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# Attentional control as a prospective predictor of posttraumatic stress symptomatology

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ABSTRACT

Attentional control may be used by trauma survivors to temporarily disengage and shift attention from threat salient information, allowing individuals to remain in, and habituate to, trauma-relevant contexts rather than using less adaptive regulatory strategies. Thus, greater attentional control abilities may be one factor that differentiates those who recover from trauma exposure from those who do not. In the present study, we examined attentional control as a prospective predictor of posttraumatic (PTS) symptoms over the course of two assessment sessions (T1 and T2). Consistent with the hypothesis that attentional control can be used to alleviate trauma-related distress, we predicted that an inverse relation between T1 attentional control and T2 PTS symptoms would be significantly stronger among participants who had experienced a traumatic event between time points (24% of the total sample: $N = 85$). Pre-T1 trauma history and T1 PTS symptoms served as covariates in regression analysis. Results revealed that T1 attentional control only predicted T2 PTS symptoms for participants who had experienced a traumatic event between time points. Thus, attentional control may be a protective factor against the development of PTS symptomatology in the aftermath of a traumatic event.



## 1. Introduction

Although it is not uncommon to experience a traumatic event, only a small fraction of trauma exposed individuals go on to develop posttraumatic stress disorder (PTSD; Breslau & Kessler, 2001). Although a number of pre-trauma risk factors have been suggested in the development of PTSD, a great deal of attention has been paid in the extant literature to information processing biases, with a number of laboratory studies providing evidence that those with relatively higher posttraumatic stress (PTS) symptoms have a bias for attending to threat information (e.g., Bardeen & Orcutt, 2011; Olatunji, Armstrong, McHugo, & Zald, 2013; Pineles, Shipherd, Mostoufi, Abramovitz, & Yovel, 2009). In fact, some have suggested that PTSD is an information-processing disorder, with an emphasis on biased threat perception (van der Kolk & McFarlane, 1996).

In line with this conceptualization, research has shown that prolonged attentional engagement with threat information maintains negative affective states (Bardeen & Read, 2010; Compton, 2000). Protracted states of distress may subsequently decrease the cognitive resources that are available for the emotional processing of trauma information (Foa & Kozak, 1986), thus resulting in the development and/or maintenance of PTS symptoms. However, popular theories of attentional threat processing (i.e., goal driven/stimulus driven theory: Corbetta & Shulman, 2002; attentional control theory: Eysenck, Derakshan, Santos, & Calvo, 2007; hot/cool-system theory of self-regulation: Metcalfe & Mischel, 1999) suggest that top-down attentional control (AC: i.e., the strategic control of higher-order executive attention in regulating bottom-up, stimulus driven, emotional responses) can be used to strategically avoid threat information in an attempt to alleviate emotional distress. Consistent with these theories, preliminary evidence suggests that AC can be used to disengage and shift attention from PTS-related threat information (Schoorl, Putman, van der Werff, & van der Does, 2014), even among those with relatively higher PTS symptoms (Bardeen & Orcutt, 2011), thus reducing trauma-related distress (Bardeen & Read, 2010). The use of AC to temporarily disengage and shift attention from threat salient information may help to down-regulate sympathetic nervous system arousal, thus allowing one to remain in, and habituate to,

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trauma-relevant contexts rather than using less adaptive regulatory strategies which have been shown to maintain PTS symptoms (e.g., experiential avoidance; Kumpula, Orcutt, Bardeen, & Varkovitzky, 2011). Thus, AC may be one pre-trauma individual difference factor of particular relevance for understanding the development of PTS symptoms following trauma exposure.

