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Positive and Negative Affect in the Daily Life of World Trade Center Responders With PTSD: An Ecological Momentary Assessment Study

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Objective: The ability to experience positive affect (PA) has clinical and quality of life implications, particularly in vulnerable populations such as trauma-exposed disaster responders. Low PA is included in the diagnostic criteria for posttraumatic stress disorder (PTSD), however evidence for PA reduction in PTSD has been mixed. In contrast, negative affect (NA) has consistently been found to be elevated among individuals with PTSD. Multiday, ecological momentary assessment (EMA) can provide more ecologically valid evidence about experiences of affect; however, no such studies have been conducted in traumatized individuals with PTSD to date. ***Method:*** World Trade Center (WTC) responders (N = 202) oversampled for the presence of PTSD were recruited from the WTC Health Program. Participants were administrated the Structured Clinical Interview for *DSM–IV* and the PTSD Checklist for *DSM–5* at baseline, then completed EMA surveys of affect four times a day over seven consecutive days. ***Results:*** Participants with current PTSD (19.3% of the sample) showed significantly higher levels of daily NA compared with those without PTSD. However, there was no group difference in daily PA, nor was PA associated with a dimensional measure of PTSD. ***Conclusion:*** Results suggest that for chronic PTSD among disaster responders, positive emotions are not inhibited across daily living. Such findings add to evidence suggesting that PA reduction may not be diagnostically relevant to PTSD, whereas NA remains an important target for therapeutic interventions. Moreover, results show that WTC responders can experience and benefit from positive emotion, even if they continue to have PTSD symptoms.

Clinical Impact Statement
First responders with posttraumatic stress disorder (PTSD) experience daily levels of positive affect that are similar to those without the disorder. Given the numerous health benefits associated with the ability to experience positive affect, findings suggest that even after experiencing significant trauma, disaster responders with PTSD can nevertheless benefit from interventions that promote positive affect. Moreover, results underscore how circadian patterns of affect can be anticipated and addressed in treatment of PTSD.

Keywords: positive affect, negative affect, EMA, PTSD, World Trade Center

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Emotional numbing, described as the experience of dampened positive affect (PA) as well as a restricted range of emotions (American Psychiatric Association [APA], 1994) has long been considered a core component of posttraumatic stress disorder (PTSD; Litz, 1992). Although it is no longer referred to as emotional numbing, the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed. [*DSM-5*]; APA, 2013) still includes "persistent inability to experience positive emotions" as a PTSD symptom of the negative alterations in mood and cognitions cluster (APA, 2013). In addition to the *DSM–5* model, other empirically supported PTSD structural models contain factors related to emotional numbing, such as dysphoria, (e.g., King, Leskin, King, & Weathers, 1998; Simms, Watson, & Doebbeling, 2002), although whether this reflects restricted PA or general distress is not often specified.

Regardless of the model, studies have consistently found that a PTSD diagnosis and PTSD symptoms are associated with significantly higher levels of negative affect (NA; Badour, Resnick, & Kilpatrick, 2017; Beckham et al., 2000; Bradley et al., 2011; Depierro, D'Andrea, Frewen, & Todman, 2017; DiMauro, Renshaw, & Kashdan, 2016; Marshall-Berenz, Morrison, Schumacher, & Coffey, 2011; Rademaker, van Zuiden, Vermetten, & Geuze, 2011; Watson, Clark, & Stasik, 2011). NA has been shown to be correlated with all facets of PTSD, not simply those related to dysphoria or numbing (Brown et al., 2016; Charak, Armour, Elklit, Koot, & Elhai, 2014; Watson, Gamez, & Simms, 2005).

Comparatively, the relationship of PA as an emotional numbing symptom to PTSD has been minimally explored, with mixed research findings. Some evidence has suggested disrupted PA in relation to PTSD severity. For example, veterans with PTSD (n = 61) tracked every 30 min during waking across a 12 to 14-hr period reported lower PA than those without PTSD (n = 56; Beckham et al., 2000). Women with PTSD (n = 49) have also demonstrated less PA when viewing pictures of themselves and listening to trait adjectives than women without PTSD (n = 36; Frewen et al., 2011). Furthermore, evidence also suggests that individuals with PTSD experience heighted anhedonia, or the inability to experience pleasure. Using measures of anhedonia, studies have found that women with PTSD (n = 55) demonstrate greater anhedonia than those without PTSD (n = 35; Frewen, Dozois, & Lanius, 2012). Specifically, anhedonia demonstrates a positive relationship with the emotional numbing cluster of PTSD among male combat veterans (N = 246; Kashdan, Elhai, & Frueh, 2006).

