Gratitude and hedonic and eudaimonic well-being in Vietnam war veterans

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Abstract

Little information exists on the contribution of psychological strengths to well-being in persons with post-traumatic stress disorder (PTSD). Data from other populations suggest that gratitude, defined as the positive experience of thankfulness for being the recipient of personal benefits, may have salutary effects on everyday functioning. We investigated whether dispositional gratitude predicted daily hedonic and eudaimonic well-being in combat veterans with and without PTSD. We also examined associations between daily gratitude and daily well-being across time. Veterans with PTSD, compared to those without PTSD, exhibited significantly lower dispositional gratitude; no differences were found on daily gratitude. Dispositional gratitude predicted greater daily positive affect, percentage of pleasant days over the assessment period, daily intrinsically motivating activity, and daily self-esteem over and above effects attributable to PTSD severity and dispositional negative and positive affect in the PTSD group but not the non-PTSD group. Daily gratitude was uniquely associated with each dimension of daily well-being in both groups. Although preliminary, these results provide support for the further investigation of gratitude in trauma survivors.
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Keywords: Post-traumatic stress disorder; Gratitude; Well-being; Emotion; Veterans

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Introduction

A large literature exists on the contribution of pathological characteristics to impaired functioning and diminished quality of life in persons with post-traumatic stress disorder (PTSD; e.g., Zatick et al., 1997; van der Kolk, 2001). Recently, researchers are increasing attention to protective factors that decrease the likelihood of distress and pathological outcomes in trauma survivors (e.g., hardiness, social support: King, King, Fairbank, Keane, & Adams, 1998; sense of coherence: Frommberger et al., 1999; hope: Crowson, Frueh, & Snyder, 2001; Irving, Telfer, & Blake, 1997). These studies have almost exclusively relied on global self-report measures to assess protective factors. In this paper, we sought to extend this line of research by examining relationships between the interpersonal strength of gratitude (Emmons & Shelton, 2002) with day-to-day hedonic and eudaimonic well-being in veterans with and without PTSD.

A small body of literature has found that some trauma survivors, in addition to negative outcomes, report positive outcomes following trauma such as enhanced social relationships and a renewed sense of meaning in life (see Tedeschi, Park, & Calhoun, 1998 for review). We believe a neglected area of resilience following traumatic events is the experience of gratitude, which involves active, mindful attention to the positive benefits, values, and experiences in daily life (see McCullough, Kilpatrick, Emmons, & Larson, 2001 for review). Appreciation and thankfulness for being the recipient of personal benefits from others (e.g., people, spiritual sources, luck) may serve as a channel to living a more satisfying and meaningful life. Gratitude emerges from two information-processing stages: (1) recognizing positive personal experiences, and (2) attributing these positive experiences to an external source[1] (McCullough et al., 2001). Gratitude is a moderately pleasant and activating emotion (Emmons & McCullough, 2003) that, following a trait-state model, can be operationalized as an enduring disposition (individual differences in gratitude experiences: McCullough, Emmons, & Tsang, 2002) or a momentary emotional experience.

Initial studies with non-psychiatric samples indicate that being grateful is positively associated with well-being and adaptive behavior (Emmons & Shelton, 2002; McCullough et al., 2001, 2002). Replications of these results in experiments that randomly assigned participants to keep daily self-reports of either gratitude, hassles, impactful events, or downward social comparisons suggest that it is unlikely that gratitude is simply an epiphenomenon associated with high life satisfaction (Emmons & McCullough, 2003). In two independent studies, as an example, the gratitude intervention enhanced positive affect and gratitude. To test whether increases in gratitude were merely a function of changes in positive affect, positive affect was examined as a mediator of the interventions' effect on gratitude. Both studies found that the effects of the intervention on gratitude were not simply a function of the intervention's impact on global, daily positive emotions (see Emmons & McCullough, 2003 for details on analyses). Rather, reports of gratitude fully accounted for the intervention's effect on positive affect.

Fredrickson's (2000) "broaden and build" model of positive emotions provides a framework for understanding how gratitude might have salutary effects on well-being. This model

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[1]Attributing the source of positive experiences to external sources does not imply that the individual cannot additionally attribute oneself and other beings as additional sources. In fact, one of the more interesting theories of gratitude suggests that it leads to a "stretching" of attributions to self and others (McCullough et al., 2001, 2002). This will be an interesting facet to examine empirically.

hypothesizes that positive emotions broaden repertoires of cognition and behavior (Folkman & Moskowitz, 2000; Fredrickson & Branigan, in press), build personal resources (Fredrickson, Tugade, Waugh, & Larkin, 2003), and ''undo'' the adverse physiological effects of negative emotions (Fredrickson & Levenson, 1998; Tugade & Fredrickson, 2004). The potential broadening and building effects of gratitude are partially supported by recent studies. Data suggest that the daily practice of being grateful increases the likelihood that an individual will help someone with a personal problem (i.e., prosocial behavior), and improves sleep and exercise habits (Emmons & McCullough, 2003; McCullough et al., 2001). A study of 2616 twins in the general population found that stronger feelings of thankfulness reduced the risk of meeting diagnostic criteria for various internalizing and externalizing psychiatric disorders (Kendler et al., 2003). Similarly, gratitude was shown to be a common emotion following the terrorist attacks on September 11, 2001, and stronger feelings of gratitude were related to less psychological distress (Fredrickson et al., 2003). Thus, there is some evidence showing that gratitude should be considered an element of resilience.

Theories of PTSD-related cognitive and emotional processing (Ehlers & Clark, 2000; Litz, 1992) provide a rationale for investigating the contribution of gratitude to psychological well-being in trauma survivors. PTSD symptoms are maintained, according to these models, by overt and covert experiential avoidance behavior, such as the evasion of situations that trigger intrusive cognitions, dissociation, rumination, and emotional numbing (Ehlers & Clark, 2000; Litz, 1992). These avoidance behaviors reduce opportunities for survivors to process and integrate trauma experiences with other autobiographical memories, which maintain the persistence of fears. Experiential avoidance behaviors such as ruminating about the trauma experience and being ''frozen'' in the trauma time frame (Ehlers & Clark, 2000) can also be expected to directly diminish well-being. Because attention is a limited resource (during any given period), an excessive focus on past negative events precludes attending to present positive stimuli (e.g., savoring of positive events, experiential acceptance). Furthermore, these models (Ehlers & Clark, 2000; Litz, 1992) posit that the frequent triggering of trauma-related memories, sensations, and emotions disrupt self-regulatory abilities. Purportedly the triggering of trauma-related sensations also increases the frequency of mood-congruent aversive experiences such as intense negative emotions and self-appraisals. These downward emotional spirals are proposed to interfere with the accessibility of positive experiences and the mobilization of behaviors toward personally meaningful goals.[2] As noted, gratitude is generated by being mindful of positive experiences and attributing them to external sources, and appears to broaden an individual's cognitive and behavioral repertoire. The experience of greater gratitude might limit access to the trauma network by inducing a more present, positive time perspective (e.g., Foa, Steketee, & Rothbaum, 1989). Greater gratitude may also counter the adverse effects of trauma triggers and associated avoidance behaviors by facilitating the experience of positive affect, and engagement in social and other adaptive activities.

A complementary or alternate way to conceptualize mechanisms by which gratitude might improve well-being in persons with PTSD is that it operates on well-being in the same manner as with non-psychiatric populations by harnessing physiological, cognitive, and behavioral aspects

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[2]There is some evidence that trauma reminders interfere with emotional expressiveness to ''objectively'' positive stimuli (i.e., reward responsivity) (Litz, Orsillo, Kaloupek, & Weathers, 2000).

of trauma survivors that are not compromised by PTSD. As described, Fredrickson's broaden and build model (2000) suggests that the experience of positive emotions, such as gratitude, undoes the adverse physiological effects of negative emotions and increases the flexibility of individual's cognitive and behavioral coping strategies.