Relatively few published studies have examined AC in the context of PTS symptomatology; however, a number of studies have shown that relatively lower levels of AC are associated with higher levels of a host of maladaptive outcomes, including PTS symptoms (Bardeen & Orcutt, 2011), poor social adaptation and externalizing behaviors (Eisenberg, Fabes, Guthrie, & Reiser, 2000), worry and rumination (Armstrong, Zald, & Olatunji, 2011), and symptoms of hyperactivity and inattention in children (Wiersema & Roeyers, 2009). Interestingly, AC has exhibited a protective effect in examinations of relations between putative risk factors and maladaptive outcomes. Specifically, empirical research has shown that AC protects (a) those who are prone to use maladaptive coping behaviors, such as worry and thought suppression from experiencing higher levels of anxiety (Fergus, Bardeen, & Orcutt, 2012), (b) those who perceive themselves as having poor emotion regulation abilities from ceasing goal-directed behavior when experiencing distress (Bardeen, Tull, Dixon-Gordon, Stevens, & Gratz, in press), (c) those with public-speaking anxiety from decrements in speech performance (Jones, Fazio, & Vasey, 2012), and (d) those with higher levels of trait anxiety from responding with fear to a $CO_2$ challenge (Richey, Keough, & Schmidt, 2012). Taken together, these findings suggest AC as a transdiagnostic protective factor against the development of maladaptive outcomes, even among those with outcome-specific vulnerabilities.

Findings to date are consistent with Gross's (1998) process model of emotion regulation, in which the ability to flexibly control attention is essential for maintaining psychological well-being. In Gross's model, attention deployment is considered the gatekeeper of emotion regulation, directly influencing subsequent stages of emotion regulation. Thus, the importance of examining the role of pre-trauma AC in the development of PTS symptoms following a traumatic event cannot be overstated, especially given research which has identified dispositional emotion dysregulation as a risk factor for the development of PTS symptomatology following trauma exposure (Bardeen, Kumpula, & Orcutt, 2013).

Although the extant literature has provided evidence suggesting that relatively higher levels of AC may promote psychological well-being, even among those who are vulnerable to experiencing maladaptive psychological outcomes, the cross-sectional nature of research in this area precludes inferences regarding temporal relations among AC and maladaptive outcomes. Thus, in the present study, we examined AC as a prospective predictor of PTS symptoms over the course of two assessment sessions. We hypothesized that AC at the first assessment session (T1) would be negatively associated with PTS symptoms at T1 and at the follow-up assessment session (T2). In addition, we examined exposure to a traumatic event between assessment sessions as a moderator of the relationship between T1 AC and T2 PTS symptoms. Given that increased PTS symptoms are not uncommon in the acute aftermath of trauma exposure, as well as evidence suggesting AC as a protective factor, we expected that an inverse relation between T1 AC and T2 PTS symptoms would be significantly stronger among participants who had experienced a traumatic event between assessment sessions when accounting for pre-T1 trauma history and T1 PTS symptoms. This hypothesis is consistent with theory, and empirical research, which suggests that AC can be used to alleviate trauma-related distress. Thus, among participants who experience a traumatic event, those with higher AC abilities may be significantly less likely to experience PTS symptoms in the acute aftermath of the event.

## 2. Method

### 2.1. Participants and procedure

This study was conducted as part of a larger study investigating relations among constructs of distress tolerance, emotion regulation, and emotional distress. Participants were recruited from introductory psychology courses at a Midwestern U.S. University. Over the course of an academic semester, 135 participants completed two assessment sessions. To be included in the present study, participants had to endorse having experienced at least one traumatic event at the first assessment session (i.e., Criterion A of the Diagnostic and Statistical Manual of Mental Disorders [DSM-V-TR]; (American Psychiatric Association [APA], 2000). Forty-eight (36%) participants who did not report experiencing a traumatic event at T1 were excluded from the final sample. Additionally, two cases were removed from analyses because of undue influence on the primary analytic model (i.e., multivariate outliers >1 $DFFITS_i$; Cohen, Cohen, West, & Aiken, 2003). The final sample ($N = 85$; 54 women) had an average age of 19.8 years ($SD = 2.5$) and 72% self-identified as White, 14% as Black, 2% as Asian, 1% as American Indian or Alaska Native, 9% endorsed "other", while 1% preferred not to respond. Additionally, 7% of participants reported being of Hispanic/Latino ethnicity.

For this institutional review board approved study, participants completed a battery of random-ordered questionnaires at each time point. Informed consent and study measures were administered via a secure online survey program. Participants could complete both study sessions from any computer with internet access. Participants were informed that their responses were confidential and that they were free to withdraw from the study at any time. Following completion of each study session, participants were given credit for their introductory psychology course. The interval between T1 and T2 varied ($M = 36.9$ days; $SD = 11.0$; range 26–84 days); over 90% of the sample completed T2 within 25–50 days of T1.

