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Accounting for intrusive thoughts in PTSD: Contributions of cognitive control and deliberate regulation strategies

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Abstract

Background—Persistent, trauma-related intrusive thoughts are common in individuals with posttraumatic stress disorder (PTSD). Automatic aspects of cognitive functioning (including executive functioning) and maladaptive deliberate attempts at cognitive regulation have been proposed as individual difference factors that may perpetuate intrusive thoughts. The current study sought to examine the joint contribution of these two factors on intrusive thoughts in PTSD.

Method—Forty-two women with PTSD completed an executive functioning assessment followed by a thought suppression task. Intrusive thoughts (frequency and duration), as well as participants' use of specific cognitive regulation strategies (avoidance-based thought regulation strategies; TRS), were measured during the task. Hierarchical linear regression was used to examine the interaction of executive functioning and TRS on intrusive thoughts.

Results—Greater use of TRS was associated with greater intrusive thought persistence for those with low executive functioning, but not those with high executive functioning.

Limitations—Data was collected cross-sectionally and the laboratory thought suppression task may not correspond to naturalistic thought regulation.

Conclusions—Results are consistent with prior literature suggesting that certain responses deployed by individuals to control intrusive thoughts may be unhelpful, but that a higher level of cognitive capacity may mitigate this effect. Implications of these findings for recent models of cognition in PTSD are discussed.

Keywords

PTSD; executive functioning; cognition; intrusions

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Introduction

Individuals with posttraumatic stress disorder (PTSD)¹ typically experience recurrent intrusive memories about traumatic experiences, a phenomenon captured by the re-experiencing symptom cluster of the diagnostic criteria (American Psychiatric Association, 2013). A critical question is what factors are implicated in the inability to regulate intrusive traumatic memories, and by extension what factors may contribute to chronic re-experiencing symptoms in individuals with PTSD. One explanation for the persistence of intrusive thoughts in PTSD focuses on the underlying automatic neurocognitive processes involved in thought regulation. By this account, an inability of cognitive control systems to downregulate or inhibit information results in the occurrence and persistence of unwanted intrusive thoughts (ITs; Anderson & Levy, 2008; Bomyea & Lang, 2015; Verwoerd, Wessel, & DeJong, 2009). Executive functioning (the cognitive control system that maintains and manipulates information while down-regulating irrelevant information; Miyake, Friedman, Emerson, Witzky, & Howerter, 2000) governs how individuals regulate ITs; individuals with relatively diminished executive functioning may have more difficulty preventing ITs from entering consciousness and removing them once they come to mind (Unsworth, 2010). In support of the executive functioning account in PTSD, individuals with the disorder are characterized by deficits in aspects of executive functioning compared to healthy controls (Aupperle, Melrose, Stein & Paulus, 2012) and demonstrate difficulty using cognitive resources to downregulate retrieval of emotional information (Catarino, Küpper, Werner-Seidler, Dalgleish, & Anderson, 2015). While these deficits may be partially secondary to the experience of trauma or having chronic PTSD, data suggest that poor executive functioning may be a pre-trauma risk factor for later PTSD development (e.g., Aupperle et al., 2012). Moreover, re-experiencing symptoms are inversely associated with executive functioning (Verwoerd et al., 2009; Bomyea, Amir, & Lang, 2012), and ITs and re-experiencing symptoms are reduced following improvements in executive functioning in analogue and PTSD samples, respectively (Bomyea & Amir, 2011; Bomyea, Stein, & Lang, 2015).