The examination of both day-to-day hedonic and eudaimonic well-being in this paper is based on a view that wellness is more than the absence of distress. Such a perspective demands that well-being be measured in a broader way than simply documenting absence of disorder or distress as in many previous studies. Individuals can be without disorder and, at the same time, experience less than satisfactory personal relationships, self-determination in activities and choices, and feelings of self-regard. Hedonic well-being is conceptualized as the experience of pleasant emotions in one's life. Hedonic well-being is more commonly referred to as happiness or life satisfaction in psychological literature, and is defined in the now large body of work on subjective well-being (see Diener, Suh, Lucas, & Smith, 1999 for overview) as the presence of life satisfaction, frequent positive emotions, and infrequent negative emotions. Assessments of these three components typically involve soliciting individuals' affective and cognitive appraisals of their overall life and current experiences. Eudaimonic well-being is conceptualized as the experience of enriching activities and personal growth. Despite the tendency for happiness to be equated with hedonic well-being, particularly in modern Western societies, social thinkers as early as Aristotle suggest that well-being is more than the experience of pleasant feelings and physical pleasures (e.g., sex, drugs, rock n' roll, chocolate). In Aristotelian philosophy, the two essentials of being happy (i.e., experiencing the "good" life or eudaimonia) are thought to be engaging in activities that (1) are freely chosen and desired for their own sake (i.e., intrinsically motivating activity) and (2) provide opportunities to maximize one's potential and foster genuine positive relations with others. The satisfaction of the need to belong is thought of as a necessary (but not sufficient) condition for human flourishing (Aristotle, 1962). (In other philosophical and religious traditions, such as Buddhism, attachment to pleasure is even conceived of as a hindrance to achieving happiness; Rahula, 1996.) In the more recent psychological literature on eudaimonic well-being (Ryff & Singer, 1998, 2000), eudaimonia is defined as engagement in purposeful and meaningful activities that provide opportunities for personal growth, positive relations with others, feelings of mastery, and positive self-regard. Although several components of eudaimonic well-being are strongly associated with pleasant emotions (e.g., Kashdan, Rose, & Fincham, 2004; Watson, Clark, McIntyre, & Hamaker, 1992), hedonic and eudaimonic well-being are distinguishable but related dimensions (Keyes, Shmotkin, & Ryff, 2002) with diverse correlates, predictors, and trajectories (see Ryan & Deci, 2001 for review). Measuring day-to-day well-being is thought to provide a richer and more accurate picture of actual, ecological functioning than global self-reports (Stone et al., 1999).

Study overview

We evaluated the degree to which dispositional and daily gratitude were associated with daily hedonic and eudaimonic well-being in Vietnam War veterans with and without PTSD. Dispositional or trait gratitude was assessed with a psychometrically sound, self-report questionnaire (McCullough et al., 2002). Daily gratitude was assessed using an experience sampling approach. Subsequent to completing trait measures, participants were asked to complete

daily self-reports for 2 weeks in which they rated how grateful and appreciative they felt over the course of the day. Well-being was assessed using a similar approach. Participants, in their daily reports, rated the extent to which they experienced hedonic well-being (i.e., positive versus negative affect; e.g., Diener et al., 1999; Kashdan, 2004), and eudaimonic well-being (i.e., positive self-regard, rewarding social activity, and opportunity for personal growth; Seligman & Csiksentmihalyi, 2000; Ryff & Singer, 1998). Rewarding social activity was defined as social participation and social connectedness (e.g., feeling cared for and understood by others), both of which have been found to be associated with psychological and physical health (e.g., Watson, 1988; Watson et al., 1992; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Opportunity for personal growth was defined as engagement in intrinsically motivating activity, for arguably, "no single phenomenon reflects the positive potential of human nature as much as intrinsic motivation, the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn" (Ryan & Deci, 2000, p. 70). To our knowledge, this is the first empirical study of gratitude (as well as the first to examine everyday well-being) in trauma survivors.

We hypothesized that gratitude and well-being would be lower in the PTSD than the non-PTSD group and that greater trait gratitude would predict greater daily well-being in each of the groups. In addition, we hypothesized that daily gratitude would covary with daily well-being across time. Daily gratitude was expected to be more strongly related to daily well-being than trait gratitude. This is because of the temporal proximity between daily gratitude experiences and daily well-being. Furthermore, both of these states are based on the retrieval of specific memories (episodic knowledge), as opposed to trait gratitude, which is based on generalized beliefs and biased memories of oneself (semantic knowledge) (Robinson & Clore, 2002). Gratitude was expected to be related to both hedonic and eudaimonic well-being because of the studies discussed above that have found positive associations between gratitude and (a) positive affect and (b) rewarding social activity (Emmons & Shelton, 2002; McCullough et al., 2001, 2002). To address the alternative hypothesis that any gratitude effects were artifacts of the distress experienced by war veterans, we tested whether gratitude contributed to well-being independently of PTSD severity and trait negative affect. Disconfirmation of this alternate hypothesis would provide some evidence for the view that well-being is more complex than low psychological distress. Moreover, as a test of incremental validity, analyses were conducted to determine whether relations between gratitude and well-being were a spurious function of positive affect rather than the unique facets of gratitude. We posit that studying the role of gratitude in daily living may advance our understanding of individual and interpersonal functioning following traumatic and stressful events, offering insights into resilience and novel interventions.

Method

Participants

Participants with PTSD were recruited from outpatient and 4-week residential specialized mental health treatment programs at the Veterans Affairs (VA) Medical Center in Buffalo, NY. A comparison group of participants without PTSD were recruited from a master list of all living veterans in the Buffalo, NY area; comparison veterans were randomly selected from the list and

contacted by telephone. Both the residential and outpatient programs included only Vietnam War veterans diagnosed with PTSD related to war-zone experiences. All of the veterans in our comparison group were Vietnam War era veterans. The outpatient and residential treatment programs were similar in that both were cognitive–behavioral in orientation, included regular group treatment involving psychoeducation and process components, and regular individual treatment. The major difference was that the 26-day residential program included daily components of psychoeducation and process groups. Admission criteria for the residential program included psychiatric stability and compliance with available outpatient treatment, including group and individual treatment. There were a variety of reasons veterans were referred for residential treatment including the lack of PTSD outpatient treatment resources in their residential area and desire for more intensive PTSD treatment. Of the PTSD outpatient subjects, 70% (14 participants) had participated in the residential program previously.

The final sample in the paper was 20 outpatients diagnosed with PTSD, 22 residential patients diagnosed with PTSD, and 35 comparison veterans without a diagnosis of PTSD. All participants were included in analyses focusing on trait measures. They had an average age of 54.79 years (SD = 5.83; ranging from 31 to 71); 76 were male and one was female.[3] Consecutive patients were invited to participate, and of those contacted, only one outpatient (3.3%) and two residential (6.7%) veterans declined. Although all the outpatient and residential veterans were diagnosed with PTSD during unstructured clinical interviews with treatment program staff psychologists, psychiatrists, or clinical social workers, data were excluded from (a) one "PTSD" outpatient and four residential "PTSD" patients whose scores on the Mississippi Scale for combat-related PTSD were *less than* the suggested cutoff of 107 (Keane, Caddell, & Taylor, 1988) and (b) one comparison veteran whose score was *greater than* the suggested cutoff. Of note, we verified self-reports of combat exposure by obtaining the DD-214 (military transcript of combat exposure, receipt of military awards, and dates of service) from all veterans.

