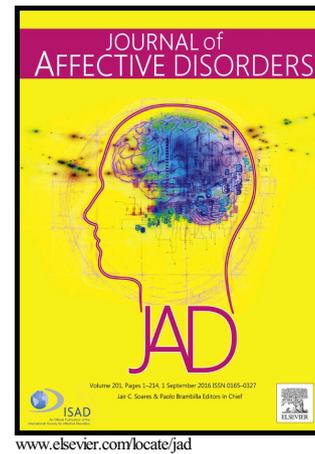


# Author's Accepted Manuscript

Expressive Flexibility in Combat Veterans with Posttraumatic Stress Disorder and Depression

Rebecca Rodin, George A. Bonanno, Nadia Rahman, Nicole A. Kouri, Richard A. Bryant, Charles R. Marmar, Adam D. Brown



PII: S0165-0327(16)30179-3  
DOI: <http://dx.doi.org/10.1016/j.jad.2016.09.027>  
Reference: JAD8468

To appear in: *Journal of Affective Disorders*

Received date: 4 February 2016  
Accepted date: 22 September 2016

Cite this article as: Rebecca Rodin, George A. Bonanno, Nadia Rahman, Nicole A. Kouri, Richard A. Bryant, Charles R. Marmar and Adam D. Brown Expressive Flexibility in Combat Veterans with Posttraumatic Stress Disorder and Depression, *Journal of Affective Disorders* <http://dx.doi.org/10.1016/j.jad.2016.09.027>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

Expressive Flexibility in Combat Veterans with  
Posttraumatic Stress Disorder and Depression

Rebecca Rodin<sup>1,2,3\*</sup>, George A. Bonanno<sup>4</sup>, Nadia Rahman<sup>2</sup>, Nicole A. Kouri<sup>2</sup>, Richard A. Bryant<sup>5</sup>, Charles R. Marmar<sup>2</sup>, Adam D. Brown<sup>2,6</sup>

<sup>1</sup>Michael G. DeGroot School of Medicine, McMaster University

<sup>2</sup>Steven and Alexandra Cohen Veterans Center for Posttraumatic Stress and Traumatic Brain Injury, Department of Psychiatry, New York University Langone Medical Center

<sup>3</sup>The Mach-Gaensslen Foundation of Canada

<sup>4</sup>Department of Counseling and Clinical Psychology, Teachers College, Columbia University

<sup>5</sup>School of Psychology, University of New South Wales

<sup>6</sup>Department of Psychology, Sarah Lawrence College

\*Corresponding Author:

Rebecca Rodin  
2 Undermount Avenue, Apt 1a  
Hamilton, ON  
L8P 3Z6  
rebecca.rodin@medportal.ca

## Introduction

It is now well established that a majority of individuals maintain healthy functioning in the wake of a traumatic event, but a significant minority will develop mental health issues, such as posttraumatic stress disorder (PTSD) and major depressive disorder (MDD; e.g., Bonanno et al., 2004; Breslau, 2009; Kessler et al., 1995). There is

considerable comorbidity between PTSD and MDD (e.g., Breslau et al., 1997; Caramanica et al., 2014; Kessler et al., 1995; Rytwinski et al., 2013), which has been reflected in recent studies reporting that US veterans who served in Iraq and Afghanistan are at elevated risk for both disorders (Hoge et al., 2004; Kang and Hyams, 2005; Seal et al., 2007; Tanielian and Jaycox). Developing a better understanding of the mechanisms that underlie both PTSD and depression are critical, as the presence of both disorders in veterans has been linked with greater economic, social, and personal burden (e.g., Kramer et al., 2003; McCrone et al., 2003; Zatzick et al., 1997).

Over the past decade a growing body of research has been aimed at identifying shared mechanisms and risk factors underlying both PTSD and MDD (for reviews see: Flory and Yehuda, 2015; Stander et al., 2014). These include a history of childhood abuse, high levels of neuroticism, and low levels of extraversion (e.g., for a review see: Flory and Yehuda, 2015). More broadly, initiatives such as the National Institute of Mental Health's (NIMH) Research Domain Criteria (RDOC, Insel, 2013) emphasize the importance of identifying neurobiological, affective, and cognitive processes that underlie trauma-related psychopathology.

A growing body of research suggests that difficulties in emotion regulation may be associated with both PTSD and MDD. For example, depressed individuals exhibited difficulties identifying, tolerating, and modifying negative emotions (Campbell-Sills et al., 2009; Rude and McCarthy, 2003) and longitudinal findings have shown that deficits in emotion regulation are associated with greater depressive symptom severity over time (Kraaij et al., 2002). Furthermore, PTSD has also been associated with impairments in emotion regulation (e.g., Cloitre et al., 2002; Cloitre et al., 2005; Tull et al., 2007).

Deficits in emotion regulation have been linked with fear conditioning (Berking and Wupperman, 2012) and individuals with PTSD have difficulty employing emotion regulation strategies (Cloitre et al., 2005; Tull et al., 2007). Despite the growing number of findings suggesting a link between emotion regulation and PTSD and MDD, it has been recently suggested that the concept of emotion regulation has had limited impact on the understanding and treatment of these clinical disorders. This has been, in part, due to the reliance on self-report measures used in such studies (Berking and Wupperman, 2012).