The manner in which an individual responds to negative ITs using deliberate, conscious strategies is also a potential determinant of whether such thoughts will persist or discontinue. Specifically, attempting to avoid ITs can paradoxically perpetuate rather than eliminate them. For example, suppressing identified negative thoughts is typically considered to be maladaptive. Numerous studies demonstrate a paradoxical effect of attempted thought suppression, such that when participants attempt to suppress thoughts (e.g., when instructed to avoid thinking about a white bear) there is actually an increase in the thought (for a review see Wenzlaff & Wegner, 2000). This phenomenon has been explained by Wegner's ironic process theory, which states that the process used to suppress (i.e., conscious searching for alternatives to the to-be-suppressed thought and simultaneous searching for failures of suppression) actually increases the emergence of the to-be-suppressed thought (Wegner & Erber, 1992). Other avoidant strategies or techniques that

¹Abbreviations: TRS = avoidance-base thought regulation strategy; IT = intrusive thought; PTSD = Posttraumatic Stress Disorder; CAPS = Clinician Administered PTSD Scale; PCL-C = PTSD Checklist-Civilian version; BDI-II = Beck Depression Inventory, 2nd edition; Ospan = operation span; TST-RQ = Thought Suppression Task Reactivity Questionnaire

have been identified as maladaptive include the use of self-punishing statements and attempts at distraction with rumination and worry (e.g., dwelling on another negative thought or potential future event; Moore & Abramowitz, 2007; Wells & Davies, 1994). Individuals with PTSD often rely on avoidance-based thought regulation strategies (TRS), which may contribute to the development or persistence of re-experiencing symptoms in the disorder (e.g., Bennett, Beck, & Clapp, 2009; Scarpa, Wilson, Wells, Patriquin, & Tanaka, 2009; Reynolds & Wells, 1999).

In spite of evidence that executive functioning and TRS contribute to disruptions in cognitive regulation, relatively less empirical work has examined the extent to which they work jointly to affect persistence of ITs. However, when participants are explicitly instructed to use avoidant cognitive regulation strategies, the degree of regulation success depends on executive functioning ability. Two studies demonstrated that participants' level of pre-existing executive functioning (measured using a working memory capacity task) predicted the extent to which they were able to suppress target thoughts (Brewin & Beaton, 2002; Brewin & Smart, 2005). Similarly, studies have shown that consciously avoiding target thoughts and memories is feasible in some cases, and depends on the executive functioning capacity of the participant (e.g., "think/no-think" paradigms; Küpper, Benoit, Dalgleish, & Anderson, 2014; van Schie, Geraerts, & Anderson, 2013). Taken together, research suggests that executive functioning resources contribute to success in using cognitive regulation techniques, such that individuals with relatively poor executive functioning experienced more intrusive thoughts when told to use a specific TRS (i.e., suppression). However, the relationship between executive functioning and the use of TRS when cognitive regulation strategies are selected and applied naturalistically by the individual has not yet been empirically examined, and the effect of these two factors on ITs has yet to be established in PTSD.

A recently proposed model highlights the possibility of an interrelationship and interactive effect of TRS and executive functioning that accounts for IT persistence in PTSD (Bomyea & Lang, 2015). In this model, diminished levels of executive functioning increase vulnerability to intrusive thoughts and memories in part due to poorer ability to downregulate unwanted cognitive activity, but also in part because poor executive functioning is associated with the tendency to use less adaptive forms of cognitive and emotion regulation. Although data suggest executive functioning predicts emotional and physiological regulation ability (e.g., Schmeichel & Demaree, 2010; Schmeichel, Volokhov, & Demaree, 2008; Williams, Suchy, & Rau, 2009), evidence is limited regarding how executive functioning may be related to the selection or use of cognitive regulation strategies. One possibility raised by this model is that using TRS may be most disadvantageous for individuals with deficient executive functioning (i.e., the degree to which deliberate, conscious avoidance techniques for cognitive regulation are unhelpful may be moderated by the availability of cognitive resources).