Other studies, however, find that PTSD is not associated with diminished PA. For instance, in a sample of 200 natural disaster victims, PA was unrelated to reexperiencing and numbing symptoms of PTSD, and positively related to avoidance and hyperarousal ones (Charak et al., 2014). Further, no evidence of PA disruption in PTSD has been found in samples of veterans (N = 61; Litz, Orsillo, Kaloupek, & Weathers, 2000) and females who have experienced interpersonal trauma (N = 54; Brown et al., 2016). Such findings are not state dependent, as state and trait PA have demonstrated no association with PTSD (N = 75; Watson et al., 2011). Findings also appear to be unique to PTSD, as one previous study found reduced PA for individuals with chronic PTSD and comorbid depression (n = 92), but not for those with PTSD alone (n = 81; Post, Zoellner, Youngstrom, & Feeny, 2011). These studies suggest that a restricted range of affect is not inherent to PTSD, but may result from comorbid diagnoses.

A major limitation of current studies examining PTSD and affect is their cross-sectional nature. With the exception of Beckham and colleagues' (2000) study of less than 24 hr, all aforementioned studies have been cross-sectional and measure PA at a single point in time, with none except Beckham's involving data collection under ecologically valid conditions. Affect is known to fluctuate throughout the day and can be influenced by a multitude of daily events (Clark & Watson, 1988). In healthy individuals, PA has been shown to be lowest in the morning, rise during the day, and then retreat again at night (Clark, Watson, & Leeka, 1989; Murray, Allen, & Trinder, 2002; Stone et al., 2006). In contrast, evidence linking NA to diurnal rhythms have been mixed (Clark et al., 1989; Stone et al., 2006; Wood & Magnello, 1992). Specific examinations of the diurnal pattern of affect in PTSD are limited, demonstrating a need for further daily examinations of affect in PTSD samples. This can be accomplished through the use of ecological momentary assessment (EMA), which allows for the monitoring of affect across multiple time points. EMA can overcome limitations of past research in this area by assessing affect in a person's natural environment, as well as repeatedly over time to provide more reliable estimates free from recall biases (Shiffman, Stone, & Hufford, 2008).

To our knowledge, no studies to date have assessed the daily patterns of affect among disaster responders. One of the largest groups of responders to date are the thousands of police, fire, and other rescue workers who responded to the World Trade Center (WTC) disaster, participated in the cleanup and recovery efforts, or both (Herbert et al., 2006). They were exposed to environmental hazards, chemical toxins, injury, death, and other traumatic stressors (Landrigan et al., 2004; Neria, Gross, Marshall, & Susser, 2006). These responders faced unique challenges as a result, including high rates of PTSD (Bromet et al., 2016; Stellman et al., 2008; Wisnivesky et al., 2011) as well as a number of co-occurring health conditions (Herbert et al., 2006; Solan et al., 2013). Given the magnitude and persistence of health and mental health conditions, we tested the degree to which PA has also been affected in responders generally and among those with PTSD in particular. The ability to experience frequent PA and the full range of positive emotions has salutary effects (Fredrickson & Losada, 2005; Lyubomirsky, King, & Diener, 2005) and represents an important component of well-being for this population.

To address these gaps, the aim of the present study was to assess positive and negative affect in the daily lives of WTC responders with and without PTSD. WTC responders (N = 202) oversampled for PTSD completed surveys of PA and NA on a smartphone or handheld electronic device four times a day for 1 week. Given the weight of evidence reviewed above, we hypothesized WTC responders with PTSD would endorse significantly higher levels of daily NA, but not PA. Consistent with the literature, we hypothesized that effects would be independent of depression, a key potential confounding factor (Post et al., 2011).

We also explored the degree to which affect followed expected diurnal rhythms. Given previous findings, we hypothesized that PA would peak during the midday, with the lowest levels occurring in the morning and evening (Clark et al., 1989; Murray et al., 2002). In line with research findings regarding NA and diurnal rhythms, we hypothesized that NA would be less closely tied to

diurnal rhythms but would peak in midmorning and midafternoon (Clark et al., 1989; Stone et al., 2006; Wood & Magnello, 1992).