A newer, emergent body of research has been addressing these limitations through the development of experimental tasks that measure emotional flexibility performance across situational contexts. Bonanno and Burton (2013) proposed that emotional flexibility in such contexts is comprised of three sequential components: 1) sensitivity to context, 2) availability of a diverse repertoire of emotion regulation strategies, and 3) responsiveness to feedback. They postulated that deficits in any of these areas might increase vulnerability to stress-related psychopathology. Extending this reasoning, Levy-Gigi and colleagues (2015) employed a behavioral task to examine sensitivity to context in firefighters with and without PTSD. They found that those with PTSD were less able to identify the appropriate regulatory strategy for a given stimulus (Levy-Gigi et al., 2015).

Another behavioral paradigm that has been used to experimentally assess positive adaptation to stress and adversity is that of expressive flexibility, recently conceptualized as the ability to both enhance and suppress emotional expression as demanded by situational constraints (Gupta and Bonanno, 2011). In a study of New York City

university students exposed to the September 11<sup>th</sup> terrorist attacks, Bonanno et al. (2004) presented participants with affective images and instructed them to suppress or enhance their emotional responses to the stimuli. Observer ratings of the facial expressions of these participants showed that greater difficulties expressing and suppressing their emotional response were associated with poor long-term psychological adjustment (Bonanno et al., 2004; Westphal et al., 2010). A similar experimental study among bereaved adults who had recently lost a spouse demonstrated that increased levels of emotional flexibility were less likely to meet criteria for complicated grief (Gupta and Bonanno, 2011).

The construct of expressive flexibility may be particularly germane to PTSD and MDD, as these disorders are characterized, in part, by affect dysregulation and social isolation (American Psychiatric Association, 2000). In this regard, Gupta and Bonanno (2011) suggested that the ability to appropriately enhance or suppress emotions may aid emotion regulation, foster social support, and provide important complimentary feedback in social interactions. However, no previous studies have yet examined expressive flexibility in individuals with depression and/or PTSD.

The current study was designed to experimentally examine potential alterations in expressive flexibility associated with PTSD and MDD among combat-exposed veterans. We hypothesized that combat-exposed veterans with PTSD and/or MDD would exhibit less expressive flexibility than those without PTSD and MDD.

## Method

### Participants

Fifty-nine Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) combat veterans with and without PTSD were recruited for this study. Veterans were recruited from the Mental Health Services of the Manhattan, Bronx, and Brooklyn Veterans Affairs Medical Centers, other regional VA medical centers, veterans Service Organizations, National Guard, reservist agencies and organizations, and from the general community. Recruitment methods included flyers, in-person presentations, media advertisements, internet postings (e.g. Craigslist) and referrals from clinicians. All study procedures were approved by NYU's IRB and all participants provided written informed consent. Participants were excluded if they had a lifetime history of psychosis, bipolar disorder, major depression with psychotic features, obsessive compulsive disorder, or were less than two months stable on psychiatric medications. Participants with exposure to trauma within the past month or with active suicidal ideation were also excluded. Participants received \$15 USD for their participation.

#### Procedure

Posttraumatic Diagnostic Scale (PDS, Foa et al., 1997). The PDS is a 17-item self-report comprised of DSM-IV PTSD criteria. Each response is rated on a 4-point scale ranging from 0 (not at all) to 3 (almost always). Individuals screened positive for PTSD diagnosis if they scored  $\geq 24$  (Sheeran and Zimmerman, 2002).

Beck Depression Inventory-II (BDI-II, Beck et al., 1996). The BDI-II is a 21-item self-report measure of depression that assesses the severity of various cognitive, behavioral, and physiological symptoms associated with depression. Participants screened positive for depression if they scored  $\geq 13$ .

Combat Exposure Scale (CES, Keane et al., 1989). The CES is a 7-item self-report measure assessing exposure to combat on a scale of 1 (e.g. no) to 5 (e.g. more than 50 times).

Expressive Flexibility Task (Bonanno et al., 2004). The procedures for this task were identical to those used in Bonanno et al.'s (Bonanno et al., 2004) study with the exception of the memory task. Participants were seated before a desktop computer and filmed through a one-way mirror positioned above their line of vision. Software displayed blocked sequences of five digitized picture stimuli selected from the International Affective Picture System (IAPS, Lang et al., 1999) and balanced across blocks for valence and arousal ratings based on pre-established norms. Within each block, a fixation cross first appeared, followed immediately by a masking stimulus (an XXX pattern) for 500 ms. One of the stimulus pictures was then presented for 10 s. Stimulus offset were followed by 4 s of blank screen before the onset of another trial. Practice sessions involved viewing randomly presented blocks of positive or negative stimuli and then rating the degree to which that each block evoked negative and positive affect, each rated on a seven-point scale. Following practice trials, participants were told that they were being filmed because another research participant would be watching them from a video monitor in an adjacent room. The participants were told that this other participant could see, but not hear, them and would be attempting to gauge the participants' emotional reactions based on their facial expressions. The participants were also told that the monitor would be turned off for some of the trials (i.e., sometimes the other team member would not be able to view them) and that they would always be informed when the monitor was on and when it was off. Finally, participants were