The goal of the present study was to examine relationships between executive functioning, TRS, and the persistence of intrusive thoughts in PTSD. To assess IT persistence, participants completed a laboratory-based thought monitoring task and recorded intrusive thought persistence and use of TRS (i.e., suppression, worry, self-punishment). We were

interested in examining how deliberate approaches to cognitive control (TRS) and automatic deployment of cognitive resources (executive functioning) affected ITs. Studies using laboratory thought suppression paradigms demonstrate that individuals with PTSD are characterized by a rebound in trauma-related ITs after engaging in thought suppression relative to controls (Amstadter, & Vernon, 2006; Shipherd & Beck, 1999; 2005). We thus used ITs during this potential vulnerable “rebound” phase as an indicator of difficulty downregulating ITs. We hypothesized that executive functioning and TRS would be related to ITs. Moreover, we predicted that the effects of executive functioning and TRS on ITs would be interactive. Specifically, we hypothesized that the relationship between TRS and ITs would be moderated by the participant’s level of executive functioning, such that there would be a stronger relationship between TRS and IT in those with low executive functioning compared to high executive functioning.

Method

Participants

Participants included 42 women between the ages of 18 and 65 diagnosed with primary PTSD secondary to sexual trauma per DSM-IV criteria. Individuals were recruited to participate through several sources, including the university subject pool and referrals through affiliated mental health providers. Recruitment materials were also posted in local community posting areas and through online websites (e.g., www.craigslist.org). Data were collected as part of a baseline assessment from a larger randomized clinical trial of a novel computer-based intervention for PTSD (Bomyea et al., 2015). Exclusion criteria included current trauma-focused psychosocial treatment, recent change in psychosocial treatment, active suicidality within the past 6 months, substance dependence in the past 6 months, current or past schizophrenia, bipolar disorder, or organic mental disorder, and insufficient English-language proficiency to complete study tasks. Participants were compensated \$25 for completing study assessments. All study procedures were approved by the institutional review boards at the University of California, San Diego and San Diego State University.

Measures

Demographics—Participants completed a demographics form, including questions regarding age, ethnicity, marital status, and years of education. Table 1 reports baseline demographic characteristics of the sample.

PTSD diagnosis—The Clinician Administered PTSD Scale (CAPS) was administered by the first author under the supervision of the second author, a licensed clinical psychologist, to determine PTSD diagnosis using DSM-IV criteria. The CAPS is a psychometrically sound structured clinical interview designed to measure symptoms of PTSD (Weathers, Keane, & Davidson, 2001; Weathers, Ruscio, & Keane, 1999). Diagnostic status was determined using the severity and intensity ratings of the questions using the “F1/I2” scoring rule, such that a symptom was counted as present if the individual endorsed a frequency greater than one and intensity greater than 2 (Weathers et al., 1999). Interviews were videotaped, and a portion were rated by a second clinician to determine diagnostic agreement. In all cases, diagnostic agreement was confirmed.

Symptom self-reports—Participants completed a self-report packet assessing PTSD and depression severity. The PTSD Checklist-Civilian version (PCL-C; Weather, Litz, Huska, & Keane, 1994) is a 17-item measure assessing PTSD symptom severity (Berlant & van Kammen, 2002). Items correspond to distress associated with DSM-IV diagnostic criteria and are rated on a scale from 1 (not at all bothersome) to 5 (extremely bothersome). Scores are determined by summing symptom severity items, with a range from 17 to 85. Validation studies indicate that the PCL-C has sound psychometric properties (Orsillo, 2001). Cronbach's α in the current study was .79. The Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996) was administered to assess symptoms of depression. The BDI-II is a 21-item scale assessing symptoms over the previous two weeks. All items are multiple choice and scored on a scale of 0 to 3; total scores are based on the sum of items and range from 0 to 63. The BDI-II is a reliable and well-validated measure of depressive symptoms (Beck et al. 1996). Cronbach's α in the current study was .90.