### 2.2. Measures

The Attentional Control Scale (ACS: Derryberry & Reed, 2002) is a self-report measure that assesses one's ability to flexibly control attention. The 20 items of the ACS are rated on a 4-point scale (1 = *Almost never true of me* to 4 = *Always true of me*), with higher scores indicating relatively better AC abilities. Participants were asked to rate how often, or how much, each statement applies to them in general. The ACS has exhibited adequate psychometric properties, including good internal consistency and concurrent validity (Derryberry & Reed, 2002). Additionally, higher scores are predictive of increased activation in brain areas associated with top-down emotion regulation (Matthews, Yiend, & Lawrence, 2004). Internal consistency for the ACS total score ($M = 53.40$, $SD = 9.71$, range = 21–75) in the present sample was adequate ($\alpha = .85$).

With the goal of reducing participant burden, a brief 7-item self-report questionnaire (Read et al., 2012), which was adapted from the Traumatic Life Events Questionnaire (TLEQ: Kubany et al., 2000), was used to assess a range of Criterion A experiences, including: (1) natural disaster/accident/fire, (2) combat, (3) sudden unexpected death of a loved one, (4) life-threatening illness, (5) physical assault, (6) sexual assault, or (7) other events that were life threatening, caused serious injury, or were highly distressing (example events were provided for this question). From the events reported, participants were asked to identify the one event that they found to be most distressing. Participants completed this measure at both sessions; however; at T2, participants were asked

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to report only the traumatic event(s) that they had experienced since completing the T1 assessment session.

The majority of participants reported experiencing events from multiple trauma categories ($M = 2.5$ of the 7 categories, $SD = 1.3$, *range* = 1–6) prior to T1. Participant endorsement of trauma experiencing prior to T1 is as follows: 4.7% endorsed natural disasters, accidents, or fires, 2.4% endorsed combat, 42.7% endorsed sudden unexpected death of a loved one, 32.9% endorsed life-threatening illness, 7.3% endorsed physical assault, 4.9% endorsed sexual assault, and 4.9% endorsed other events. Of the 20 participants who reported experiencing a traumatic event between T1 and T2, an average of 1.6 trauma categories were endorsed ($SD = .75$, *range* = 1–7). Twenty-five percent endorsed natural disasters, accidents, or fires, 5% endorsed combat, 55% endorsed sudden unexpected death of a loved one, 40% endorsed life-threatening illness, 5% endorsed physical assault, 10% endorsed sexual assault, and 20% endorsed other events.

PTS symptoms were assessed at both time points via the civilian version of the PTSD Checklist (PCL-C: Weathers, Huska, & Keane, 1991). The PCL-C is a 17-item self-report questionnaire designed to assess *DSM-IV-TR* PTSD Criteria B–D. Participants were instructed to indicate the extent to which they were bothered by each symptom in the past month in relation to the traumatic event they identified on the brief trauma measure as most distressing. The PCL-C has strong psychometric properties, including internal reliability, sensitivity, specificity, and concurrent validity (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Weathers, Litz, Herman, Huska, & Keane, 1993). Consistent with evidence suggesting that PTSD is not a discrete clinical syndrome, but rather a dimensional construct (e.g., Forbes, Haslam, Williams, & Creamer, 2005; Ruscio, Ruscio, & Keane, 2002), PCL-C items were summed to create a total score for use as a continuous variable. The PCL-C total Score (T1: $M = 29.56$, $SD = 13.19$, *range* = 17–66; T2: $M = 28.18$, $SD = 12.78$, *range* = 17–69) demonstrated adequate internal consistency at both time points (T1: $\alpha = .94$; T2: $\alpha = .96$).