informed that when the experiment began, the computer would (1) sometimes ask them to enhance their expression of emotion, so the observing person could more easily guess what they were feeling; (2) sometimes ask them to suppress their expression of emotion, so the observing person could not easily guess what they were feeling; or (3) sometimes inform them that the monitor will be turned off and that the observing person will be unable to see them, in which case they should behave as they would normally (see Appendix for full list of instructions). Each participant viewed six blocks of experimental trials consisting of a randomized presentation of stimuli balanced for valence (positive, negative) in each of three instruction types (enhancement, suppression, or control).

Four independent raters blind to images in each block, the purpose of the study, participant diagnosis, and the hypotheses of the study rated participants' video-recorded emotional expressions on the same 7-point Likert scale (1 = no emotion – 7 = extreme emotion) used by the participants during the task. Onset and offset of each block of trials were indicated by an auditory signal, and raters were unaware of the subject's instructions for any given block. Overall observer agreement was good ( $r = .73$ ) and the final observer-rater scores were based the averages of the raters.

Expressive flexibility was assessed by both expressive enhancement ability and expressive suppression ability. Expressive enhancement was obtained by subtracting mean ratings of emotional expression in the control condition from mean ratings of emotional expression in the enhancement condition. Similarly, expressive suppression ability was obtained by subtracting mean ratings of emotional expression in the suppression condition from mean ratings of emotional expression in the control condition.

## Results

### Participant Characteristics

Participant characteristics are presented in Table 1. The sample ( $n = 59$ ) consisted mainly of men (male = 98.3%) between the ages of 23 and 52 ( $M = 33.6$ ,  $SD = 6.6$ ). There were no significant differences between those with and without PTSD on age, gender, level of education, and combat exposure (see Table 1).

### Manipulation Check

In the expressive flexibility paradigm, participants are not explicitly instructed to alter their subjective experience of emotion, only their facial expressions of emotion according to instruction condition (i.e., enhance, suppress or behave normally). Manipulation checks in previous studies (e.g., Gupta and Bonanno, 2011) have confirmed this pattern by demonstrating a significant two-way interaction for condition and rating source. This interaction showed that subjective affect ratings did not to vary across conditions while observer ratings of emotion varied according to the regulation instructions. Consistent with previous manipulation checks, we observed a similar Condition by Rating interaction in the current study,  $F(2, 110) = 33.15$ ,  $p < .001$ ,  $\eta^2 = .23$ . As can be seen in Figure 1, observers rated the participants markedly higher during the Enhancing condition than during the Control and higher in the Control condition than in the Suppression condition while the subject ratings showed very little difference. Therefore, following previous studies (Bonanno et al., 2004; Gupta and Bonanno, 2011; Westphal et al., 2010), subsequent analyses focused only on observer ratings of emotion.

### Expressive Flexibility and PTSD

To test whether expressive flexibility was reduced in PTSD, we conducted a 2

(Diagnosis: PTSD, No PTSD) X 2 (Valence: Positive, Negative) X 3 (Condition: Enhance, Suppress, Monitor Off) repeated measures ANCOVA of the observer ratings. Given previous findings showing an association between trauma exposure and emotional flexibility (Bonanno, et al., 2011), combat exposure totals were included as a co-variate. Not surprisingly, the main effect for Condition was significant ( $F(1, 56) = 7.25, p < .01, \mu = .12$ ), reflecting the manipulation check reported above. Importantly, however, the interaction between Diagnosis and Condition was also significant ( $F(2, 57) = 4.80, p < .05, \mu = .08$ ). Follow-up planned contrasts indicated that differences between by Diagnosis were evident for comparisons of ratings in the Enhancement versus Control conditions,  $F(1, 57) = 5.44, p < .05, \mu = .08$ , with lower Enhancement among individuals with PTSD compared to those without (see Figure 2). However, planned contrasts for PTSD were non-significant for comparisons of ratings in the Suppression or Control conditions,  $F(1, 57) = 0.24, p = .63, \mu = .00$ .

#### Expressive Flexibility and Depression

We next examined if expressive flexibility was also reduced in those participants that screened positive for MDD. We repeated the analyses described above using MDD as the between-subjects factor. Consistent with the findings for PTSD, these analyses again revealed a main effect for Condition ( $F(1, 56) = 11.18, p < .01, \mu = .17$ ).

Additionally, an interaction was observed between Diagnosis and Condition ( $F(1, 56) = 7.98, p < .01, \mu = .13$ ). Again, follow-up planned contrasts indicated that differences between by MDD were evident for comparisons of ratings in the Enhancement versus Control conditions,  $F(1, 57) = 8.52, p < .01, \mu = .13$ , with lower Enhancement among individuals with MDD compared to those without (see Figure 2). Planned contrasts for

MDD were non-significant for comparisons of ratings of in the Suppression or Control conditions,  $F(1, 57) = 0.16$ ,  $p = .69$ ,  $\mu = .00$ .