To obtain a reliable cross-section of participants' everyday lives, for analyses with daily measures, we only retained veterans completing at least half of the 14 possible daily report entries (mean = 13.5, range = 9–14). Our subsample for these analyses included 13 outpatients, 14 residential, and 28 comparison veterans; no significant differences were found between this group and the larger sample on any demographic or study variables.

Measures

Trait gratitude: Using a 7-point Likert scale from "strongly disagree" to "strongly agree", participants completed the 6-item Gratitude Questionnaire-6 ($\alpha = .86$; GQ-6; McCullough et al., 2002). The GQ-6 exhibits excellent psychometric properties and has been shown to explain unique associations with relevant constructs even after controlling for higher-order personality traits (i.e., Big Five) and social desirability (McCullough et al., 2002). Additionally, the GQ-6 only exhibits small to moderate negative relations with indices of anxiety and depression (r's = −.20 and −.30,

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[3]The one woman in our sample was retained because our sampling strategy involved recruiting consecutive veterans receiving treatment and a random selection of all living veterans in the Buffalo, NY area. We did not specifically recruit men or women, did not want to compromise our sampling strategy, and did not believe there is a theoretical or empirical justification for excluding female veterans. The one woman in our sample, who was in the comparison group of veterans without PTSD, did not substantially deviate from mean levels on the variables under study.

respectively), indicating that gratitude is not the absence of anxiety and depression. The items probe gratitude intensity ("I feel thankful for what I have experienced in life"; "If I had to list everything that I felt thankful for, it would be a very long list") and span ("I sometimes feel grateful for the smallest things"; "I am grateful to a wide variety of people").

Daily gratitude emotions: Participants were asked to provide daily reports for 14 days on the intensity of gratitude emotions experienced (Gratitude Adjectives Checklist; Emmons & McCullough, 2003; McCullough et al., 2002). The reports were typically completed at the end of the day; participants rated how "grateful" and "appreciative" they felt during that day.[4] Ratings on the two adjectives were aggregated ($\alpha = .84$). The high correlation between average daily gratitude and trait gratitude, r (55) = .62, $p < .001$, obtained in this study supports the convergent validity of this measure.

PTSD severity: Using a 5-point Likert Scale, veterans completed the 35-item Mississippi Scale to assess the severity of combat-related PTSD symptoms (Keane et al., 1988). Large-scale prevalence studies have used the Mississippi as the primary self-report index of PTSD symptoms (e.g., Kulka et al., 1990). The Mississippi has demonstrated excellent diagnostic sensitivity (.93) and specificity (.89) in predicting PTSD diagnoses derived from structured clinical interviews (Keane et al., 1988). The Mississippi Scale total score served as our index of PTSD severity ($\alpha = .85$).

Trait affect: During initial evaluation sessions, participants completed the widely used 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), which assessed activated negative affect (NA; $\alpha = .94$) and positive affect (PA; $\alpha = .91$). Both scales have been shown to exhibit excellent psychometric properties.

Daily hedonic well-being: Participants also provided daily reports on PA (6 adjectives: happy, proud, interested, determined, strong, and energetic, $\alpha = .91$), and NA (6 NA adjectives: anxious, frustrated, angry, irritable, afraid, and depressed; $\alpha = .93$); adjectives were derived from prior experience-sampling studies of affect (e.g., Emmons & Colby, 1995; Watson, 1988).

Two indices of hedonic well-being were created using the daily reports of affect (based on Diener, Larsen, Levine, & Emmons, 1985): (1) daily affect balance: subtraction of NA from PA for each day (with higher scores indicative of higher well-being), and (2) percentage of happy days: percentage of days during the assessment period that PA exceeded NA. This second index is arguably the most salient index of well-being. The frequency of hedonic well-being has been consistently shown to be more important than intensity in predicting individual differences in happiness (see Diener, Sandvik, & Pavot, 1991).

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[4]Whereas our daily gratitude emotions measure includes two adjectives (grateful, appreciative), the measure by Emmons and McCullough (2003) is a 3-item measure that also includes the adjective "thankful." However, secondary analyses conducted by Emmons (personal communication, April 30, 2004) compared the 3-item composite (grateful, appreciative, thankful) with our 2-item composite (grateful, appreciative) for the analyses reported in prior articles (Emmons & McCullough, 2003; McCullough et al., 2002). There was virtually no difference in the correlations between the 2-item and 3-item composites. For example, correlations between the composite and various convergent criteria for the 3-item vs. the 2-item composites were .68 vs. .66 (for satisfaction about life as a whole), .46 vs. .45 (for optimism about the upcoming day), .43 vs. .42 (for feelings of connectedness to others), and for divergent criteria the respective values were .02 and .02 (for self-rated pain), and .05 and .07 (for self-rated impairment due to pain). Moreover, each of the three adjectives correlated approximately .80 with each other. These data provide empirical justification for our 2-item daily gratitude emotions measure.

Daily eudaimonic well-being: To assess self-esteem, we included two positively worded and two negatively worded items from the Rosenberg Self-Esteem Scale (items 3, 6, 7, and 10; Rosenberg, 1965) modified to reflect daily self-regard. This 4-item daily self-esteem scale has been well validated in prior research (e.g., Nezlek & Plesko, 2001; Nezlek, Feist, Wilson, & Plesko, 2001) (e.g., "On the whole, I am satisfied with myself;" $\alpha = .93$). To assess the quantity and quality of rewarding social activity, we included two face-valid items (derived from a measure assessing the daily need for relatedness; see Reis, Sheldon, Gable, Roscoe, & Ryan, 2000) i.e., "Felt that people in my life cared about me"; "Tended to socialize with other people" ($\alpha = .59$). To assess intrinsically motivating activity, we included two items on the self-determined pursuit of novelty and challenge, i.e., "Found yourself doing things purely for the interest and enjoyment of doing them" (derived from Reis et al., 2000; i.e., definition of intrinsic motivation); "Found myself looking for new opportunities to grow as a person (e.g., new knowledge, people, resources)" (derived from the highest loading item on the Curiosity and Exploration Inventory; Kashdan et al., 2004) ($\alpha = .82$). All daily report items were evaluated using 5-point Likert Scales.

Procedures

Written informed consent was obtained from all participants after presenting a thorough description of the study. Consenting participants completed a self-report packet during scheduled group sessions. At the end of each session, participants were provided with instructions for completing 14 consecutive daily report entries at the end of each day. The experimenter went over each item on the daily report form to ensure that participants had a thorough understanding of the instructions and all words on the form. Participants were provided with the necessary materials to send back daily reports at the end of each week of assessment. As mentioned (see *Participants*), not all of the veterans participated in both the trait-level and daily self-monitoring studies. Participants were paid $20 for completing the self-report packet, $40 for completing the daily reports, and an additional $10 for travel expenses (for outpatients and comparison group).