Method

Participants

Participants ($N = 202$) were recruited from the Long Island site of the World Trade Center Health Program between October 2014 and February 2016 as part of an EMA study focused on the daily relationships between PTSD and health. All participants worked or volunteered in the rescue, recovery, restoration, and/or cleanup of the WTC.

The mean age of the sample was 54.28 ($SD = 9.69$). The group was primarily male (82.7%, $n = 167$), White (88.1%, $n = 178$), and non-Hispanic (80.7%, $n = 163$) with an average of 14.82 ($SD = 2.26$) years of education. The majority of participants worked in law enforcement at the time of 9/11 (62.9%, $n = 127$) and almost half (48.5%, $n = 98$) were retired, although many continued to work part-time. The sample was oversampled for current PTSD, such that 39 (19.3%) had a current diagnosis of PTSD. Thirty-two (15.8%) participants had a current diagnosis of major depressive episode (MDE), and 20 (9.9%) participants had comorbid PTSD and MDE at baseline. The study was approved by the Stony Brook University Committees on Research Involving Human Subjects, and all participants provided written informed consent.

Measures

PTSD diagnosis. The Structured Clinical Interview for *DSM–IV* (SCID; First, Spitzer, Gibbon, & Williams, 1997) was used to assess for current PTSD at baseline. The SCID interviews were administrated by experienced interviewers, who were closely supervised by two clinical psychologists (Camilo J. Ruggero and Roman Kotov). Previous assessments of interrater reliability in this clinic demonstrated very good interrater agreement ($\kappa = .82$; Bromet et al., 2016).

PTSD symptoms. The PTSD Checklist for *DSM–5* (PCL-5; Weathers et al., 2013) was used to assess PTSD symptom severity at baseline. Participants were cued to the WTC disaster and were instructed to rate the extent to which they experienced each of 20 symptoms in the past month on a 5-point Likert scale from 0 (*not at all*) to 4 (*extremely*). A total score was calculated, and the scale had excellent internal consistency in the sample (Cronbach's $\alpha = .95$).

EMA affectivity. Six affective items drawn from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) were used to assess daily PA and NA. PA items were: attentive, excited, and proud. NA items were guilty, nervous, and upset. Each item began with the stem "Right now" and participants were instructed to report, "To what extent do you feel . . ." on a 5-point Likert scale from 1 (*not at all*) to 5 (*extremely*). The items were administrated four times a day (i.e., immediately upon awaking, morning, afternoon, and evening) over seven consecutive days. Mean scores were calculated for PA and NA by averaging the corresponding items. Using the equations provided in Mehl and Conner (2012), within-person reliability and between-person reliability were calculated for PA items and NA items, respectively. For the three PA items, the within-person reliability (i.e., reliability of change) $R_C = .53$ and the between-person reliability $R_{KF} = .99$. For the three NA items, the within-person reliability $R_C = .58$ and the between-person reliability $R_{KF} = .99$.

Procedure

Participants first completed a baseline interview that included the SCID, PCL-5, and other survey measures. They were then trained to complete the EMA either on an iPod provided by the study or on their smartphone. Participants were instructed to complete EMA surveys four times a day (i.e., upon awakening, midmorning, afternoon, and evening before bed) over 7 consecutive days. Prior to starting the EMA, participants provided their availabilities for the following seven days, and the assessment times were then fixed to each participant on the basis of the schedules they provided. Participants were prompted by an alarm prior to the designated assessment times and had to complete the surveys within 2 hours of their scheduled times. Individual adherence rates (i.e., percentage of completed surveys per participant) in the present study ranged from 57.7% to 100%. The average of these individual adherence rates was 93.8%.

Analytic Plan

Two-level longitudinal multilevel modeling (MLM) was used to test hypotheses since it can account for the nested nature of the data (repeated assessments nested within participants). Missing data were estimated using maximum likelihood and a first-order autoregressive structure (i.e., AR[1]) was estimated for errors in the models. Random intercepts were estimated in all the models. Study variables, including predictors and outcome variables, were standardized prior to analyses. The analyses were conducted using

Table 1
Descriptive Statistics and Intraclass Correlations (ICCs) for Unconditional Models of Positive Affect (PA) and Negative Affect (NA)

	Current PTSD ($n = 39$)				Non-PTSD ($n = 163$)				
EMA affectivity[a]	*M*	*SD*	Minimum	Maximum	*M*	*SD*	Minimum	Maximum	ICC
PA	1.83	.59	1.00	3.40	1.92	.62	1.00	3.92	.64
NA	1.86	.70	1.05	3.78	1.29	.39	1.00	3.42	.66

Note. $N = 202$. PTSD = posttraumatic stress disorder; EMA = ecological momentary assessment.
[a] For the EMA variables, between-person means, standard deviations, minimums, and maximums were calculated using within-person averages. That is, an average of PA and NA was calculated for each participant across the entire EMA reporting period, then descriptive statistics were calculated on the basis of the person-averaged data for current PTSD group and non-PTSD group.