#### Is Expressive Flexibility Associated with PTSD and MDD Severity?

**Expressive Flexibility and PTSD severity.** We next examined whether expressive flexibility was associated with the severity of PTSD and MDD symptoms. In the first analysis (Model 1), PDS total scores were regressed on enhancement ability and suppression ability. Model 2 included combat exposure as a predictor and Model 3 tested potential interactions among enhancement, suppression, and combat exposure. The results showed that Model 2 was significant with lower levels of enhancement ability and combat exposure independently associated PTSD symptom severity ( $F(3, 58) = 3.39$ ,  $p = .02$ , see Table 2 for summary statistics).

**Expressive Flexibility and MDD severity.** The same three-model regression analysis was conducted again, however this time examining whether expressive flexibility was associated with the severity of MDD symptoms. Model 1 was significant, in which lower levels of enhancement ability was associated with greater MDD symptom severity ( $F(2, 58) = 3.14$ ,  $p = .05$ , see Table 3 for summary statistics).

#### Discussion

The present findings demonstrate that lower levels of emotional flexibility, particularly related to enhancing emotional expression, was significantly associated with increased severity of PTSD and depressive symptoms among combat veterans. That is, lower levels of emotional enhancement appeared to be a common mechanism associated with greater symptom severity in both PTSD and MDD. However, ratings of emotional

expression did not differ for those with and without PTSD when instructed to suppress their emotional responses.

Although these findings are the first to show a reduction in emotional enhancement in PTSD and MDD in a combat exposed population, these data are consistent with previous studies showing a relation between self-report measures of affect dysregulation and both PTSD and depressive symptoms (e.g., Ehring et al., 2010; Rude and McCarthy, 2003). For example, traumatized individuals were found to report greater difficulties tolerating and regulating negative emotions (Ehring et al., 2010), more experiential avoidance of negative emotions (Batten et al., 2001; Frewen and Lanius, 2006), and increased difficulty regulating their emotions or impulses (van der Kolk et al., 1996), compared to their non-traumatized counterparts. Similarly, those with depression have been shown to use dysfunctional cognitive emotion regulation strategies, such as rumination and catastrophizing, more frequently (Ehring et al., 2008). In other research, depressed individuals have been found to have less understanding, clarity, and acceptance of their emotions, than never-depressed individuals (Catanzaro and Mearns, 1990; Hayes et al., 2004; Rude and McCarthy, 2003).

The present findings also extend a growing body of literature emphasizing the importance of flexibility as a construct underlying emotion regulation. Emotion regulation has been viewed dichotomously (e.g. suppression versus expression) but recent approaches emphasize the importance of flexibility in the regulation of emotion according to contextual demands, over and above any particular strategy (Aldao, 2013; Aldao et al., 2015; Bonanno and Burton, 2013). In that regard, the present study suggests that emotional flexibility, and in particular a reduction in emotional enhancement, may

play an important role in PTSD and MDD following trauma, such as combat. Such findings are consistent with previous experimental studies that have linked emotional flexibility, as measured by the experimental task of Bonanno et al. (Bonanno et al., 2004), to adjustment and resilience in trauma-exposed university students (Bonanno et al., 2004; Westphal et al., 2010), and in bereaved adults, who recently lost a spouse (Gupta and Bonanno, 2011).

The present results also converge with similar findings from recent work showing difficulties in emotional enhancement among ambulance workers with PTSD (Shepherd and Wild, 2014). Participants were instructed to enhance, suppress, or maintain negative emotions in response to negative stimuli while Galvanic Skin Response measurements were obtained. Similar to our findings, Shepherd and Wild (2014) found that PTSD symptoms were associated with greater difficulty enhancing, but not suppressing, negative emotions. However, emotional reactivity to the stimuli was based on the GSR responses and did not include observer ratings of the participants. We believe that the observer ratings are an important piece underlying a lack of flexibility as they may contribute to interpersonal difficulties often reported and observed in PTSD and MDD.

Despite the observed differences in enhancement among those with and without PTSD, the precise mechanisms underlying these results cannot be determined from these data. For example, a reduction in emotional enhancement in individuals with PTSD and depression might be explained by the emotional numbing and restricted range of affect that is associated with these disorders (Feeny et al., 2000). However, other factors may have also contributed to these findings. For instance, there may have been greater incongruity between the subjective experience of emotion and observed expression in

those with PTSD. Alternatively, those with PTSD may be less comfortable enhancing their outward displays of emotion in an observed setting. Finally, these differences may reflect an actual inability to enhance emotional expression to the same degree as those without PTSD. One way in which future studies could shed light on the potential mechanisms underlying this phenomenon would be to test whether these differences can be minimized through training programs aimed to improve flexibility in emotional expression among combat-exposed veterans with PTSD.