Executive functioning assessment: Operation span task—Executive functioning was assessed using a computerized operation span (Ospan) working memory capacity task (Conway et al., 2005; Unsworth et al., 2005). In this task, participants are required to remember letter stimuli while simultaneously completing math exercises. In each trial, the participant first sees a centered fixation cross (500ms), followed by a completed math problem. The participant indicates whether or not the answer to the math problem is completed correctly or incorrectly by using the mouse to select a corresponding button. The participant is then shown a letter (500ms) that they are asked to remember. The presentation of completed math equations and letters repeats two to seven times, at which point a recall array of 12 letters appears, prompting the participant to select the letters that were shown in the correct serial order. After the participant completes the recall array, the next set of math and letters begins for a total of 18 trials. Working memory capacity performance is indexed by the percent of letters identified in the correct serial position. The Ospan has demonstrated sound psychometric properties, including high test-retest reliability and convergence with other measures of higher-order cognitive functioning assessments (Conway et al., 2005).

Thought Suppression Task—To obtain an in-laboratory assessment of thought regulation ability, participants completed a thought suppression task (Wegner, Schneider, Carter, & White, 1987; Wenzlaff & Wagner, 2000). The experimenter first gave participants a definition of intrusive thoughts (adapted from Salkovskis & Campbell, 1994). Next, participants completed the fifteen minute thought suppression task while indicating the number of trauma-related ITs they experienced using a hand-held event marker (Najmi, Riemann, & Wegner, 2009). For the first five minute period, the experimenter instructed participants to think about anything they wished while simultaneously recording each time they experienced a trauma-related IT. For the second five minute period, the experimenter instructed participants to try to avoid thinking about their index trauma, but to record any IT occurrences that did occur. For the final five minute period, the experimenter instructed participants that they could think of anything, and to record occurrences of trauma-related ITs as in period one. Immediately after each period, participants indicated the percentage of the period they spent having trauma-related ITs, from zero to one hundred percent. An index of IT persistence during the each period was computed via a composite score of the total

number of intrusions (i.e., number of counts from the hand-held recorder) and intrusion duration (i.e., self-reported percent of the time period spent on intrusive thoughts).

Thought suppression task-reactivity questionnaire—Immediately after each time period, participants completed the thought suppression task-reactivity questionnaire (TST-RQ), a brief self-report form created for this study to assess reactions during the thought suppression task. Items assessed the degree to which individuals used three specific types of strategies in response to intrusive thoughts: suppression (i.e., “tried not to think about the thought or anything that might be a reminder of the thought”), negative dwelling (i.e., “dwelled on another negative thought”; designed to capture worry in the case of dwelling about a potentially negative future event or rumination in the case of dwelling about a negative past event), and self-punishment (i.e., “felt angry or upset at myself for having the thought”). Negative dwelling and self-punishment items were adapted from items on the Thought Control Questionnaire (Wells & Davies, 1994). Participants rated, on a 1 (not at all) to 7 (very much) scale, the extent to which they used suppression, negative dwelling, or self-punishment in response to ITs during each phase of the thought suppression task. These three items were summed to create a total score for each period that captured utilization of TRS.

Procedure

Participants began the study by providing informed written consent and completing the interview and clinical symptom self-report questionnaires. After this initial assessment session, participants returned to the lab for a second visit. First participants completed the Ospan. Next, they were told they would be completing a thought monitoring task that would consist of three 5-minute monitoring intervals. They then completed the thought suppression task, and after each interval phase participants completed the TST-RQ. Participants were debriefed following their participation in the parent study.

Results

Preliminary analyses and data preparation

Descriptive information for study measures are presented in Table 1, and bivariate correlations in Table 2. Comorbid DSM-IV diagnoses included major depressive disorder or other mood disorders ($N = 22$, 52.4%), anxiety disorders ($N = 20$, 47.6%), substance abuse ($N = 4$, 9.5%), and eating disorders ($N = 2$, 4.8%). Prior to conducting the main analyses, we screened for univariate outliers by identifying scores 3.0 or more SD from the sample mean and multivariate outliers by examining leverage and Cook’s distance values. This procedure identified one univariate outlier on IT scores during the thought suppression task; this individual’s score was adjusted to one point above the next highest (non-outlier) score (Tabachnick & Fidell, 2007). Prior to the regression analyses, continuous predictor variables included in interaction terms were centered following the recommendations of Aiken and West (1991). Do executive functioning and TRS predict ITs?

