidence in abilities), and "I often feel intimidated in social gatherings" (interpersonal confidence: reverse scored). Participants respond to the items on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The MTQ48's subscales have been shown to have acceptable validity and reliability in a number of studies (e.g., Crust and Keegan, 2010; Lin, Clough, Welch & Papageorgiou, 2017; Perry, Clough, Crust, Earle & Nicholls, 2013; Ward, St Claire-Thompson and Postlethwaite, 2018).

The SMTQ, developed by Sheard et al. (2009), consists of 14 items divided into three subscales of confidence, constancy, and control. Examples include "I have an unshakeable confidence in my ability" (confidence), "I give up in difficult situations" (constancy), and "I worry about performing poorly" (control: reverse scored). Responses are made on a 4-point Likert scale from "not at all true" to "very true". Sheard et al. found the SMTQ to have

adequate reliability, divergent validity, and discriminative power. Additional support for the reliabilities of the three subs-scales has been shown by Zieger and Zeiger (2018) and Goldby and Wood (2016).

The Big Five Inventory (BFI; McCrae & Costa, 1987) consists of a 44-item questionnaire measuring the five personality traits of extraversion, agreeableness, neuroticism, conscientiousness, and openness to experience. Participants complete the sentence stem "I see myself as someone who" with phrases that relate to one of the five traits and then rate whether they agree or disagree with the resulting statement. Examples include "is talkative" (extraversion), "is helpful and unselfish with others" (agreeableness), "worries a lot" (neuroticism), "does a thorough job (conscientiousness), and "prefers work that is routine" (openness to experience: reverse scored). Participants respond on a 5-point Likert scale from "disagree strongly" to "agree strongly". This well-established questionnaire has been shown to have acceptable reliabilities (e.g., Benet-Martinez & John, 1998).

The stimuli for the directed forgetting task were 96 concrete nouns (e.g., *cottage*, *teacher*) taken from the MRC Psycholinguistic Database (Wilson, 1988) and randomly divided into two study lists of 48 items each. Within each study list, 24 items were allocated to the Remember condition and 24 to the Forget condition. The recognition test consisted of the 24 Remember items and the 24 Forget items, with the 48 unstudied items included as lures. Allocation of lists to target and lure items and to Remember and Forget conditions was fully counterbalanced.

Procedure. Ethical approval was granted by the local Ethics Committee prior to the commencement of the study. At the start of the testing procedure, participants read and completed a consent form, then completed a brief demographic questionnaire followed by the MTQ48, the SMTQ, and the BFI. Participants were instructed to work through the questionnaires from the first item to the last and to spend no more than a few seconds on each

item. After completing all three questionnaires, participants were given the instructions for the directed forgetting task. Briefly, they were informed that they would be presented with a series of words followed by a memory test in which they would be required to remember some, but not all, of the presented words. They were told that each word would be followed by a row of upper case letter R (RRRRRR) or by a row of upper case letter F (FFFFFF). Participants were told that they would subsequently be asked to remember the words followed by RRRRRR but not those followed by FFFFFF.

The presentation of each item in the directed forgetting task began with a 1-second fixation consisting of a row of six asterisks, followed by a blank screen for 500ms, the study word for 750ms, a blank screen for 250ms, and the instruction ('RRRRRR' or 'FFFFFF') for 3 seconds. The next item appeared after a 500ms blank screen. After a 5-minute distractor task involving simple maths problems, participants received the instructions for the recognition test. They were told that they would be presented with another set of words, some of which had appeared in the study list and some of which had not. They were asked to identify all the words that had been presented in the study list, including the words they had been instructed to forget. Items in the recognition test remained on screen until the participants pressed a response key ('z' for an old item or 'm' for a new item) with a 500ms blank screen between each item.

Results

Mean recognition scores in the directed forgetting task were 21.23 (*SD*=2.43) for the Remember words and 15.20 (*SD*=4.86) for the Forget words. A paired samples t-test indicated a significant difference between the recognition scores, $t(92) = 12.49$, $p < .001$, $d = 1.29$, confirming that the directed forgetting manipulation was effective. The relationships between the measures of mental toughness and correct recognition scores for Remember and Forget words were then analysed in a series of hierarchical regressions. In each analysis, the

BFI scores were entered at step 1. Separate analyses were conducted on the MTQ48 and the SMTQ, with the respective subscales entered at step 2. For each measure of mental toughness, separate analyses were conducted on the correct recognition of Remember and Forget words.