The lack of difference observed in the suppression condition in our sample may be associated with military training and culture. That is, combat-exposed veterans may be well-practiced in maintaining or down-regulating their emotional responses to various stimuli in their daily work. Indeed, such suppression is likely to be beneficial in the context of war and combat, in which the experience and expression of intense emotional stimuli may be socially unacceptable, psychologically burdensome, and potentially life-threatening. These practiced patterns of emotion regulation have the potential to become ingrained and to carry over into post-deployment contexts.

There were several limitations to the present study. First, despite the observed differences in enhanced emotional expression, the cross-sectional design of the study does not allow us to determine if this is a risk factor or outcome of PTSD and MDD. Second, the sample is predominately male, all of whom served in the military. Further research is needed to determine if these findings generalize across gender and trauma-exposed contexts and populations. Third, emotional flexibility was assessed with one task and one outcome measure (i.e. observer ratings of emotion). Future studies would benefit from including other measures of emotional flexibility to help shed light on the exact

mechanism underlying these observed alterations in reduce enhancement. Additionally, self-report measures were used to diagnostically screen participants for PTSD and depression. Future studies would benefit from using clinician-administered measures to determine diagnoses.

Notwithstanding these limitations, the results of the present study shed new light on a shared mechanism that may underlie both PTSD and MDD in the wake of traumatic stress and may help to guide interventions that facilitate emotional expression. The need to identify mechanisms underlying both PTSD and MDD in trauma-exposed populations is particularly important, as there is now extensive evidence showing the PTSD and depression occur together. This may reflect a “general traumatic stress” outcome (O'Donnell et al., 2004), in which many of the same variables underlie both disorders. The identification of shared mechanisms in these disorders may also illuminate underlying neurobiological processes associated with PTSD and MDD. The elucidation of such findings may also aid in guiding biologically-based interventions through the identification and modification of neurobiological targets underlying expressive flexibility in these disorders.

Table 1.

Demographic and clinical characteristics of participants

Variable	PTSD	No PTSD	p [X <sup>2</sup> ]
	M [%]	M [%]	
Age	33.78 (6.26)	33.16 (6.88)	.96
% Male Gender	[100%]	[96%]	[.50]
PDS	33.61(6.44)	9.83 (7.75)	<.001
BDI-II	21.72 (8.54)	8.02 (8.50)	<.001
% BDI Diagnosis	17%	78%	<.001

CES 21.89 (6.69) 19.51 (6.31) .20

Note. PDS = Posttraumatic Stress Disorder Scale, BDI-II = Beck Depression Inventory-II, CES = Combat Exposure Scale.

Table 2.

Regression analyses predicting PTSD symptom severity from expressive regulation abilities and combat exposure (N = 59).

Variable	B	SE	$\beta$
Model 1			
Enhancement	-1.69	.73	-.30
Suppression	-.54	1.00	-.07
Model 2			
Enhancement*	-1.52	.71	-.27
Suppression	-.65	.97	-.09
Exposure*	.54	.26	.26
Model 3			

Enhancement	.06	2.72	.01
Suppression	-2.35	3.59	-.35
Exposure	.55	.50	.27
Enhancement X Exposure	-.08	.13	-.29
Suppression X Exposure	.08	.16	.24

Note. Model 1:  $R^2 = .09$ ,  $F(2, 58) = 2.71$ . Model 2:  $R^2 = .16$ ,  $F(3, 58) = 3.39^*$ .  
 Model 3:  $R^2 = .17$ ,  $F(5, 58) = 2.13$ . Enhancement = Enhancement Ability.  
 Suppression = Suppression Ability. Exposure = Combat Exposure Scale Total. \* $p < .05$ .

Table 3.

Regression analyses predicting MDD symptom severity from expressive regulation abilities and combat exposure (N = 59).

Variable	B	SE	$\beta$
Model 1			
Enhancement*	-1.42	.58	-.32
Suppression	.09	.79	.02
Model 2			
Enhancement	1.24	.58	-.30
Suppression	.04	.79	.01
Exposure	.26	.21	.16

## Model 3

Enhancement	-.41	2.21	-.09
Suppression	-1.15	2.92	-.19
Exposure	.25	.41	.15
Enhancement X Exposure	-.05	.11	-.21
Suppression X Exposure	.06	.13	.21

Note. Model 1:  $R^2 = .10$ ,  $F(2, 58) = 3.14^*$ . Model 2:  $R^2 = .13$ ,  $F(3, 58) = 2.62$ .

Model 3:  $R^2 = .13$ ,  $F(5, 58) = 1.62$ . Enhancement = Enhancement Ability.

Suppression = Suppression Ability. Exposure = Combat Exposure Scale Total. \* $p = .05$ .