Table 2
Fixed-Effect Parameter Estimates for Positive Affect and Negative Affect

Model predictor	PA				NA			
	AIC	BIC	β (*SE*)	*p*	AIC	BIC	β (*SE*)	*p*
PTSD diagnosis[a]	9617.3	9627.2			9338.7	9348.6		
Intercept			.022 (.06)	.733			−.154 (.06)	.010
Current PTSD[b]			−.101 (.15)	.487			.830 (.14)	<.001
PTSD symptom severity	9413.8	9423.7			9097.5	9107.4		
Intercept			.005 (.06)	.931			.001 (.05)	.990
PTSD severity			−.007 (.06)	.899			.490 (.05)	<.001
PTSD and MDE comorbidity[c]	9616.4	9626.3			9334.5	9334.5		
Intercept			.022 (.06)	.739			−.107 (.06)	.056
Comorbidity			−.181 (.19)	.348			1.149 (.18)	<.001

Note. To accurately report the size of each estimate, all values were reported on three decimal points. PA = positive affect; NA = negative affect; PTSD = posttraumatic stress disorder.
[a] Analyses with current PTSD and PTSD symptom severity were repeated controlling for time. The overall result patterns had no substantial change. [b] The non-PTSD diagnosis group was used as a reference group in the model. [c] The group without comorbidity was used as a reference group in the model.

the PROC MIXED procedure, which by default uses restricted maximum likelihood estimation method, in SAS 9.3 (SAS Institute Inc., 2011). Prior to testing hypotheses, an unconditional model was estimated for PA and NA independently, and intraclass correlations (ICCs) were calculated for each outcome.

To test the hypotheses, we examined the effects of PTSD on daily PA and NA using separate models in which current PTSD diagnosis was added as a between-person (i.e., Level 2) predictor of affect. Specifically, at the within-person level (i.e., Level 1), no predictor was included. At the between-person level, the intercept was allowed to vary across participants and was also predicted by current PTSD diagnosis. Analyses were repeated using PTSD symptom severity (from the PCL-5) at baseline instead of diagnosis to ensure subthreshold effects were not responsible for results. Moreover, to ensure results were not due to confounding factors, analyses were repeated with comorbid PTSD/MDE as a separate between-person predictor of affect.

Finally, to examine the daily rhythm of PA and NA, the mean scores of PA and NA over seven days for each time period (i.e., waking, morning, afternoon, and evening) were computed for each participant. MLM was then repeated by adding "time-of-day" as a within-person (i.e., Level 1) predictor and contrasting PA and NA levels for the morning, afternoon, and evening periods to that of waking (i.e., the reference period).

Results

Descriptive statistics and ICCs of PA and NA estimated from unconditional models are summarized in Table 1. Values of ICCs suggested that 64% of the variance in PA and 66% of the variance in NA was accounted for by the between-person level, warranting examination with MLM.

The associations of PTSD with daily PA and NA are summarized in Table 2. Results showed that current PTSD diagnosis, PTSD symptom severity, and PTSD/MDE comorbidity were not significantly associated with PA.[1] In contrast, all three were significantly associated with NA, indicating that participants with PTSD had higher levels of daily NA. Figure 1 illustrates patterns of daily affect in participants with and without a current PTSD diagnosis.