Hierarchical regression analyses were used to test the hypothesis that executive functioning and TRS would interact to predict the persistence of intrusive thoughts during the thought suppression task. Given that individuals with PTSD typically demonstrate a post-

suppression increase in trauma-related ITs, the critical period of interest was the post-suppression monitoring period, when participants were not given explicit instruction regarding how to regulate their thoughts. Thus, IT persistence during the post-suppression period (post-ITs) served as the dependent variable. For all analyses, baseline IT persistence (i.e., during the pre-suppression period; pre-ITs) was included in step one as a control for general regulation ability prior to the introduction of explicit instructions. The two predictor variables, Ospan and TST-RQ scores were entered in step two of the regression equation. The Ospan-by-TST-RQ interaction term was entered in step three of the regression analysis. Results revealed a significant Ospan-by-TST-RQ interaction, $R^2 = 0.10$, $p = .01$, which indicated that individuals' executive functioning performance moderated the relationship between the extent to which individuals utilized TRS strategies during the post-suppression period of the thought suppression task and persistence of ITs in that phase (Table 3)².

The significant interaction was probed in two ways. First executive functioning was dichotomized based on a median split and a simple slope analysis within groups conducted. TST-RQ scores were significantly and positively associated with greater IT persistence for individuals with low Ospan, $\beta = 0.55$, $t = 3.26$, $p = .004$. This effect did not reach significance for individuals with high Ospan, $\beta = .26$, $t = 1.32$, $p = .20$ (see Figure 1). Second, a regions of significance (ROS) analysis was conducted (Johnson & Neyman, 1936) with the SPSS macro developed by Hayes and Matthes (2009). ROS analysis allows for identification of the specific values of the moderator for which there is a relationship between the predictor and outcome (i.e., at what level of executive functioning performance there is a relationship between TRS and ITs). This analysis identified 81.1% on the Ospan as a point of transition between a statistically significant and a statistically non-significant effect of TST-RQ on post-ITs, $B = .10$ ($SE = .05$), [$t(37) = 1.76$, $p = .09$]. For Ospan scores below 81.1 to the lowest value observed (37.0), there was a significant relationship between TRS and ITs. However, at Ospan scores above 81.1 to the maximum observed value (100.0), TRS did not significantly relate to ITs.

Discussion

PTSD is characterized by frequent, recurrent thoughts about traumatic experiences (e.g., Ehlers, 2010); poor executive functioning and the use of TRS are two individual difference factors proposed to account for persistent trauma-related ITs (e.g., Bennett et al., 2009; Bomyea et al., 2012). The current study examined relationships between executive functioning, TRS, and IT regulation in a sample of individuals with PTSD during a laboratory-based TST. PTSD is associated with an increased frequency of ITs following thought suppression, suggesting the presence of disruptions in cognitive monitoring and/or regulation following deliberate suppression attempts (e.g., Beck et al., 2006). We tested the hypothesis that TRS and executive functioning account for variability in regulation of ITs specifically during this period of the TST, and that individuals with poor executive functioning and high TRS usage would experience the greatest number of ITs.

²The regression model was also conducted including total CAPS and depression severity score as a predictor in the model. The pattern of results remained the same, such that the interaction of EF and TRS was a statistically significant predictor of thought persistence.