Data analytic overview

The covariation between gratitude and well-being was examined within each veteran group with a hierarchical linear modeling (HLM) approach using the HLM 5.04 program (Raudenbush, Bryk, Cheong, & Congdon, 2000). As noted, two aspects of daily well-being were examined: hedonic (affect balance)[5] and eudaimonic (rewarding social activity, intrinsically motivating activity, self-esteem). Two level models were employed, with repeated daily assessments (Level-1) nested within participants (Level-2). This approach simultaneously controlled for dependencies in the same person completing self-reports across different days. In each model, outcomes were predicted by equations that accounted for within-person variation (Level-1) and between-person

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[5]To avoid redundancy, hedonic well-being was only evaluated as an outcome using affect balance (level of daily PA compared to NA for a given day) and percentage of pleasant days (over the course of the 14-day assessment period). Daily PA and daily NA were components used to create these composite measures. Relations between trait and daily gratitude with daily PA were similar in magnitude as relations reported with affect balance; relations with daily NA were substantially smaller in magnitude. The results of these analyses are available upon request from the first author.

variation (Level-2). We used different models (see *Results*) to evaluate whether (a) trait gratitude predicted participants' average daily well-being and (b) daily gratitude emotions were related to daily well-being. Two-tailed tests with an alpha of .05 were used; degrees of freedom were based on the number of participants on which specific analyses were performed (Raudenbush et al., 2000). All Level-1 predictors were group-mean centered and Level-2 predictors were grand-mean centered. The magnitude of relationships was examined by transforming *t*-tests into Cohen's *d* effect sizes (small = .20; medium = .50; large = .80) (Cohen, 1988). Reduced form equations are presented prior to the results of each set of HLM analyses to facilitate understanding of the statistical models. Hierarchical regression analysis, rather than HLM, was used to examine the relationship between gratitude and the percentage of pleasant days experienced because there was a single aggregate value for each participant (in contrast to other well-being variables that had multiple values across time). Differences in levels of gratitude and well-being, as well as demographic characteristics, between the groups were examined using independent samples *t*-tests.

Results

Preliminary analyses

Comparisons were made between outpatient and residential veterans with PTSD on the demographic and study variables to test whether these samples could be merged. No significant group differences were found on demographic variables, PTSD severity, trait affect, and indices of daily well-being ($p > .30$). The residential group reported slightly greater trait gratitude ($p = .15$) and daily gratitude emotions ($p = .11$) than the outpatient group; these differences, however, were also non-significant. These data support the use of a single sample of veterans being treated for PTSD for subsequent analyses (i.e., combining residential and outpatient veterans). Demographic data are reported in Table 1.

Differences between veterans with and without PTSD

Comparisons were made between veterans with and without PTSD on gratitude measures (Table 1). Veterans with PTSD reported less trait gratitude than non-PTSD veterans, $t(75) = 5.98$, $p < .001$, $d = 1.38$. The difference between these groups was in the same direction for daily gratitude but was not significant ($p = .17$). Veterans with PTSD demonstrated lower well-being than veterans without PTSD as evidenced by daily affect balance, percentage of pleasant days, rewarding social activity, and self-esteem ($p < .01$); no group differences were found on intrinsically motivating activity ($p = .11$).

Relationship of trait gratitude to average daily well-being in veterans with and without PTSD

Bivariate relations

We first examined whether trait gratitude predicted daily well-being. The equations used to predict daily rewarding social activity from trait gratitude are listed below to illustrate how we

Table 1
Demographic characteristics, combat exposure, PTSD severity, trait affect, and gratitude of final sample of participants

Characteristics	Group	
	PTSD	Non-PTSD
Age (mean years $\pm$ SD)	54.1 ± 4.5	55.7 ± 7.1
Male (%)	100%	97%
Experienced combat (%)	100%	9%***
PTSD severity (mean $\pm$ SD)[a]	128.1 ± 16.8	77.8 ± 10.8***
Trait PA (mean $\pm$ SD)[b]	25.5 ± 8.5	34.8 ± 7.2***
Trait NA (mean $\pm$ SD)[b]	35.1 ± 8.5	17.7 ± 7.0***
Trait gratitude (mean $\pm$ SD)[c]	22.1 ± 9.4	33.7 ± 7.0***
Daily gratitude emotions (mean $\pm$ SD)[d]	4.1 ± 3.2	5.1 ± 3.14
Daily PA (mean $\pm$ SD)[d]	14.7 ± 4.8	18.2 ± 5.2*
Daily NA (mean $\pm$ SD)[d]	16.2 ± 5.5	9.9 ± 4.4***
Daily affect balance (mean $\pm$ SD)[d]	-1.4 ± 9.4	8.3 ± 7.3***
Daily rewarding social activity (mean $\pm$ SD)[d]	5.7 ± 1.2	6.6 ± 1.4*
Daily intrinsically motivating activity (mean $\pm$ SD)[d]	4.5 ± 1.8	5.4 ± 2.1
Daily self-esteem (mean $\pm$ SD)[d]	11.8 ± 3.9	16.9 ± 2.6***
Percentage of pleasant days	$.45 \pm .37$	$.80 \pm .29$***

Note: *$p < .05$, **$p < .01$, ***$p < .001$. A series of *t*-tests were conducted to test group differences. For trait measures, $n = 42$ and 35 for the PTSD and non-PTSD groups, respectively. For daily reports, $n = 27$ and 28 for the PTSD and non-PTSD groups, respectively.

[a]Mississippi scale for combat-related PTSD (Keane et al., 1988).
[b]Positive and negative affect schedule (Watson et al., 1988).
[c]The gratitude questionnaire-6 (McCullough et al., 2002).
[d]Daily ratings are based on the averages of the averages within persons.

tested our hypotheses:

$$\text{Daily rewarding social activity}_{ij} = b_{0j} + r \tag{1}$$

$$b_{0j} = \gamma_{00} + \gamma_{01} \text{ (trait gratitude)} + u_0 \tag{2}$$

Eq. (1) represents within-person effects (Level-1; see Data Analytic Overview). Daily rewarding social activity is individual *i*'s social activity on day *j*, b_{0j} is the intercept (i.e., the individual's social activity on an average day) and *r* is a within-person random error term (i.e., extent to which individual *i* experienced more or less daily social activity on day *j* than their mean level). Eq. (2) represents the effects of individual differences on the within-person relationships (Level-2; see Data Analytic Overview), where γ_{00} refers to the average between-person level of social activity (which is equivalent to zero when trait gratitude equals the grand mean because trait predictors were grand-mean centered); γ_{01} represents the maximum likelihood estimate of the population slope estimating average level of social activity across all days from trait gratitude; and u_0 is error (or residual variance in mean levels of daily social activity for the entire sample that are not accounted for by equation components). More simply, the model tests the degree to which participants' average daily social activity across all 14 days is a function of individual differences

in trait gratitude. The results of HLM analyses with trait gratitude as the only predictor are reported in Table 2.

In our initial analyses, we failed to find any significant interactions between PTSD group and trait gratitude to predict well-being (affect balance, $p = .75$, $d = .09$; rewarding social activity $p = .14$, $d = .43$; intrinsically motivating activity, $p = .99$, $d = .00$; self-esteem, $p = .50$, $d = .19$). Despite a failure to find differential gratitude relationships between groups, because of substantial differences in combat exposure we did not collapse our analyses across groups.

For the PTSD group, in all models, trait gratitude was a significant predictor of greater daily hedonic and eudaimonic well-being outcomes. The effect sizes for trait gratitude ranged from .88 (rewarding social activity) to 2.00 (affect balance). For the non-PTSD group, in 3 of 4 models, trait gratitude was a significant predictor of greater daily hedonic and eudaimonic well-being outcomes (the exception being intrinsically motivating activity). For significant models, the effect sizes for trait gratitude ranged from 1.37 (affect balance) to 1.43 (self-esteem).

Unique relations

The most parsimonious explanation for our significant gratitude findings was the absence of psychopathology or distress. Thus, our second set of analyses examined whether trait gratitude predicted daily well-being independently of measures of psychopathology and distress (PTSD severity, trait NA). Furthermore, we tested the incremental validity of gratitude over and above PA to evaluate whether the prior significant findings were due simply to individual differences in PA.