With respect to diurnal patterns, Figure 2 plots the diurnal rhythm of PA and NA in participants with and without a current PTSD diagnosis. Specific contrasts among different time periods showed that PA levels during the morning ($\beta = .50$, $p < .001$), afternoon ($\beta = .28$, $p < .001$), and evening ($\beta = .24$, $p < .001$) were significantly higher than PA levels at waking (i.e., the "reference period"). PA levels showed a sharp increase from waking to morning, reached their peak in the morning, and then gradually declined from afternoon to evening (the difference between the two was not significant; $\beta = -.04$, $p = .100$). NA levels were similarly lowest at waking and then peaked in the morning ($\beta = .31$, $p < .001$), although the slope for NA was not as sharp as the one for PA. Like PA, NA levels also showed a gradual decrease from afternoon to evening ($\beta = -.02$, $p = .355$). NA levels at afternoon and evening remained significantly higher than the levels at waking (βs = .24 and .22, respectively; *p*s < .001). The effects of covariates were further tested in the time-of-day analyses. Across all three covariates (current PTSD diagnosis, PTSD symptom severity, and PTSD/MDE comorbidity), the interaction with time-of-day was not significant for PA, but was significant for NA (βs = .10, .06, and .14, respectively; *p*s < .01), suggesting circadian patterns for NA are more pronounced for those with PTSD. Finally, given sparse work examining PA in those with PTSD, particularly among responders, Figure 3 provides a case illustration of PA in a responder with a PTSD diagnosis.

Discussion

The present study represents the first examination of daily affect in a large sample of WTC responders using EMA for more than 24 hr. The results provide evidence that PA does not differ between those with and without PTSD, nor is it related to subthreshold symptoms. Findings suggest that WTC responders can and do experience positive affect even as they struggle with persistent PTSD symptoms (see case example in Figure 3). Overall, these results add to a growing body of literature suggesting that re-

[1] When analyzed separately, there was a non-significant trend for MDE to be associated with lower PA ($\beta = -.23$, $p = .136$).

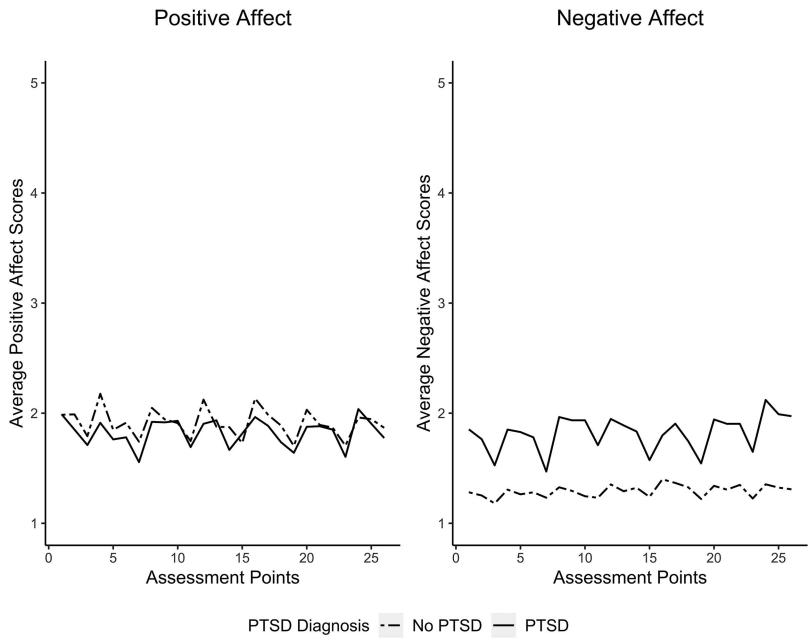

Figure 1. Daily patterns of positive affect (PA) and negative affect (NA) for current posttraumatic stress disorder (PTSD) diagnosis and non-PTSD groups in the present study.

stricted positive emotion may not be inherent to PTSD (Brown et al., 2016; Charak et al., 2014; Litz et al., 2000; Post et al., 2011; Watson et al., 2011), a finding which contradicts current *DSM–5* diagnostic criteria for PTSD. In contrast, the findings regarding elevated NA in PTSD are consistent with previous studies and diagnostic criteria (Badour et al., 2017; Beckham et al., 2000; Bradley et al., 2011; Depierro et al., 2017; DiMauro et al., 2016; Marshall-Berenz et al., 2011; Rademaker et al., 2011; Watson et al., 2011).