Anxiety Symptoms were assessed at T1 with the Anxiety Scale of the 21 item-version of the Depression, Anxiety, and Stress Scales (DASS-21 Anxiety: Lovibond & Lovibond, 1995a). The seven items of the DASS-21 Anxiety Scale are rated on a 4-point scale (0 = *Did not apply to me at all* to 3 = *Applied to me very much, or most of the time*), with higher scores indicating higher levels of anxiety. Participants rated the degree to which each statement applied to them over the past week. The DASS-21 Anxiety Scale has exhibited adequate psychometric properties, including strong convergent correlations with established measures of anxiety (Beck & Steer, 1990; Lovibond & Lovibond, 1995b), as well as the ability to differentiate between those who have been diagnosed with an anxiety disorder (as per the DSM-IV-TR) versus nonclinical control participants (Antony, Bieling, Cox, Enns, & Swinson, 1998). Internal consistency for the DASS-21 Anxiety Scale ($M = 3.53$, $SD = 4.05$, range = 0–21) in the present sample was adequate ($\alpha = .84$).

### 2.3. Data analytic strategy

Bivariate correlations were calculated to test the hypothesis that T1 AC would be inversely associated with PTS symptoms at T1 and T2. Hierarchical regression was used to test the hypothesis that exposure to a traumatic event between time points would moderate the relationship between T1 AC and T2 PTS symptoms. To account for duration effects, the interval between time points was included as a covariate in the model. To account for variation in trauma exposure and PTS symptoms at T1, the number of traumatic events reported at T1 and the T1 PCL-C total score also served as covariates in the regression model. In addition, to ensure that that the interaction effect of interest is not better explained by the variance accounted for in PTS symptoms by anxious arousal, a general measure of anxiety symptomatology (the DASS-21 Anxiety Scale) served as a covariate in the regression model. Consistent with Aiken and West (1991), predictor variables were mean centered and an interaction term was calculated as the product of the two centered predictor variables of interest (i.e., ACS total score and T2 Exposure). Covariates (i.e., session interval, T1 Exposure, T1 PCL-C, T1 DASS-21 Anxiety) were entered as predictor variables in the first step of the model. The ACS total score and T2 Exposure variable were entered as predictor variables in the second step of the model, and the interaction term was entered as a predictor variable in the third step of the model. The T2 PCL-C total score served as the outcome variable in each step of the model. To further investigate the significant interaction effect, simple slopes analysis was conducted examining the relationship between the predictor (AC) and outcome (T2 PTS symptoms) variables at the two levels of the moderator (i.e., T2 Exposure: presence [$n = 20$] versus absence [$n = 65$]) and at high and low levels (i.e.,+1 and −1 *SD*) of the predictor variable (Aiken & West, 1991).

## 3. Results

An examination of bivariate correlations showed that the relation between the ACS total score and T1 and T2 PTS symptoms did not reach statistical significance (T1: $r = -.15$, $p = .16$; T2: $r = -.19$, $p = .09$). As expected, regression analysis showed that T1 PTS symptoms predicted T2 PTS symptoms ($ps < .001$; see Table 1). Of the remaining covariates, T1 Anxiety symptoms predicted T2 PTS Symptoms ($p < .001$), but T1 Exposure and the interval between T1 and T2 did not (*ns*). After accounting for T1 PTS symptoms, T1 Exposure, T1 Anxiety, and the interval between T1 and T2, both the ACS total scale score and T2 Exposure did not significantly predict T2 PTS symptoms (*ns*). In the third step of the model, the interaction term significantly predicted T2 PTS symptoms ($p < .001$). As predicted, simple slopes analysis revealed a significant negative association between AC and T2 PTS symptoms for participants who had experienced a traumatic event between time points ($B = -.93$, $\beta = -.71$, $p < .001$). No association was observed between AC and T2 PTS symptoms for those who had not experienced a traumatic event between time points, ($B = -.06$, $\beta = -.04$, $p = .58$; see Fig. 1).[1]

## 4. Discussion

In the present study, we sought to examine the concurrent and temporal relations (from pre- to post-trauma) among AC and PTS symptoms. Although the bivariate relations between both T1 and T2 PTS symptoms and T1 AC did not reach statistical significance