Accepted manuscript

## References

- Aldao, A., 2013. The Future of Emotion Regulation Research: Capturing Context. *Perspect Psychol Sci* 8, 155-172.
- Aldao, A., Sheppes, G., Gross, J.J., 2015. Emotion Regulation Flexibility. *Cognitive Therapy and Research* 39, 263-278.
- Association, A.P., 2000. Diagnostic and statistical manual of mental disorders., Washington, DC.
- Batten, S.V., Follette, V.M., Aban, I.B., 2001. Experimental avoidance and high-risk sexual behavior in survivors of child sexual abuse. *J Child Sex Abus* 10, 101-120.
- Beck, A.T., Steer, R.A., Brown, G.K., 1996. Manual for the Beck Depression Inventory–II, Psychological Corporation, San Antonio, TX.
- Berking, M., Wupperman, P., 2012. Emotion regulation and mental health: recent findings, current challenges, and future directions. *Curr Opin Psychiatry* 25, 128-134.
- Bonanno, G.A., Burton, C.L., 2013. Regulatory Flexibility: An Individual Differences Perspective on Coping and Emotion Regulation. *Perspect Psychol Sci* 8, 591-612.
- Bonanno, G.A., Papa, A., Lalande, K., Westphal, M., Coifman, K., 2004. The importance of being flexible: the ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychol Sci* 15, 482-487.
- Breslau, N., 2009. Trauma and mental health in US inner-city populations. *Gen Hosp Psychiatry* 31, 501-502.
- Breslau, N., Davis, G.C., Peterson, E.L., Schultz, L., 1997. Psychiatric sequelae of posttraumatic stress disorder in women. *Arch Gen Psychiatry* 54, 81-87.

- Campbell-Sills, L., Norman, S.B., Craske, M.G., Sullivan, G., Lang, A.J., Chavira, D.A., Bystritsky, A., Sherbourne, C., Roy-Byrne, P., Stein, M.B., 2009. Validation of a brief measure of anxiety-related severity and impairment: the Overall Anxiety Severity and Impairment Scale (OASIS). *J Affect Disord* 112, 92-101.
- Caramanica, K., Brackbill, R.M., Liao, T., Stellman, S.D., 2014. Comorbidity of 9/11-related PTSD and depression in the World Trade Center Health Registry 10-11 years postdisaster. *J Trauma Stress* 27, 680-688.
- Catanzaro, S.J., Mearns, J., 1990. Measuring generalized expectancies for negative mood regulation: initial scale development and implications. *J Pers Assess* 54, 546-563.
- Cloitre, M., Koenen, K.C., Cohen, L.R., Han, H., 2002. Skills training in affective and interpersonal regulation followed by exposure: a phase-based treatment for PTSD related to childhood abuse. *J Consult Clin Psychol* 70, 1067-1074.
- Cloitre, M., Miranda, R., Stovall-McClough, K.C., Han, H., 2005. Beyond PTSD: Emotion regulation and interpersonal problems as predictors of functional impairment in survivors of childhood abuse. *Behavior Therapy* 36, 119-124.
- Ehring, T., Fischer, S., Schnulle, J., Bösterling, A., Tuschen-Caffier, B., 2008. Characteristics of emotion regulation in recovered depressed versus never depressed individuals. *Personality and Individual Differences* 44, 1574-1584.
- Ehring, T., Tuschen-Caffier, B., Schnulle, J., Fischer, S., Gross, J.J., 2010. Emotion regulation and vulnerability to depression: spontaneous versus instructed use of emotion suppression and reappraisal. *Emotion* 10, 563-572.

- Feeny, N.C., Zoellner, L.A., Fitzgibbons, L.A., Foa, E.B., 2000. Exploring the roles of emotional numbing, depression, and dissociation in PTSD. *J Trauma Stress* 13, 489-498.
- Flory, J.D., Yehuda, R., 2015. Comorbidity between post-traumatic stress disorder and major depressive disorder: alternative explanations and treatment considerations. *Dialogues Clin Neurosci* 17, 141-150.
- Foa, E.B., Cashman, L., Jaycox, L., Perry, K., 1997. The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment* 9, 445-451.
- Frewen, P.A., Lanius, R.A., 2006. Toward a psychobiology of posttraumatic self-dysregulation: reexperiencing, hyperarousal, dissociation, and emotional numbing. *Ann N Y Acad Sci* 1071, 110-124.
- Gupta, S., Bonanno, G.A., 2011. Complicated grief and deficits in emotional expressive flexibility. *J Abnorm Psychol* 120, 635-643.
- Hayes, S.C., Strosahl, K., Wilson, K.G., Bissett, R.C., Pistorello, J., Toarmino, D., Polusny, M.A., Dykstra, T.A., Batten, S.V., Bergan, J., Stewart, S.H., Zvolensky, M.J., Eifert, G.H., Bond, F.W., Forsyth, J.P., Karekla, M., McCurry, S.M., 2004. Measuring experiential avoidance: A preliminary Test of a Working Model. *The Psychological Record* 54.
- Hoge, C.W., Castro, C.A., Messer, S.C., McGurk, D., Cotting, D.I., Koffman, R.L., 2004. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *N Engl J Med* 351, 13-22.

