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Factor Structure and Concurrent Validity of the Posttraumatic Growth Inventory–Short Form Among Veterans From the Iraq War

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The Posttraumatic Growth Inventory is a frequently used self-report measure of posttraumatic growth. It was adapted recently to a short form with preliminary evidence in support of its psychometric properties. The current survey study replicates evidence for the short form's factor structure, internal consistency reliability, and concurrent validity among a sample of 327 National Guard soldiers deployed in support of military operations in Iraq, a population distinct from the original scale-development sample of undergraduates. Findings provide evidence for satisfactory reliability, replicable factor structure (i.e., the same 5-factor structure as the original measure), and support for concurrent validity (i.e., relations with theoretically related constructs). Further research should address validity of the scale among more ethnically and racially heterogeneous samples.

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Over the past two decades, systematic research has increasingly focused on posttraumatic growth as an aspect of reported positive posttrauma outcomes. Posttraumatic growth and other nonpathological posttrauma outcomes (e.g., resilience), allow a consideration of the wide range of responses that individuals demonstrate in the face of traumatic events, ranging from extreme distress and pathology to positive functioning and even, in the case of posttraumatic growth, to positive change (e.g., Bonanno, 2004; Pietrzak et al., 2010). This attention has led to the development of multiple measures intended to tap the relevant domains of positive posttrauma life change, among them the Stress-Related Growth Scale (Park, Cohen, & Murch, 1996), the Perceived Benefits Scale (McMillen & Fisher, 1998), and the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996).

The PTGI (Tedeschi & Calhoun, 1996), the most frequently used measure in the posttraumatic growth literature (Joseph & Linley, 2008), assesses perceived positive changes in domains including Relating to Others, Personal Strength, New Possibilities, Appreciation of Life, and Spiritual Change after a stressful event. The scale consists of 21 items rated on a 6-point Likert scale anchored by *I did not experience this change as a result of my crisis*,

and *I experienced this change to a very great degree as a result of my crisis*. Existing findings support factorial stability (Linley, Andrews, & Joseph, 2007; Taku, Cann, Calhoun, & Tedeschi, 2008), high internal consistency reliabilities for the total scale and subscales, and evidence for convergent and discriminant validity (Weinrib, Rothrock, Johnsen, & Lutgendorf, 2006). Recently, the PTGI was adapted to a short form (Cann et al., 2009) with preliminary evidence for reliability and validity.

The 10-item Posttraumatic Growth Inventory–Short Form (PTGI-SF; Cann et al., 2009) assesses the same five domains as the Posttraumatic Growth Inventory. Previous confirmatory factor analyses on the PTGI supported a 5-factor structure reflecting the subscales of the measure (e.g., Taku et al., 2008—a mixed trauma sample), and a confirmatory factor analysis conducted on the PTGI-SF among a sample of undergraduates reporting a variety of traumatic events replicated this result (Cann et al., 2009). Cann and colleagues also found that the short form reproduced relations between posttraumatic growth and variables of interest among samples of bereaved parents, survivors of intimate partner violence, and individuals diagnosed with acute leukemia who had completed the full PTGI—using only the PTGI-SF items. The PTGI-SF also produced a total-scale internal consistency coefficient of .89.

Each of the factors from the PTGI is represented by two items on the PTGI-SF. Authors of the PTGI-SF encourage the computation of a total score rather than scoring the five 2-item subscales separately to represent a more global sense of participants' posttraumatic growth and to ensure greater reliability (i.e., Cann and colleagues found a total scale α of .89 and short-form subscale α coefficients ranging from .72 to .84). Although preliminary evidence from the scale development studies suggests the PTGI-SF replicates the strong psychometric qualities of the PTGI, many of the data for these analyses were gathered among undergraduates. Thus, we assessed the psychometric properties of the PTGI-SF among a sample of National Guard soldiers following a 16-month combat deployment to Iraq in support of Operation Iraqi Freedom (OIF).