Findings regarding daily PA in WTC responders with PTSD are consistent with prior cross-sectional studies (Brown et al., 2016; Charak et al., 2014; Litz et al., 2000; Post et al., 2011; Watson et al., 2011). Such results are important, since they suggest that even those responders most affected by tragedy can experience and report positive emotions to the same degree as their unaffected peers. The findings may be consistent with studies suggesting that PTSD may not be associated with difficulties experiencing PA per se, but rather may be associated with the inability to regulate

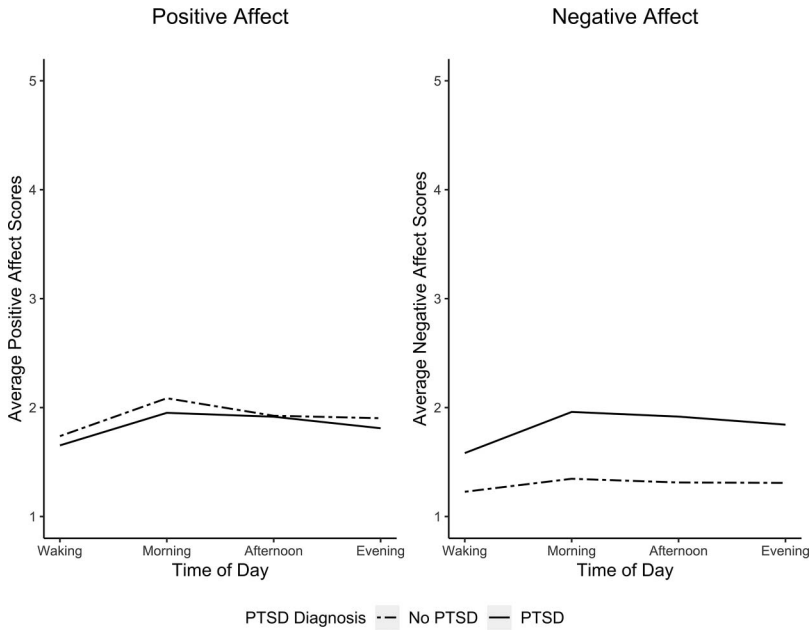

Figure 2. Time of day patterns of positive affect (PA) and negative affect (NA) for current posttraumatic stress disorder (PTSD) diagnosis and non-PTSD groups in the present study.

The participant was in his late 30's when the 9/11 attacks occurred. He arrived in lower Manhattan two days after the attack and spent the majority of his time adjacent to the pit helping with the recovery. He spent a few days working with family members who were looking for their loved ones. Although not personally threatened, he reported processing human remains during the recovery and knowing people killed on 9/11. He operated at the site for approximately three weeks. Fourteen years after the attack, he is now in his early 50's and met criteria for current WTC-related PTSD. He reported sporadic flashbacks within the past month, most often occurring in the shower. Nightmares of 9/11 started a few months after the attacks and still occur occasionally to this day. The most common triggers for PTSD symptoms are construction sites and seeing bones in food. On the first day of the EMA period, he reported only a few PTSD symptoms (below threshold), as well as minimal levels of PA. However, both fluctuated substantially across the week. His PTSD symptoms spiked on the third day of the study, when he reported experiencing more than a moderate number of symptoms. They gradually diminished over the next three days, but then spiked again on his last day of the study. Despite these symptoms, he reported moderate PA almost every day of the study. On the third day of the study, despite his worsened PTSD symptoms, he reported higher than usual PA (more than moderate). He was socially active throughout the week, reporting many interactions on almost all days, although his satisfaction with these interactions varied and he described difficulty with most of them. On most days, he reported feeling "jumpy" and "nervous." Despite these feelings, he reported several positive events and reported accomplishing important goals that sustained his positive affect.

Figure 3. Case example of positive affect (PA) in daily life. WTC = World Trade Center; PTSD = posttraumatic stress disorder; EMA = ecological momentary assessment.

emotion broadly, including regulation of PA (Ehring & Quack, 2010; Tull, Barrett, McMillan, & Roemer, 2007; Weiss, Dixon-Gordon, Peasant, & Sullivan, 2018). If individuals with PTSD are able to experience a normal range of emotions but are unable to effectively regulate those emotions (e.g., unable to effectively downregulate emotional stimuli, unable to differentiate emotions), they are more likely to engage in compensatory strategies to manage their emotional experience. Strategies such as avoidance and heightened fear acquisition may serve to perpetuate symptoms characteristic of PTSD (Tull et al., 2007). In accordance with this theory, PA suppression may only be related to deficits in regulating emotions under certain circumstances, such as when reminded of the trauma (Litz, 1992; Litz et al., 2000). In contrast to results from the present study, future studies using event-contingent recording (Moskowitz & Young, 2006) may find PA restricted, but only during specific triggering events (e.g., construction sites, bones in food; see Figure 3). We could not test these hypotheses, but results from the present study suggest that even if this is the case, effects are temporary rather than pervasive.