The equations used to predict daily rewarding social activity from trait gratitude, independently of PTSD severity, trait NA, and trait PA, are listed below to illustrate how we tested our experimental questions:

$$\text{Daily rewarding social activity}_{ij} = b_{0j} + r$$

$$b_{0j} = \gamma_{00} + \gamma_{01} \, (\text{PTSD severity}) + \gamma_{02} \, (\text{trait NA}) + \gamma_{03} \, (\text{trait PA}) + \gamma_{04} \, (\text{trait gratitude}) + u_0$$

$$(2\prime)$$

Table 2
Trait gratitude relations with Hedonic and Eudaimonic daily well-being using multilevel modeling

Outcomes	Affect balance[a]			Rewarding social activity			Intrinsically motivating activity			Self-esteem		
	B (SE)	t-test	d	B (SE)	t-test	d	B (SE)	t-test	d	B (SE)	t-test	d
PTSD group												
Intercept	−1.85 (1.36)	−1.36	.54	5.70 (.21)	26.67***	10.67	4.56 (.26)	17.87***	7.15	11.75 (.61)	19.42***	7.77
Trait gratitude	.69 (.14)	4.89***	1.96	.05 (.02)	2.21*	.88	.13 (.03)	5.01***	2.00	.25 (.06)	3.94***	1.58
Non-PTSD group												
Intercept	7.91 (1.21)	6.56***	2.57	6.71 (.22)	30.07***	11.79	5.36 (.39)	13.77***	5.40	16.78 (.40)	41.45***	
Trait gratitude	.68 (.19)	3.49**	1.37	.13 (.04)	3.52**	1.38	.08 (.06)	1.25	.49	.24 (.07)	3.64***	1.43

Note: *$p < .05$, **$p < .01$, ***$p < .001$. All p-values were two-tailed. B = unstandardized HLM coefficient. SE = standard error. The magnitude of relationships was examined by transforming t-tests into Cohen's d effect sizes (Cohen, 1988). In the PTSD and non-PTSD groups, degrees of freedom for effects are 25 and 26, respectively.
[a]For Affect Balance, higher scores implied a greater extent of PA compared to NA for each day.

The model tests the degree to which participants' average daily social activity is a function of individual differences in trait gratitude after controlling for PTSD severity, trait NA, and trait PA.

As shown in the upper half of Table 3, trait gratitude in the PTSD group predicted significantly greater positive affect balance, intrinsically motivating activity, and self-esteem after statistically controlling for PTSD severity, trait NA, and trait PA. Trait gratitude was a unique predictor in 3 of 4 models and effect sizes for incremental variance (over and above distress-related variables) ranged from .95 (for self-esteem) to 1.44 (for intrinsically motivating activity). In contrast to trait gratitude, trait PA was not uniquely associated with any outcomes, and trait NA was only uniquely associated with lower self-esteem. Overall, gratitude exhibited unique relations with well-being outcomes. Gratitude effects were not attributable to variability in psychological distress or dispositional PA.

As shown in the lower half of Table 3, trait gratitude in the non-PTSD group failed to emerge as a unique predictor in any of the well-being models (i.e., effect sizes for incremental variance of trait gratitude ranged from .17 to .33). In contrast, trait PA was a significant predictor in 3 of 4 models. Thus, for veterans with PTSD, trait gratitude emerged as a significant, unique predictor of well-being over and above trait PA, whereas for veterans without PTSD, trait gratitude failed to account for unique variance in well-being.

Relationship across time of daily gratitude to daily well-being in veterans with and without PTSD

Bivariate relations

The analyses above suggested that the disposition to be grateful predicts daily hedonic and eudaimonic well-being among persons with PTSD. We next examined how the experience of

Table 3
Trait gratitude, trait affect, and PTSD severity relations with hedonic and eudaimonic daily well-being using multilevel modeling

Outcomes	Affect balance[a]			Rewarding social activity			Intrinsically motivating activity			Self-esteem		
	B (SE)	*t*-test	*d*	*B* (SE)	*t*-test	*d*	*B* (SE)	*t*-test	*d*	*B* (SE)	*t*-test	*d*
PTSD group												
Intercept	−1.83 (1.18)	−1.55	.66	5.70 (.20)	28.00***	11.94	4.56 (.26)	17.89***	7.63	11.76 (.41)	28.91***	12.33
PTSD severity	−.09 (.08)	−1.20	.51	−.01 (.01)	−.57	.24	.01 (.02)	.59	.25	−.05 (.03)	−1.95	.83
Trait negative affect	−.14 (.18)	−.78	.33	−.01 (.03)	−.17	.07	.00 (.04)	.11	.05	−.18 (.06)	−2.80*	1.19
Trait positive affect	.28 (.18)	1.58	.67	.05 (.03)	1.65	.70	.06 (.04)	1.68	.72	.07 (.06)	1.20	.51
Trait gratitude	.44 (.15)	2.99**	1.27	.02 (.03)	.69	.29	.11 (.03)	3.38**	1.44	.11 (.05)	2.22*	.95
Non-PTSD group												
Intercept	8.28 (1.03)	8.01	3.34	6.61 (.22)	30.04***	12.53	5.38 (.35)	15.19***	6.33	16.85 (.39)	43.05***	17.95
PTSD severity	−.10 (.12)	−.81	.34	.00 (.03)	.03	.01	−.06 (.04)	−1.46	.61	.00 (.05)	.06	.03
Trait negative affect	−.12 (.19)	−.62	.26	−.00 (.04)	−.07	.03	.07 (.07)	1.02	.43	−.06 (.07)	−.77	.32
Trait positive affect	.54 (.20)	2.73*	1.14	.09 (.04)	2.10*	.88	.18 (.07)	2.68*	1.12	.14 (.08)	1.89	.79
Trait gratitude	.11 (.27)	.40	.17	.04 (.06)	.77	.32	−.06 (.09)	−.61	.25	.08 (.10)	.80	.33

Note: *p<.05, **p<.01, ***p<.001. All *p*-values were two-tailed. *B* = unstandardized HLM coefficient. SE = standard error. The magnitude of relationships was examined by transforming *t*-tests into Cohen's *d* effect sizes (Cohen, 1988). In the PTSD and non-PTSD groups, the degrees of freedom for effects are 22 and 23, respectively.
[a] For Affect Balance, higher scores implied a greater extent of PA compared to NA for each day.

grateful emotions on a daily basis influenced well-being. The results of HLM analyses with daily gratitude as the only predictor are reported in Table 4. For the PTSD and non-PTSD groups, in all models, daily gratitude was positively associated with daily hedonic and eudaimonic well-being. For the PTSD group, the effect sizes for daily gratitude in predicting daily well-being ranged from 1.48 (self-esteem) to 3.17 (affect balance). For the non-PTSD group, effect sizes for daily gratitude in predicting daily well-being ranged from 1.50 (intrinsically motivating activity) to 2.41 (rewarding social activity). Comparing Tables 2–4, daily gratitude was more strongly related to well-being than trait gratitude for half of the outcomes in the PTSD group and all outcomes in the non-PTSD group.