Results revealed that greater self-reported TRS use (i.e., TST-RQ scores) was positively associated with ITs after suppression, consistent with literature suggesting that the use of avoidance techniques is generally an ineffective cognitive regulation strategy (e.g., Wells & Davies; 1994; Wenzlaff & Wegner, 2000). In contrast, the bivariate relationship between executive functioning and ITs did not reach statistical significance. Theoretical accounts of the relationship between executive functioning and re-experiencing symptoms in PTSD, as well as data showing relationships between executive functioning and ITs in analogue samples, suggest that performance on the Ospan task might be associated with ITs during the TST (e.g., Verwoerd et al., 2009). Although methodological factors (e.g., limited power and a restricted range due to the distressed sample) likely contributed to failure to observe a statistically significant relationship, the magnitude of the effect was relatively small. Consideration of how individuals modulate intrusive thoughts using automatic cognitive processes (executive functioning) may thus be more informative when taking other factors into account, including how these cognitive resources are linked to deliberate reactions to ITs.

Consistent with this proposal, individuals with poorer executive functioning performance endorsed greater use of TRS, and the extent to which TRS impacted trauma-related ITs after attempted suppression was moderated by level of executive functioning. Relationships between executive functioning and certain forms of emotional regulation have been demonstrated (e.g., emotional suppression; Schmeichel et al., 2008), and our study extends existing literature by demonstrating a relationship between executive functioning and how individuals relate to and attempt to regulate their thought contents. Moreover, data indicated that individuals with low executive functioning scores displayed the typical pattern of a positive relationship between TRS and ITs, suggesting that using suppression, self-punishment and negative dwelling were detrimental for IT regulation. However, there was no statistically significant relationship between TRS and ITs for individuals with high executive functioning scores. Thus, the relationship between TRS and ITs depended on cognitive resources available, such that better executive functioning may buffer the effects of TRS on ITs. Our conclusions are broadly in line with prior work suggesting that avoidance of ITs (e.g., suppression) is an effortful and demanding task that requires availability of cognitive resources (e.g., Wegner and Erber, 1991), which may be depleted over time under taxing cognitions (i.e., after attempting to follow earlier experimental instructions to suppress; Englert & Bertrams, 2015).

Following traumatic experiences, many individuals experience distressing memories that they might prefer to avoid, particularly in certain circumstances (i.e., when having the thought and associated emotion would interrupt ongoing activities). In spite of the potential utility of averting the mind away from negative memories, avoiding ITs is considered to be a maladaptive coping strategy involved in the etiology and maintenance of PTSD. The current study suggests that individuals who tend to use maladaptive methods for dealing with ITs may be particularly vulnerable to experiencing recurrent negative cognitions after trauma, which may be in part because of concurrent diminished cognitive resources available to devote toward the goal of avoidance (due to situational factors or general trait factors such as inherited ability; Friedman et al., 2008). Moreover, avoidance precludes emotional habituation, thereby increasing subjective fear and anxiety, further increasing the likelihood

that ITs will be triggered (i.e., through contextual cues; Foa & Kozak, 1986; Wells & Sembi, 2004). In contrast, although avoidant thought regulation techniques are not recommended for those with relatively good cognitive capacity, these individuals appear to have additional resources that shield against the potentially harmful effects that avoidance might have on ITs. From a clinical perspective, this suggests that individuals expected or assessed to have executive functioning deficits (e.g., following head injury or neurodegenerative disease) might particularly benefit from interventions targeted at reducing maladaptive attempts to avoid trauma-related thoughts or memories.

A number of limitations exist in the current study. First, the data cannot speak to the temporal process or causal chain by which executive functioning and TRS contribute to the persistence of intrusive thoughts that unfold naturalistically over time. It is possible that poorer executive functioning leads to more intrusive thoughts, which leads to TRS in response. However, alternative plausible accounts are that diminished executive functioning encourages compensatory TRS which leads to ITs, or that reductions in executive functioning are actually attributable to the emotional and cognitive toll of chronically experiencing and trying to avoid ITs. In addition, participants were not assessed immediately after trauma and followed longitudinally to determine the effect of trauma and PTSD on executive functioning. Thus, it is possible that chronic PTSD has a detrimental effect on executive functioning performance over time (e.g., resulting from long-term exposure to stress hormones that have deleterious effects on neurobiological substrates involved in higher order cognition; George et al., 2015). Thus it remains to be established the extent to which executive functioning performance predates trauma or PTSD. Further research is needed to better elucidate how these factors unfold over time. Although participants were allowed to use regulation strategies without instruction, the paradigm was still a lab-based task and may not accurately reflect day-to-day cognitive patterns. Because this study used a specific sample of individuals with PTSD related to sexual trauma, it cannot speak to how processes differ in PTSD relative to other groups, or whether effects generalize to other type of traumatic events. Finally, because the sample was small, future studies are needed to replicate the observed effect.