[1] In a recent examination of the psychometric properties of the English version of the ACS, Judah, Grant, Mills, and Lechner (2014) conducted three studies which indicated that only 12 of the original 20 items of the ACS exhibited factor loadings in exploratory factor analysis high enough for retention. Although the 12-item ACS total score evidenced adequate psychometric properties (Judah et al., 2014), these findings are still relatively preliminary in comparison to the long precedence in the extant literature of using the 20-item ACS total score. However, given Judah et al. (2014) compelling case in favor of the psychometric properties of the 12-item ACS, we have chosen to also provide the primary results of the described analyses using the 12-item ACS. Of primary importance, when using the 12-iterm version of the ACS, the interaction term remained a significant predictor of T2 PTS symptoms ($B = -1.66$, $\beta = -.29$, $p < .001$). Additionally, the results of the simple slopes analysis was consistent with those in which the 20-item ACS was used. That is, a significant negative association between AC and T2 PTS symptoms was only observed for participants who had experienced a traumatic event between time points ($B = -1.70$, $\beta = -.84$, $p < .001$). At the bivariate level, the magnitude of relations between AC and PTS symptoms was larger when using the 12-item ACS. Specifically, the correlation between the 12-item ACS total score and T1 PTS symptoms trended toward significance ($r = -.19$, $p = .09$), and the 12-item ACS total score was significantly negatively associated with T2 PTS symptoms ($r = -.23$, $p = .03$).

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**Table 1**
Hierarchical Multiple Regression Analysis Predicting T2 PCL-C.

| Predictor | Step 1 | | Step 2 | | Step 3 | | $\Delta R^2$ |
|---|---|---|---|---|---|---|---|
| | *B* | *β* | *B* | *β* | *B* | *β* | |
| Step 1 | | | | | | | .59*** |
| T1 PCL-C | .49 | .50*** | .46 | .48*** | .45 | .47*** | |
| T1 exposure | 1.01 | .10 | .89 | .09 | 1.06 | .11 | |
| T1 DASS-anxiety | .99 | .31*** | .93 | .29*** | .84 | .27** | |
| Session interval | −.02 | −.02 | −.01 | −.01 | −.03 | −.02 | |
| Step 2 | | | | | | | .01 |
| T1 ACS | | | −.05 | −.03 | −.18 | −.14 | |
| T2 exposure | | | 2.85 | .10 | 1.90 | .06 | |
| Step 3 | | | | | | | .06*** |
| T1 ACS × T2 exposure | | | | | −.99 | −.26*** | |

*Note:* $N = 85$. PCL-C = PTSD Checklist-Civilian Version total score; DASS-Anxiety = Depression Anxiety Stress Scales Anxiety Scale score. ACS = Attentional Control Scale total score.
** $p < .01$.
*** $p < .001$.

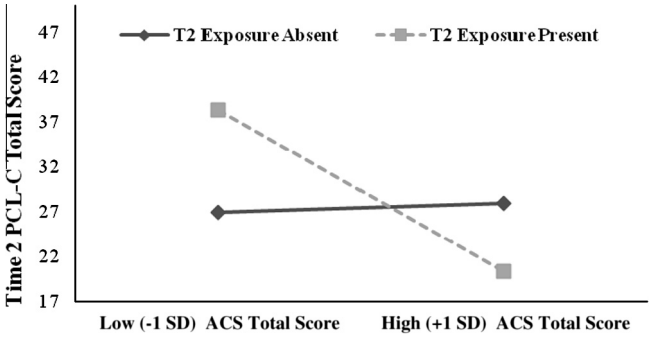


**Fig. 1.** The interaction effect (Attentional Control Scale [ACS] total score by T2 Exposure) was a significant predictor of the PTSD Checklist (PCL-C) total score at Time 2 (i.e., posttraumatic stress (PTS) symptoms, $\beta = -.26$, $p < .001$. Simple slopes analysis revealed that, among participants who experienced a traumatic event between Times 1 and 2, those with lower attentional control reported significantly higher levels of PTS symptoms than those with higher attentional control. There was not a significant association between attentional control and T2 PTS symptoms for those who did not experience a traumatic event between time points.