- Kang, H.K., Hyams, K.C., 2005. Mental health care needs among recent war veterans. *N Engl J Med* 352, 1289.
- Keane, T.M., Fairbank, J.A., Caddell, J.M., Zimering, R.T., Taylor, K.L., Mora, C.A., 1989. Clinical evaluation of a measure to assess combat exposure. *A Journal of Consulting and Clinical Psychology* 1, 53-55.
- Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., Nelson, C.B., 1995. Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry* 52, 1048-1060.
- Kraaij, V., Pruyboom, E., Garnefski, N., 2002. Cognitive coping and depressive symptoms in the elderly: a longitudinal study. *Aging Ment Health* 6, 275-281.
- Kramer, T.L., Booth, B.M., Han, X., Williams, D.K., 2003. Service utilization and outcomes in medically ill veterans with posttraumatic stress and depressive disorders. *J Trauma Stress* 16, 211-219.
- Lang, P.J., Bradley, M.M., Cuthbert, B.N., 1999. International affective picture system (IAPS): Technical manual and affective ratings., in: University of Florida, C.f.R.i.P. (Ed.), Gainesville.
- Levy-Gigi, E., Bonanno, G.A., Shapiro, A.R., Richter-Levin, G., Kéri, S., Sheppes, G., 2015. Emotion Regulatory Flexibility Sheds Light on the Elusive Relationship Between Repeated Traumatic Exposure and Posttraumatic Stress Disorder Symptoms. *Clinical Psychological Science*.
- McCrone, P., Knapp, M., Cawkill, P., 2003. Posttraumatic stress disorder (PTSD) in the Armed Forces: health economic considerations. *J Trauma Stress* 16, 519-522.

- O'Donnell, M.L., Creamer, M., Pattison, P., Atkin, C., 2004. Psychiatric morbidity following injury. *Am J Psychiatry* 161, 507-514.
- Rude, S.S., McCarthy, C.T., 2003. Emotional functioning in depressed and depression-vulnerable college students. *Cognition and Emotion* 17, 799-806.
- Rytwinski, N.K., Scur, M.D., Feeny, N.C., Youngstrom, E.A., 2013. The co-occurrence of major depressive disorder among individuals with posttraumatic stress disorder: a meta-analysis. *J Trauma Stress* 26, 299-309.
- Seal, K.H., Bertenthal, D., Miner, C.R., Sen, S., Marmar, C., 2007. Bringing the war back home: mental health disorders among 103,788 US veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs facilities. *Arch Intern Med* 167, 476-482.
- Sheeran, T., Zimmerman, M., 2002. Screening for posttraumatic stress disorder in a general psychiatric outpatient setting. *J Consult Clin Psychol* 70, 961-966.
- Shepherd, L., Wild, J., 2014. Emotion regulation, physiological arousal and PTSD symptoms in trauma-exposed individuals. *Journal of Behavior Therapy and Experimental Psychiatry* 45, 360-367.
- Sherman, N., 2005. *Stoic warriors: The ancient philosophy behind the military mind.* . Oxford University Press, Oxford, New York.
- Stander, V.A., Thomsen, C.J., Highfill-McRoy, R.M., 2014. Etiology of depression comorbidity in combat-related PTSD: a review of the literature. *Clin Psychol Rev* 34, 87-98.

- Tanielian, T., Jaycox, L.H., Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery RAND, Santa Monica, CA.
- Tull, M.T., Barrett, H.M., McMillan, E.S., Roemer, L., 2007. A preliminary investigation of the relationship between emotion regulation difficulties and posttraumatic stress symptoms. *Behav Ther* 38, 303-313.
- van der Kolk, B.A., McFarlane, A.C., Weisaeth, L., 1996.) Traumatic stress: The effects of overwhelming experience on mind, body, and society. Guilford Press, New York.
- Westphal, M., Seivert, N.H., Bonanno, G.A., 2010. Expressive flexibility. *Emotion* 10, 92-100.
- Zatzick, D.F., Marmar, C.R., Weiss, D.S., Browner, W.S., Metzler, T.J., Golding, J.M., Stewart, A., Schlenger, W.E., Wells, K.B., 1997. Posttraumatic stress disorder and functioning and quality of life outcomes in a nationally representative sample of male Vietnam veterans. *Am J Psychiatry* 154, 1690-1695.

## Abstract

**Background:** A growing body of evidence suggests that the ability to flexibly express and suppress emotions (“expressive flexibility”) supports successful adaptation to trauma and loss. However, studies have yet to examine whether individuals that meet criteria for posttraumatic stress disorder (PTSD) or depression exhibit alterations in expressive flexibility. The present study aims to test whether lower levels of expressive flexibility are associated with PTSD and depression in combat-exposed veterans.

**Methods:** Fifty-nine combat veterans with and without PTSD completed self-report measures assessing symptoms of depression, PTSD, and combat exposure. Participants also completed an expressive flexibility task in which they were asked to either enhance or suppress their expressions of emotion while viewing affective images on a computer screen. Expressive flexibility was assessed by both expressive enhancement ability and expressive suppression ability.

**Results:** Repeated measures ANOVA’s showed that both PTSD and depression were associated with lower levels of emotional enhancement ability. In addition, a series of linear regressions demonstrated that lower levels of emotional enhancement ability were associated with greater symptom severity of PTSD and depression. The ability to suppress emotional responses did not differ among individuals with and without PTSD or depression.