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Highlights

- Maladaptive thought regulation strategies are implicated in intrusive thoughts (ITs).
- This relationship may depend on availability of cognitive resources.
- The effect of these factors on ITs during thought monitoring was measured in PTSD.
- Low cognitive resources combined with poor regulation strategies produced more ITs.

Figure 1. Interaction effect predicting intrusive thought persistence based on TRS use in participants with low (left) versus high (right) Ospan performance.

Table 1

Sample baseline characteristics.

Variable	
Mean Age (SD)	28.00 (10.7)
Mean Years Education	14.9 (2.4)
N per Racial category	
Caucasian	29
Black	3
Asian	9
Other/Biracial	1
Mean number of months since trauma	123 (140)
Mean PCL-C severity score	55.8 (10.1)
Mean BDI-II score	28.3 (11.0)
Mean Ospan score	78.3% (.17)
Mean Intrusions	
Period 1	9.5 (9.2)
Period 2	6.0 (6.1)
Period 3	5.0 (7.2)
Mean % time of intrusions	
Period 1	32.7 (28.9)
Period 2	21.2 (23.6)
Period 3	16.3 (18.1)
Mean TST-RQ score	11.0 (4.0)

Note: PCL-C= PTSD Checklist, civilian version; BDI-II = Beck Depression Inventory-II; Ospan: Operation Span; TST-RQ = Thought suppression task reactivity questionnaire.

Table 2
Bivariate correlations between PTSD symptoms, depression, Ospan performance, and TST measures

Measure	1	2	3	4	5	6
1. PCL-C	1.00					
2. BDI-II	.75***	1.0				
3. Ospan % correct	-.028	-.15	1.00			
4. TST-RQ	0.35*	.31*	-.41**	1.00		
5. Pre-ITs	0.43**	.22	-.27	.14	1.00	
6. Post-ITs	0.42**	.15	-.22	.49**	.45**	1.00

Note: PCL-C= PTSD Checklist; BDI-II = Beck Depression Inventory II; Ospan= Operation Span score; TST-RQ = Thought suppression task reactivity questionnaire; Pre-ITs= Intrusive thought persistence score during period 1; Post-ITs = Intrusive thought persistence score during period 3

* $p < .05$

** $p < .01$

*** $p < .001$.

Table 3

Hierarchical regression analyses predicting intrusive thought persistence

Variable	B	SE B	β	95%CI	R ²
Step 1					
Pre-IT's	0.41	0.13	0.45**	.15, .66	.21*
Step 2					
Pre-IT's	0.37	0.12	0.41**	0.13, 0.60	0.19**
Ospan	0.68	1.25	0.08	-1.86, 3.21	
TRS	0.17	0.05	0.47**	0.07, 0.27	
Step 3					
Pre-IT's	0.32	0.11	0.36**	0.10, 0.54	0.10*
Ospan	1.57	1.20	0.18	-0.87, 4.00	
TRS	0.12	0.05	0.32*	0.01, 0.22	
Ospan $\times$ TRS	-0.64	0.23	-0.39*	-1.11, -0.16	

Note: ITs = Intrusive thoughts; Ospan = Operation Span score; TRS = Avoidance-base thought regulation strategies; Pre-ITs= Intrusive thought persistence score during period 1; Post-ITs = Intrusive thought persistence score during period 3

* $p < .05$

** $p < .01$.