(*ps* = .15 and .09, respectively), the observed effects are similar in magnitude to that which was observed by Bardeen and Orcutt (2011) ($r = -.24$, $p < .05$); thus suggesting that the lack of statistical significance in the present study may be a function of the relatively small sample size. In regard to the proposed interaction effect, we had initially predicted that the association between T1 AC and T2 PTS symptoms would be significantly stronger among participants who had experienced a traumatic event between time points. Although a moderation effect was observed, T1 AC only predicted T2 PTS symptoms for participants who had experienced a traumatic event between time points. To our knowledge, this is the first time that a temporal relationship between AC, trauma, and PTS symptoms has been demonstrated in an empirical study. Study findings are consistent with theory, and empirical research, which suggest that AC can be used to alleviate trauma-related distress. Specifically, the ability to disengage, shift, and reengage attention as needed, appears to serve as a protective factor against elevated PTS symptoms in the acute aftermath of a traumatic event. As noted, Gross's (1998) process model of emotion regulation suggests that attention is the gatekeeper of emotion regulation. As such, the ability to temporarily disengage attention from threat- and trauma-related stimuli and refocus elsewhere may serve to down-regulate sympathetic nervous system arousal. By reducing the intensity of the emotional experience, the individual may be able to remain in, and habituate to, the environment in which the anxiety-provoking stimuli is present, rather than using more extreme avoidance strategies, such as physical escape, which do not allow for habituation. Although the intensity of the negative emotion is reduced, it is still experienced. Thus, the combination of reduced hyperarousal (within a range which facilitates emotional processing) and exposure to threat-or trauma-stimuli may increase the likelihood that fear acquisition does not occur.

Although the present study advances our understanding of the relationship between AC and PTS symptoms, limitations must be acknowledged. Despite utilization of a sample consisting solely of undergraduate students, approximately 30% of our trauma-exposed sample met or exceeded the cut score for screening for PTSD in a primary care setting (Bliese et al., 2008), and 16% met or exceeded the recommended cut score for diagnosing PTSD in a civilian population (Blanchard et al., 1996). Furthermore, the majority of participants reported experiencing more than one type of trauma, thus increasing confidence that the observed interaction effect may be generalizable to a wide variety of trauma experiences rather than being trauma specific. Even in light of the considerable degree of variability in trauma exposure and PTS symptoms, caution is warranted in generalizing these findings to a clinical population. Given the brief measure of trauma used in the present study, we do not know the time course of participant trauma experiences (both pre-T1 trauma and post-T1 trauma). This limitation is particularly important because it is not uncommon to experience some PTS symptoms in the acute aftermath of a traumatic event (Bryant, 2003). For the majority of participants who experienced a traumatic event between time points, PTS symptoms were assessed within 30 days of the target event, and thus, are more accurately viewed as acute reactions to a traumatic event rather than symptoms of PTSD. Given evidence of PTSD as a dimensional construct where symptomatology occurs along a continuum of PTS responses, rather than representing a qualitatively distinct syndrome (e.g., Broman-Fulks et al., 2006; Ruscio et al., 2002), results from the present study are still likely beneficial in light of this limitation, especially because relatively little published research has examined AC–PTS relations. Nonetheless, it will be important to assess AC, PTS symptoms, and trauma exposure at multiple time points over a prolonged period in future research. Such an investigation will provide a better understanding of the role of AC in the development and trajectory of PTSD.

The present study is the first to our knowledge to provide evidence of AC as a protective factor against the development of PTS symptomatology in the acute aftermath of a traumatic event. Thus,

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greater AC abilities may be one factor that differentiates those who recover from trauma exposure from those who do not. In addition, study results are consistent with a growing body of research suggesting AC as a transdiagnostic protective factor against the development of psychopathology. As such, AC may be an important transdiagnostic treatment target. Instead of targeting the multitude of pathology-specific risk factors, time may be better spent focusing on AC abilities, which can be significantly improved through clinical intervention (Jha, Krompinger, & Baime, 2007) and mindfulness training techniques (Bherer et al., 2008; Zylowska et al., 2008). Moreover, because the majority of Americans experience trauma exposure, institutional implementation of AC training programs (e.g., in school or vocational settings) could have a major societal impact by reducing the risk for PTSD, and psychopathology more generally.

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