Results are important since habitual experience of PA has a number of health benefits (e.g., Hu, Zhang, & Wang, 2015; Lyubomirsky et al., 2005), including health-protective biological responses (e.g., decreased cortisol), positive health behaviors (e.g., increased physical activity), improved sleep, social support, adaptive coping styles (e.g., seeking help, rational decision-making; reviewed in Steptoe, Dockray, & Wardle, 2009), better mental health (e.g., preventing anxiety and depression; Fredrickson, 2000; Lyubomirsky et al., 2005), and greater success in several life domains (Lyubomirsky et al., 2005). Additionally, positive emotions can broaden one's scope of thoughts and behaviors, and can enhance enduring personal resources (e.g., intellectual, social; Fredrickson, 2001). Indeed, such health benefits appear to be reflected in the case example presented in Figure 3. The fact that participants with PTSD experience and report positive emotions suggests that to some extent, the deleterious effects of PTSD are offset by the presence of PA and its positive effects. Thus, our results suggest that rendering activities that promote PA may be a potentially important target in PTSD interventions.

Results also confirm past work (Clark et al., 1989; Murray et al., 2002) showing a clear diurnal pattern of PA. PA has been shown to steadily rise until midday and then decline, whereas NA's

diurnal pattern is less demarcated (Clark et al., 1989; Stone et al., 2006; Wood & Magnello, 1992). These rhythms were especially pronounced for participants with PTSD. Patients with PTSD can be educated about these patterns, and anticipate changes in affect, with plans to address these changes. Additionally, results point to an optimal therapeutic window to practice affective regulation strategies and address affect changes in individuals with PTSD.

From a theoretical standpoint, the results lend support to models such as the Tripartite Model of Anxiety and Depression (Clark & Watson, 1991). In that model, disorders related to both anxiety and depression are characterized by elevations in NA. However, only depression is characterized by the presence of low PA. Our results provide support for this pattern by finding that low PA is not relevant to PTSD. The presence of PTSD symptoms may therefore be indicative of healthy levels of positive affect, even in individuals with comorbid depressive episodes.

These results contrast with current emotion-based *DSM–5* diagnostic criteria for PTSD, which include the inability to experience PA and increased NA (APA, 2013). Although more research needs to be conducted to determine if these effects are due to sample-specific factors (e.g., longevity of PTSD symptoms), the results suggest it may be warranted to remove the "positive affect" criterion from the diagnostic criteria for PTSD. Several studies have indicated that PTSD's numbing/dysphoria symptoms may be nonspecific to PTSD and may be driving PTSD's comorbidity with distress-based disorders (Contractor et al., 2014; Elhai et al., 2015; Hurlocker, Vidaurri, Cuccurullo, Maieritsch, & Franklin, 2018). Potentially, the "positive affect" criterion may be driving these findings, an important avenue for future research.

Although the present study provides important contributions to our understanding of daily affect in PTSD and had a number of strengths, including one of the largest samples to use EMA to address these questions, some limitations should be noted. First, the present sample consisted overwhelmingly of White males, most of whom were in law enforcement. The findings may lack generalizability and should therefore be replicated in other samples. Specifically, results may differ in women. Second, we used abbreviated measures of PA and NA. More nuanced measures, or measures for specific types of PA (e.g., Gilbert et al., 2008; Watson et al., 1988; Watson & Clark, 1994), may find differences. Third, affect is known to be influenced by various factors including physical health, stress, social interactions, and rewards (Clark & Watson, 1988; Watson, 1988). The impact of these factors on the findings should be explored. Fourth, study participants were assessed over 10 years after experiencing the index trauma. Future studies should explore the daily experience of affect in individuals with recent exposure to trauma and should examine whether affective differences (e.g., high NA) place individuals at greater risk for development of long-term PTSD. Fifth, the present study utilized time-based intervals in the EMA design. However, event-contingent recording, through its examination of daily experiences in response to specific events, may have greater sensitivity to detect restricted PA, especially when triggered by trauma reminders. Sixth, low within-person reliability was found for both PA and NA. The degree to which this is a limitation, however, is not clear. Affect varies, and given the time interval in the present study (i.e., approximately 5 hr), low reliability may instead reflect normal variability.

Despite these limitations, the present study provides new evidence about the nature of PA in first responders, and shows how PTSD does not lead to its restriction. Results provide evidence for considering revision to the disorder's diagnostic criteria, and can guide interventions focused on using affective patterns to promote well-being in those with PTSD.

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