**Limitations:** Limitations of the study include a cross-sectional design, precluding causality; the lack of a non-trauma exposed group and predominantly male participants limit the generalizability to other populations.

**Conclusions:** Alterations in expressive flexibility is a previously unrecognized affective mechanism associated with PTSD and depression. Clinical strategies aimed at enhancing emotional expression may aid in the treatment of these disorders.

*Keywords:* Emotional Flexibility, Expressive Flexibility, Posttraumatic Stress Disorder, Major Depressive Disorder, Veterans

Accepted manuscript

Figure 1.

Subjective and Observer ratings of emotion by condition

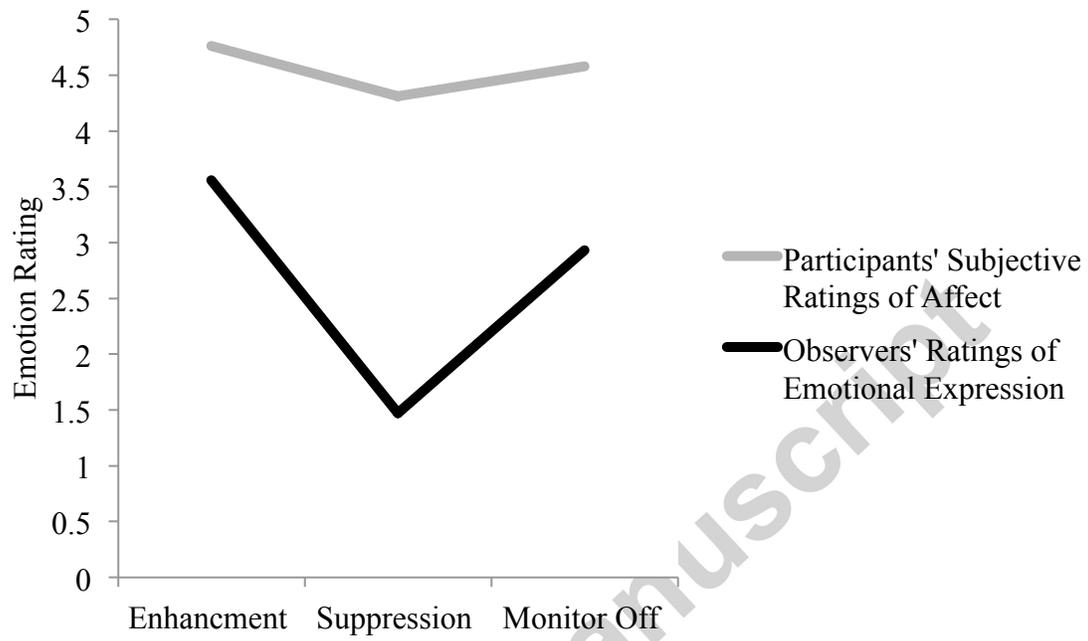
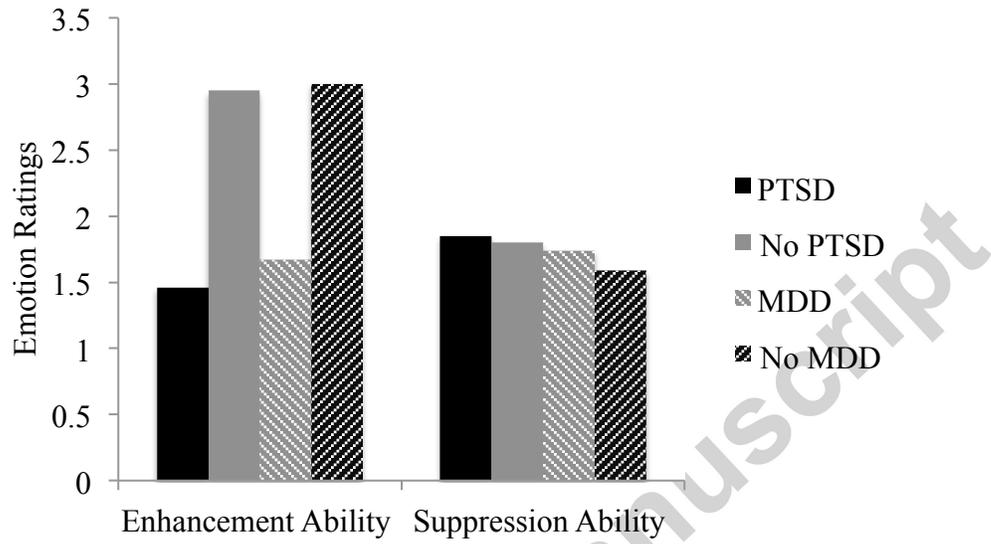


Figure 2.

Observer ratings of emotional expression by condition and diagnoses



### Highlights

- Tested expressive flexibility paradigm in OEF/OIF combat veterans
- Lower levels of emotional enhancement were associated with diagnoses of PTSD and depression
- Lower levels of emotional enhancement were associated with PTSD and depression symptom severity
- Alterations in expressive flexibility may reflect a mechanism in these disorders

Accepted manuscript