In the analysis of the MTQ48 and Remember words, the BFI accounted for less than 5% (R^2 = .046) of the variance at step 1, F<1. Entering the MTQ48 at step 2 accounted for a statistically significant 21% of the variance, R^2 = .213, F (11,92) = 2.00; p = .039. Analysis of the coefficients showed a significant positive effect of emotional control (β = .47, p = .001), with none of the other subscales accounting for significant additional variance, all p's > .12 (see Table 1). In the analysis of the Forget words, neither the BFI, R^2 = .057, F (5,92) = 1.05; p = .395, nor the MTQ48, R^2 = .138, F (11,92) = 1.18; p = .315, accounted for significant variance in recognition scores (see Table 2). In the analysis of the SMTQ and Remember words, neither the BFI, R^2 = .046, nor the SMTQ, R^2 = .071, accounted for significant variance, both Fs<1 (see Table 3). Finally, neither the BFI, R^2 = .057, F (5,92) = 1.05; p = .395, nor the SMTQ, R^2 = .074, F<1, accounted for significant variance in the analysis of the Forget words (see Table 4). The correlation matrix for the recognition of Remember and Forget words and the scores on the MTQ48, SMTQ, and BFI subscales is shown in Table 5.

Discussion

The results of the current study are consistent with those of Dewhurst et al. (2012) in showing a positive association between mental toughness and directed forgetting. They also extend this finding to the item-method version of the directed forgetting paradigm and tests of recognition memory. As in our previous research, mental toughness was positively associated with retention of the Remember words but was not significantly associated with retention of the Forget words. This pattern confirms our previous interpretation that mental

toughness is associated with the ability to prevent unwanted information (the Forget words) from interfering with current goals (encoding the Remember words).

Although the selective effect on Remember items has now been observed in two studies, one might intuitively expect mental toughness to be associated with memory for Forget words, whereby individuals with high mental toughness remember fewer Forget words as well as more Remember words. However, such a finding would be more likely to occur if mentally tough individuals were actively suppressing unwanted information, rather than simply directing attention away from it. The current pattern is consistent with the findings of Festini and Reuter-Lorenz (2017) that the disruptive effect of articulatory suppression on directed forgetting in recognition memory was located in the Remember items, suggesting that the concurrent task interfered with the allocation of attention to the target information.

In our previous research, the relationship between mental toughness and the list-method directed forgetting task was driven by the commitment subscale of the MTQ48, suggesting that performance was linked to the ability to commit to current goals. In contrast, the relationship between mental toughness and the item-method task was driven by a positive effect of emotional control. According to Clough and Strycharczyk (2012, p.54), individuals with high levels of emotional control are able to control their responses to external forces and direct their energy towards their chosen objectives. This is consistent with the demands of the item-method directed forgetting task. The finding that directed forgetting was not significantly associated with the life control subscale of the MTQ48 suggests that it is control of one's responses that is critical in tasks that require one to allocate attention strategically, rather than control of external forces themselves.

In contrast to the MTQ48, the control subscale of the SMTQ was not significantly associated with directed forgetting. This is consistent with the findings of Crust and Swann

(2011) that, despite having the same label, some of the subscales of the MTQ48 and the SMTQ are measuring different constructs. In the current study, one possible explanation of the null effect in the SMTQ is that some items on the control subscale conflate emotional control and life control (e.g., "I get anxious by events I did not expect or cannot control" and "I get angry and frustrated when things do not go my way"). As noted above, the life control subscale of the MTQ48 was not significantly associated with performance on the directed forgetting task. The current findings thus underline the importance of distinguishing between the control of external forces and the control of one's emotional responses to them.

It should be noted, however, that directed forgetting requires *cognitive* control rather than emotional control. Although cognition and emotion are intimately associated (see Duncan & Barrett, 2007, and Gray, Braver, & Raichle, 2002, for reviews of the interdependence of cognition and emotion), it is likely to be the control of cognitive processes, rather than purely emotional processes, that predicts performance on the directed forgetting task. Interestingly, the Cricket Mental Toughness Inventory (CMTI) developed by Gucciardi and Gordon (2009) includes a subscale of attentional control. The CMTI was not suitable for the current study because some of the items refer specifically to cricket. It is possible, however, that the concept of attentional control underlies the pattern observed in the current study. Crust and Swann (2011) alluded to this point in their comparison of the MTQ48 and the SMTQ. As they noted, some items in the SMTQ (e.g., "I get distracted easily and lose my concentration" in the constancy subscale) would appear to relate to attentional control. The sensitivity of more general self-report measures of mental toughness might be enhanced by the inclusion of a subscale that measures attentional or cognitive control.