Because serial dependency (i.e., autocorrelation) is a unique threat to validity in analyses using day-to-day assessments, this potential confound was controlled for statistically by using time-lagged differencing analyses. Specifically, analyses of relationships between daily gratitude emotions and daily well-being were adjusted by statistically controlling for the previous day's gratitude and well-being scores. The equations used to estimate the covariance between daily gratitude emotions and daily rewarding social activity, controlling for serial dependency, are listed below to illustrate our analytic approach:

$$\text{Daily rewarding social activity}_{ij} = b_{0j} + b_{1j} (\text{Daily rewarding social activity}_{j-1})$$
$$+ b_{2j} (\text{Daily gratitude emotions}_{j-1}) + b_{3j} (\text{Daily gratitude emotions}) + r \quad (1*)$$

$$b_{0j} = \gamma_{00} + u_0 \quad (2*)$$

As for the previous analyses, Eq. (1*) represents within-person effects (Level-1). Daily rewarding social activity is individual i's social activity on day j; b_{0j} is the intercept (i.e., the individual's social activity on an average day); b_1 to b_3 represent the maximum likelihood estimates of the population slopes estimating daily social activity from the prior day's social activity, prior day's gratitude, and today's gratitude, respectively; and r is a within-subject random error term. All day-level coefficients were treated as random effects because the 14 days under

Table 4
Daily gratitude emotion relations with hedonic and eudaimonic daily well-being using multilevel modeling

Outcomes	Affect balance[a]			Rewarding social activity			Intrinsically motivating activity			Self-esteem		
	B (SE)	t-test	d	B (SE)	t-test	d	B (SE)	t-test	d	B (SE)	t-test	d
PTSD group												
Intercept	−1.51 (1.38)	−1.09	.43	5.73 (.18)	31.88***	12.50	4.56 (.29)	15.63***	6.13	11.54 (.69)	16.76***	6.57
Daily gratitude	2.10 (.26)	8.09***	3.17	.28 (.05)	5.53***	2.17	.32 (.06)	5.01***	1.97	.37 (.10)	3.78**	1.48
Non-PTSD group												
Intercept	7.99 (1.19)	6.70***	2.58	6.77 (.17)	40.53***	15.60	5.40 (.35)	15.61***	6.01	17.03 (.39)	43.51***	16.75
Daily gratitude	1.93 (.33)	5.93***	2.28	.39 (.06)	6.27*	2.41	.30 (.08)	3.91***	1.50	.46 (.11)	4.25***	*1.64*

Note: *$p<.05$, **$p<.01$, ***$p<.001$. All p-values were two-tailed. B = unstandardized HLM coefficient. SE = standard error. The magnitude of relationships was examined by transforming t-tests into Cohen's d effect sizes (Cohen, 1988). In the PTSD and non-PTSD groups, the degrees of freedom for effects are 26 and 27, respectively.
[a] For Affect Balance, higher scores implied a greater extent of PA compared to NA for each day.

study were a random sample of days from participants' lives, i.e., the specific 2 weeks under study were no more important than any other sampling of days in their lives (Nezlek, 2001). Unlike the two-level models employed in the preceding sections that include trait predictors, the only variables in Eq. (2*) (Level-2) are a sample-wise person level intercept (γ_{00}) and a random person effect (u_0) accounting for error. The model tests the degree to which an average participants' social activity varies from day-to-day as a function of gratitude emotions on that day, controlling for the prior day's social activity and gratitude emotions (i.e., adjusting for serial dependency).

In initial analyses, we failed to find significant PTSD group and daily gratitude interactions in predicting well-being ($p > .20$). We did not collapse across groups when conducting these tests for the same reason as for the trait level analyses.

As shown in the upper half of Table 5, daily gratitude emotions in the PTSD group were associated with significantly greater hedonic and eudaimonic daily well-being after accounting for the variance associated with serial dependencies. For all four models, the effect sizes for daily gratitude emotions ranged from 1.43 (for self-esteem) to 3.14 (for affect balance). As shown in the lower half of Table 5, similar findings were found in the non-PTSD group. For all four models, daily gratitude emotions accounted for incremental variance ranging from 1.63 (for self-esteem) to 2.42 (for affect balance).

Unique relations

We also tested the independent relationship of daily gratitude emotions to daily well-being independent of daily NA and PA. Analyses between daily gratitude emotions and daily well-being were adjusted by statistically controlling for the previous day's reports of gratitude emotions and well-being *and* for the current day's reports of NA and PA. These analyses were only carried out for eudaimonic well-being variables (rewarding social activity, intrinsically motivating activity, self-esteem). This is because models examining relations between daily gratitude emotions and daily affect balance could not statistically control for daily affect (daily NA and PA) when daily affect was used to develop the affect balance composite measure. PTSD severity was controlled for indirectly by the inclusion of daily NA in the models, as PTSD severity and daily NA were highly correlated, $r = 82$, $p < .001$. PTSD severity was not controlled for directly because it was not assessed in the daily reports.

The equations used to estimate the covariance between daily gratitude emotions and daily rewarding social activity, controlling for serial dependency and daily affect, are listed below to illustrate our analytic approach:

$$\text{Daily rewarding social activity}_{ij} = b_{0j} + b_{1j} (\text{Daily rewarding social activity}_{j-1})$$
$$+ b_{2j} (\text{Daily gratitude emotions}_{j-1}) + b_{3j} (\text{Daily NA}) + b_{4j} (\text{Daily PA})$$
$$+ b_{5j} (\text{Daily gratitude emotions}) + r \tag{1$'$}$$

$$b_{0j} = \gamma_{00} + u_0$$

The model tests the degree to which an average participants' social activity varies from day-to-day as a function of gratitude emotions on that day, controlling for the prior day's reports of social activity and gratitude emotions and for the current day's reports of NA and PA.

Table 5
Daily gratitude emotions relations with hedonic and eudaimonic daily well-being using multilevel modeling and controlling for serial dependencies

Outcomes	Affect balance[a]			Rewarding social activity			Intrinsically motivating activity			Self-esteem		
	B (SE)	t-test	d	B (SE)	t-test	d	B (SE)	t-test	d	B (SE)	t-test	d
PTSD group												
Intercept	−1.39 (1.16)	−1.20	.47	5.75 (.14)	42.12***	16.52	4.55 (.24)	19.06***	7.48	11.50 (.56)	20.66***	8.10
Outcome variable (from yesterday)[b]	.17 (.04)	4.17***	1.64	.27 (.04)	6.61***	2.59	.21 (.04)	5.51***	2.16	.20 (.04)	4.89***	1.92
Daily gratitude (from yesterday)[c]	.03 (.17)	.15	.06	−.12 (.04)	−3.02**	1.18	−.07 (.04)	−1.93	.76	−.09 (.08)	−1.11	.44
Daily gratitude	1.98 (.25)	8.01***	3.14	.29 (.05)	5.38***	2.11	.33 (.06)	5.30***	2.08	.34 (.09)	3.65***	1.43
Non-PTSD group												
Intercept	8.58 (.92)	9.31***	3.58	6.66 (.17)	39.62***	15.25	5.36 (.29)	18.40***	7.08	17.15 (.34)	51.07***	19.66
Outcome variable (from yesterday)[b]	.15 (.05)	3.10**	1.19	.11 (.05)	2.14*	.82	.14 (.05)	2.74*	1.05	.14 (.04)	3.02**	1.16
Daily gratitude (from yesterday)[c]	−.06 (.17)	−.33	.13	−.04 (.05)	−.81	.31	−.01 (.05)	−.29	.11	.00 (.09)	.03	.01
Daily gratitude	1.91 (.30)	6.30***	2.42	.37 (.07)	5.61***	2.16	.34 (.07)	4.81***	1.85	.45 (.11)	4.23***	1.63

Note: $*p < .05$, $**p < .01$, $***p < .001$. All *p*-values were two-tailed. *B* = unstandardized HLM coefficient. SE = standard error. The magnitude of relationships was examined by transforming *t*-tests into Cohen's *d* effect sizes (Cohen, 1988). In the PTSD and non-PTSD groups, the degrees of freedom for effects are 26 and 27, respectively.

[a]For Affect Balance, higher scores indicate a greater extent of PA compared to NA for each day.
[b]Adjusting for yesterday's scores on the outcome variable (at time *t−1*) to control for serial dependency in the model.
[c]Adjusting for yesterday's daily gratitude emotions (at time *t−1*) to control for serial dependency in the model.