Dewhurst et al. (2102) discussed the importance of forgetting in competitive or pressurised situations, where dwelling on a mistake can undermine subsequent performance. The current findings suggest that mentally tough individuals, specifically those with high

levels of emotional (or cognitive) control, will be at an advantage in situations that involve repeated challenges over a sustained period of time. The ability to allocate attention trial by trial, remembering or forgetting information according to whether or not it is relevant to current goals, is clearly beneficial in many domains. An interesting direction for future research would be to investigate whether mentally tough individuals retain their advantage when the directed forgetting task is made more challenging, for example by presenting the task under time pressure or with a concurrent distractor task.

Delaney et al. (2015) found that the effect of directed forgetting in the list-method directed forgetting task was predicted by the conscientiousness subscale of the BFI as well as the commitment subscale of the MTQ48 and concluded that conscientiousness was the critical factor. In the current study, however, none of the subscales of the BFI was associated with performance on the item-method task. This is most likely due to differences in the nature of the directed forgetting tasks and the fact that the item-method was associated with emotional control rather than commitment. Horsburgh, Schermer, Veselka, and Vernon (2009) compared the MTQ48 and the BFI and found significant negative correlations between emotional control and neuroticism. Despite this, neuroticism was not significantly associated with the recognition of Remember words in the current study. It should be noted, however, that Horsburgh et al. found significant negative correlations between neuroticism and all MTQ48 items. The correlation matrix from the current study (see Table 5) shows the same pattern. In contrast, the only self-report measure that correlated significantly with the correct recognition of Remember words was emotional control. We share the concern expressed by Horsburgh et al. that correlations between self-report measures may be spurious.

To summarise, the current findings provide further evidence that it is possible to identify behavioural correlates of mental toughness in a simple laboratory task. Previous

research into mental toughness has relied primarily on self-report data collected using psychometric tests in the form of questionnaires. The current findings, together with those of Dewhurst et al. (2012), raise the possibility of moving from a model of mental toughness that is derived purely from self-reports to a model that combines self-reports with data from objective behavioural tests. By identifying the cognitive underpinnings of mental toughness, we can avoid circular definitions and develop better-targeted behavioural interventions to enhance mental toughness.

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Table 1: *Summary of the Simultaneous Multiple Regression Analyses for the BFI, the MTQ48, and Remember words*

		B	*B SE*	*Beta*	*Sig.*
Step 1	(Constant)	22.93	2.94		.000
	Extraversion	-.43	.35	-.14	.230
	Agreeableness	.52	.41	.15	.210
	Conscientiousness	-.42	.43	-.11	.337
	Neuroticism	-.25	.35	-.08	.466
	Openness	-.04	.50	-.01	.936
Step 2	(Constant)	16.71	4.55		.000
	Extraversion	-.33	.41	-.11	.426
	Agreeableness	.50	.40	.14	.219
	Conscientiousness	-.45	.54	-.12	.410
	Neuroticism	.14	.51	.05	.787
	Openness	-.41	.50	-.09	.411
	Challenge	-.13	.54	-.03	.808
	Commitment	1.24	.80	.25	.128
	Control (emotion)	2.33	.66	.47	.001
	Control (life)	-.48	.60	-.12	.431
	Confidence (abilities)	-1.00	.69	-.26	.147
	Confidence (interpersonal)	.16	.50	.05	.747

Table 2: *Summary of the Simultaneous Multiple Regression Analyses for the BFI, the MTQ48, and Forget words*

		B	*B SE*	*Beta*	*Sig.*
Step 1	(Constant)	15.23	5.84		.011
	Extraversion	-1.16	.70	-.19	.101
	Agreeableness	.26	.82	.04	.752
	Conscientiousness	.96	.85	.13	.262
	Neuroticism	.16	.68	.03	.817
	Openness	-.40	.99	-.04	.689
Step 2	(Constant)	21.47	9.50		.027
	Extraversion	-1.83	.86	-.30	.035
	Agreeableness	.55	.84	.08	.514
	Conscientiousness	1.57	1.13	.21	.168
	Neuroticism	-.47	1.06	-.08	.659
	Openness	-.64	1.04	-.07	.541
	Challenge	-1.11	1.31	-.13	.329
	Commitment	.38	1.68	-.04	.822
	Control (emotion)	.83	1.37	.09	.543
	Control (life)	-1.57	1.26	-.21	.216
	Confidence (abilities)	-.99	1.44	-.13	.490
	Confidence (interpersonal)	1.89	1.04	.30	.073

Table 3: *Summary of the Simultaneous Multiple Regression Analyses for the BFI, the SMTQ, and Remember words*

		B	*B SE*	*Beta*	*Sig.*
Step 1	(Constant)	22.93	2.94		.000
	Extraversion	-.43	.35	-.14	.230
	Agreeableness	.52	.41	.15	.210
	Conscientiousness	-.42	.43	-.11	.337
	Neuroticism	-.25	.35	-.08	.466
	Openness	-.04	.50	-.01	.936
Step 2	(Constant)	21.61	4.11		.000
	Extraversion	-.38	.37	-.12	.310
	Agreeableness	.42	.42	.12	.318
	Conscientiousness	-.61	.50	-.16	.229
	Neuroticism	-.09	.50	-.03	.863
	Openness	-.13	.53	.03	.810
	Confidence	-.43	.75	-.09	.573
	Constancy	.66	.65	.14	.316
	Control	.55	.55	.14	.323

Table 4: *Summary of the Simultaneous Multiple Regression Analyses for the BFI, the SMTQ, and Forget words*

		B	*B SE*	*Beta*	*Sig.*
Step 1	(Constant)	15.23	5.84		.011
	Extraversion	-1.16	.70	-.19	.101
	Agreeableness	.26	.82	.04	.752
	Conscientiousness	.96	.85	.13	.262
	Neuroticism	.16	.68	.03	.817
	Openness	-.40	.99	-.04	.689
Step 2	(Constant)	16.95	8.20		.042
	Extraversion	-.97	.74	-.16	.195
	Agreeableness	.13	.84	.02	.879
	Conscientiousness	.36	1.00	.05	.717
	Neuroticism	-.10	1.00	-.02	.922
	Openness	-.52	1.05	-.06	.621
	Confidence	-1.18	1.50	-.12	.435
	Constancy	1.55	1.30	.16	.237
	Control	.05	1.09	.01	.963

Table 5: *Correlation matrix for recognition of Remember words, recognition of Forget words, and the subscales of the MTQ48, SMTQ, and BFI.*

Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Remember words	1															
2. Forget words	.33**	1														
3. MTQ48 Challenge	-.03	-.16	1													
4. MTQ48 Commitment	.05	.01	.29**	1												
5. MTQ48 Control (Emo.)	.31**	-.05	.34**	.14	1											
6. MTQ48 Control (Life)	-.05	-.14	.41**	.58**	.36**	1										
7. MTQ48 Conf. (Ability)	-.06	-.15	.54**	.50**	.47**	.70**	1									
8. MTQ48 Conf. (Inter.)	-.08	-.04	.38**	.41**	.18	.48**	.45**	1								
9. SMTQ Confidence	-.01	-.12	.43**	.28**	.50**	.36**	.53**	.51**	1							
10. SMTQ Constancy	.07	.11	.29**	.56**	.04	.32**	.30**	.33**	.40**	1						
11. SMTQ Control	.13	-.03	.39**	.22*	.44**	.33**	.52**	.22*	.40**	.19	1					
12. Extraversion	.12	-.19	.27**	.17	.15	.22*	.30**	.63**	.41**	.15	.23*	1				
13. Agreableness	.12	.06	.18	.37**	.11	.19	.29**	.04	.12	.30**	.23*	.09	1			
14. Conscientiousness	-.06	.11	.15	.68**	-.04	.39**	.29**	.22*	.03	.47**	.07	.16	.39**	1		
15. Neuroticism	-.06	.04	-.56**	-.30**	-.60**	-.47**	-.69**	-.40**	-.59**	-.24*	-.64**	-.27**	-.28**	-.21*	1	
16. Openness	-.06	-.10	.19	.09	.11	.05	.01	.30**	.27**	.23*	.05	.29**	-.03	.02	-.01	1

* Significant at the 0.05 level (2-tailed)
** Significant at the 0.01 level (2-tailed)