In the PTSD group, daily gratitude emotions accounted for a significant incremental proportion of the variance in daily rewarding social activity, $B = .12$, SE $= .05$, $t(26) = 2.30$, $p = .03$, $d = .90$, and intrinsically motivating activity, $B = .11$, SE $= .05$, $t(26) = 2.19$, $p = .04$, $d = .86$. The incremental variance in these variables accounted for by daily gratitude emotions was over and above that explained by the previous day's reports of social activity and gratitude emotions and the current day's reports of NA and PA. No incremental effects were found for self-esteem ($p = .86$). For veterans with PTSD, thus, the impact of daily gratitude on greater daily rewarding social activity and intrinsically motivating activity was not attributable to serial dependencies or daily affect.

In the non-PTSD group, daily gratitude emotions accounted for a significant incremental proportion of the variance in daily rewarding social activity, $B = .18$, SE $= .06$, $t(27) = 2.88$, $p = .008$, $d = 1.11$, and self-esteem, $B = .23$, SE $= .08$, $t(27) = 2.90$, $p = .008$, $d = 1.12$. The incremental variance in these variables accounted for by daily gratitude emotions was over and above that explained by the previous day's reports of social activity and gratitude emotions and the current day's reports of NA and PA. No incremental effects were found for intrinsically motivating activity ($p = .36$). For veterans without PTSD, thus, the association of daily gratitude with greater daily rewarding social activity and self-esteem was not attributable to serial dependencies or daily affect.

Examining reactive effects of monitoring as a potential confound

It has been argued that the act of repeated monitoring over the course of 14 days may modify participants' reporting or actual experiences (i.e., self-monitoring serves as an intervention). To address this potential threat to validity, we tested whether levels of daily gratitude and daily well-being changed over the daily report assessment period. A series of 2-level HLM analyses were conducted separately for PTSD and non-PTSD groups with repeated daily assessments nested in participants. The effect of repeated monitoring was represented by a dummy variable (Time) with two levels: the first 7 days and second 7 days of participants' daily reports. Separate models represented (a) daily gratitude and (b) daily well-being variables as a function of Time (see Nezlek, 2002 for similar analytic approach). With a single exception, Time was not found to have an effect on daily gratitude or daily well-being levels ($ps > .35$); in the PTSD group, intrinsically motivating activity significantly decreased from the first to second half of the self-monitoring period ($p = .009$). This finding is in the opposite direction from what would be predicted if repeated monitoring were therapeutic. We also tested whether repeated monitoring changed the strength of associations between gratitude and daily well-being over the assessment period. This question was examined by constructing HLM models that represented individual daily well-being outcomes as a function of the interaction between (a) trait gratitude and Time and (b) daily gratitude and Time. With a single exception in eight models, Gratitude × Time interactions were found to be non-significant ($ps > .30$). These data dovetail with prior studies (e.g., Nezlek, 2002) showing that the act of repeated monitoring does not lead to meaningful changes in variables of interest over time. Thus, possible reactive effects of monitoring did not serve as a threat to the validity of findings.

Relationship of gratitude to percentage of pleasant days

In contrast to the other well-being variables, the percentage of pleasant days during the assessment period (calculated from daily reports) was by definition a between-subject criterion. Thus, relations between gratitude and the percentage of pleasant days were examined with correlation and regression analyses. In terms of bivariate relations, percentage of pleasant days in the PTSD group was significantly associated with trait gratitude, $r(42) = .59$, $p < .001$, and daily gratitude emotions, $r(27) = .53$, $p = .003$. In the non-PTSD group, percentage of pleasant days was also significantly associated with trait gratitude, $r(35) = .51$, $p < .001$, and daily gratitude emotions, $r(28) = .51$, $p = .006$.

Models of the incremental effects of gratitude on percentage of pleasant days could not statistically control for daily affect because daily PA and NA were used to develop hedonic well-being composite measures. Thus, the incremental effects of trait and daily gratitude on the percentage of pleasant days were examined by controlling for PTSD severity. Hierarchical regression models were conducted with PTSD severity entered at Step 1, and in separate models, trait gratitude and daily gratitude emotions were entered at Step 2. In the PTSD group, PTSD severity accounted for 16% of the variance, $F(1, 40) = 7.40$, $p = .01$, $d = .86$. In the first model, trait gratitude accounted for an additional 23% of the variance, $F\varDelta(1, 39) = 14.55$, $p < .001$, $d = 1.22$. In the second model, daily gratitude emotions accounted for an additional 40% of the variance, $F\varDelta(1, 39) = 34.59$, $p < .001$, $d = 1.88$. In the non-PTSD group, PTSD severity accounted for 2% of the variance in the percentage of pleasant days ($p = .46$). In the first model, trait gratitude accounted for an additional 24% of the variance, $F\varDelta(1, 32) = 10.66$, $p = .003$, $d = 1.15$. In the second model, daily gratitude emotions accounted for an additional 65% of the variance, $F\varDelta(1, 32) = 64.20$, $p < .001$, $d = 2.83$. In summary, gratitude was uniquely associated with the proportion of pleasant days, after controlling for PTSD severity, in the PTSD and non-PTSD groups; incremental variance was substantially larger for daily compared to trait gratitude.

Discussion

Veterans with PTSD were no less responsive to the variations in daily gratitude or the effects of dispositional gratitude than veterans without PTSD. In veterans with and without PTSD, daily gratitude had salutary effects, demonstrating positive relations with hedonic and eudaimonic daily well-being. These relationships were independent of trauma-related distress (PTSD severity), general distress (NA), and elevated mood (PA), and were not attributable to validity threats common to time series data (i.e., serial dependency, effects of repeated monitoring). Furthermore, relative to the variance in outcomes typically accounted for by individual difference variables, the size of the gratitude effects were striking and beg further attention.

As noted in the introduction, application of Fredrickson's (2000) broaden and build model of PA to current theoretical models of PTSD (Ehlers & Clark, 2000; Foa et al., 1989; Litz, 1992) offers some suggestions for understanding why gratitude may relate to the well-being of trauma survivors. Our results lend some support to the mechanisms proposed (i.e., gratitude affects well-being by building personal resources and broadening cognitive and behavioral repertoires). Although our sample size did not permit use of structural equation modeling to test mediational

hypotheses rigorously, findings that daily gratitude was for the most part positively associated with rewarding social activity and intrinsically motivating activity were suggestive. Rewarding social activity, which is likely to like to lead to new or enhanced relationships with others, has been considered a personal resource (Aron & Aron, 1997; Ryff & Singer, 2000). Intrinsically motivating activity, which has been found to increase exposure to new and challenging experiences (Kashdan et al., 2004), is thought to broaden repertoires such as cognitive flexibility (see Deci & Ryan, 2000 for review). The finding that relations between daily gratitude and well-being were similar in veterans with and without PTSD is also consistent with Fredrickson's model given that it applies equally well to persons with and without a psychiatric disorder.

Alternate explanations of the results for the PTSD group include mechanisms that are specific to countering PTSD symptoms. Individuals with clinical or subclinical post-traumatic stress are easily primed for distressing re-experiencing symptoms by triggers that have direct relevance to the trauma itself or general resemblance to the original trauma context (e.g., sensory stimuli such as the smell of grass and trees for Vietnam War veterans who fought in the jungle). More complex trauma networks increase the likelihood that trauma survivors will be disconnected from their current surrounding and ''frozen'' in their traumatic past. The integral ingredients of gratitude, including recognizing and savoring positive life circumstances and the benefactor of perceived rewards might disrupt the trauma network and increase opportunities for greater emotional and psychological well-being. Another way to account for the results is that gratitude may be associated with some other human strength, which directly contributes to well-being enhancements. Nevertheless, the findings from this study, in conjunction with interventions studies conducted by Emmons and McCullough (2003), suggest that it might be worthwhile to test whether gratitude can be manipulated to promote well-being in clinical populations, such as persons with PTSD.

Of additional interest, PTSD severity, and trait NA were useful in predicting self-esteem in the PTSD group. However, these pathological and distress-related variables failed to explain significant variance for the majority of hedonic and eudaimonic well-being dimensions assessed (i.e., affect balance, percentage of pleasant days, rewarding social activity, intrinsically motivating activity). These data support the premise that well-being is more than the absence of distress and impairment, and that appetitive and aversive tendencies and concomitant affective experiences are relatively independent (e.g., Cacioppo & Berntson, 1994; Carver, Sutton, & Scheier, 2000). Basic and applied research on PTSD has largely excluded positive aspects of mental health with the consequences that (a) thriving in post-trauma environments has been inadequately addressed and understood (Tedeschi et al., 1998), (b) possible treatment-related changes in positive psychological functioning have not been documented, and (c) positive psychological functioning has not been a systematic target of intervention. These trends may partly explain why 40–60% of clients in treatment outcome studies for PTSD cannot be classified as high functioning at post-treatment (e.g., see Craske, 1999), and combat-related PTSD interventions have found only mild symptom improvement and variable maintenance over follow-up (Fontana & Rosenheck, 1996). Changes in psychological strengths such as gratitude may account for improvements in well-being that veterans in PTSD treatments experience but are not evident in psychopathological assessment. Among other implications, our findings suggest a refocusing of assessment in clinical research to ensure that the breadth of well-being is more adequately captured.

There were two striking differences in veterans with and without PTSD. The first was that all veterans with PTSD saw combat, while the vast majority in the non-PTSD group never saw combat (91%). Subsequently, group differences in gratitude, well-being, and relations between gratitude and well-being may be a function of exposure to war-zone stressors as opposed to the presence of PTSD. Unmeasured third variables could also account for the gratitude effects observed such as lifespan adversity and trauma, socioeconomic factors, and other comorbid conditions including depression and substance abuse. To rule out such confounds, samples that are similar with regard to these variables would need to be obtained or better yet gratitude might be manipulated and its effect on well-being measured in samples with and without PTSD. Furthermore, to understand whether gratitude promotes post-trauma resilience, gratitude would need to be assessed immediately after or even before the occurrence of trauma and the trajectories of gratitude and well-being traced over time. The second striking difference was that while the results for the two groups were relatively similar on the daily reports, there was a divergence in the results for the trait measures. The PTSD group displayed significantly less trait gratitude than the non-PTSD group. Plus, trait gratitude for the most part was a unique predictor of daily well-being in the PTSD group but it did not *uniquely* predict daily well-being in the non-PTSD group. If one applies the view that gratitude is equally accessible to those with and without psychopathology, this might suggest that the daily gratitude reports were veridical while that trait gratitude scores were not. If one applies the opposite view, the opposite conclusion might follow. Alternately, both the trait and daily accounts of gratitude may be veridical and there may be differential relationships between the disposition to gratitude, its actual exercise, and subsequent well-being in persons with and without psychopathology. Results indicated that the disposition towards gratitude was more closely related to the exercise of gratitude (i.e., as indexed by daily gratitude emotions) and experience of well-being in veterans with PTSD than veterans without PTSD. These open questions point to the fact that the present study was designed to be an initial examination of gratitude as a potential domain of resilience and that systematic replication is clearly necessary.

Some consideration should be given to our all male, older veteran sample. Prior work on attitudes about emotional experiences found that Americans view gratitude as less desirable and constructive than other positive emotions such as love, enthusiasm, hope, compassion, and pride (Sommers & Kosmitzki, 1988). Interestingly, compared to women, men evaluate gratitude as difficult to express, undesirable, and in some cases, humiliating. In fact, over 33% of older American men (aged 35–50) prefer to conceal the experience of gratitude as opposed to expressing it openly, whereas none of the women in the sample reported these difficulties or preferences (Sommers, 1984; Sommers & Kosmitzki, 1988). Despite this reluctance to admit gratitude, we found that male veterans reaped psychosocial benefits from experiencing/expressing gratitude. Given the above report of tendencies to hide and discount grateful feelings among American males, our findings on the positive influences of gratitude on well-being may be underestimates.

There are a number of other study limitations that should be noted including the small sample size and low statistical power, issues of generalizability, differential completion rates, questions regarding participant reading and comprehension abilities, and a lack of true random sampling. The small sample size did not compromise the evaluation of relations between gratitude and well-being because of the magnitude of gratitude effects. However, other

associations, which were not as strong, might not have been detected due to inadequate power. Some of the other concerns were partially addressed by our failure to detect differences between excluded and included participants on any variable. Concerns regarding unstructured clinical interviews to diagnose PTSD were addressed by using clinical cutoffs on the Mississippi PTSD Scale for combat-related PTSD (Keane et al., 1988) to supplement the interview-based diagnoses. Future studies might capitalize on the convergence of self-report instruments and *structured* clinical interviews. Generalizability to other trauma and age groups remains an empirical question given that participants in our study were all middle-aged and older Vietnam War veterans.

There are a number of strengths to the present study. Our use of a prospective, experience sampling design is a departure from much of the research on post-trauma experiences. Data collected at a single-time point via global self-report scales or on-site interviews invite problems related to autobiographical memory and recall biases. Studying veterans in their natural environment enhances ecological validity and the repeated completion of assessments across days increases the reliability of data collected. This daily process approach allowed us to approximate a random representation of veterans' ecological experiences by sampling a population of days from their lives. Furthermore, we used multilevel modeling techniques to provide more accurate parameter estimates, tests of significance, error modeling, and handling of missing data than ordinary least squares regression techniques. Our primary analyses conservatively controlled for the potential confounding effects of distress-related variables in an attempt to challenge the alternative hypothesis that the predictive power of positive traits such as gratitude is subsumed by variability in distress and impairment. These analyses also controlled for the possibility that gratitude effects were due to generally elevated positive emotions (i.e., trait PA).

As a preliminary investigation of gratitude in a veteran population, this research raises a number of additional questions for future study. What factors predispose veterans to more frequent and intense daily gratitude experiences? Can the induction of more frequent and intense gratitude experiences offer resilience against mental health problems and social difficulties in veterans? Further insight on the contribution of gratitude to well-being can be obtained by collecting data on peri- and post-trauma gratitude experiences. Additionally, there is merit in expanding beyond self-reports for more fine-tuned examinations of the "broadening" and "building" effects of gratitude. This includes information-processing tasks to examine the possible broadening of attentional resources and building of more positively valenced cognitive appraisals and self-regulatory strategies. The positively valenced external-focus associated with gratitude runs counter to the negatively valenced, excessively internal-focus that characterizes the majority of anxiety and mood disorders (Ingram, 1990). Changes in the valence, content, and direction of attentional focus associated with gratitude may serve to attenuate the pernicious effects of excessive anxiety (e.g., PTSD symptoms). Additionally, considering the risk for interpersonal functioning deficits in veterans, there might be utility in examining the effects of gratitude on social interactions. As posited by McCullough, Emmons, and their collaborators (e.g., McCullough et al., 2001), the positive experience of gratitude may reinforce both benefactor and recipient for engaging in prosocial, relationship building behaviors. Although preliminary, this research provides support for the importance of examining gratitude and hedonic and eudaimonic well-being in trauma survivors.

Acknowledgements

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