With the exception of studies examining prisoners of war (POWs), relatively few published studies have explored posttraumatic growth among soldier samples using standardized, quantitative measures of posttraumatic growth. One cross-sectional survey study conducted among 61 Gulf War veterans (Maguen, Vogt, King, King, & Litz, 2006) sought to identify correlates of posttraumatic growth from the Deployment Risk and Resilience Inventory (King, King, & Vogt, 2003). Among scales assessing for predeployment stressors, combat exposure, perceived threat, unit social support, and postdeployment social support, only postdeployment social support was found to relate significantly, positively, and uniquely with the PTGI total score in a regression analysis. In regression analyses of the subscales, findings suggested postdeployment social support was related to the Personal Strength and Relating to Others subscales. Notably, findings did not suggest that unit social support (i.e., social support by one's military unit while on deployment) was a significant predictor.

A second cross-sectional study (Pietrzak et al., 2010) examined posttraumatic growth among a cohort of 272 National Guard/Reservist veterans of Operation Enduring Freedom (OEF) and OIF following deployment. They used an abbreviated (6-item) form of the PTGI (not previously tested) to examine relations between posttraumatic growth and a variety of correlates. Findings included significant positive correlations between posttraumatic growth and posttraumatic stress disorder (PTSD; $r = .29$) and factors from Deployment Risk and Resilience Inventory subscales (King et al., 2003) tapping unit social support ($r = .29$) and postdeployment social support ($r = .26$), as well as a significant negative relation between posttraumatic growth and age ($r = -.26$). However, they noted that the significant relation between posttraumatic growth and PTSD has been inconsistent across studies, an observation also reflected in an existing review of the posttraumatic growth literature (Zoellner & Maercker, 2006). Because the study utilizes a short form of the PTGI and also factors of social support subscales—rather than the subscales in their entirety—without prior evidence for validity, results should be regarded tentatively. Nonetheless, the finding that posttraumatic growth relates to postdeployment social support replicates Maguen and colleagues' (2006) finding among Gulf War I veterans.

The lone extant meta-analysis investigating correlates of posttraumatic growth (Helgeson, Reynolds, & Tomich, 2006) examined results from 87 cross-sectional studies and found significant relations between self-reported posttraumatic growth and depression ($r = -.09$), subjective well-being ($r = .22$), and intrusive-avoidant thoughts about the traumatic event ($r = .18$). The last relation may seem somewhat counterintuitive; however, multiple scholars within the trauma literature (e.g., Calhoun, Cann, Tedeschi, & McMillan, 2005; Helgeson et al., 2006; Janoff-Bulman, 1992) have discussed intrusive and avoidant thinking as markers of cognitive processing, not simply as markers of distress. Thus, endorsement of intrusive thinking and avoidance symptoms may indicate that individuals are reflecting upon and working through the meaning of their traumas, which may also encourage posttraumatic growth. In contrast, studies have not consistently found a relationship between posttraumatic growth and overall severity of symptoms of PTSD (Zoellner & Maercker, 2006).

The current study seeks to examine evidence for the factor structure, concurrent validity, and internal consistency reliability of the PTGI-SF among a combat-exposed military sample. Hypotheses regarding concurrent validity were derived from the empirical literature on growth among combat-exposed military populations (Maguen et al., 2006; Pietrzak et al., 2010) and also from a meta-analytic review of the correlates of posttraumatic growth (Helgeson et al., 2006). Specifically, the present study sought to test whether the PTGI-SF replicates linear relations with relevant variables from the Maguen et al. (2006) and Pietrzak et al. (2010) studies (i.e., postdeployment social support and unit social support)

and the Helgeson et al. (2006) meta-analysis (i.e., depression, subjective well-being, reexperiencing, and avoidance symptoms). Consistent with the Cann et al. (2009) findings, we hypothesized that the PTGI-SF would replicate relations similar to those in previous studies. Specifically, we expected to find significant small-to-medium positive associations between posttraumatic growth and subjective well-being, intrusive trauma-related reexperiencing, avoidance symptoms, unit social support, and postdeployment social support as well as a significant, small negative association between growth and depression. These hypothesized effect sizes were consistent with the findings of the studies described above as interpreted in accord with Cohen's (1992) conventions of $r = .10$ as small, .30 as medium, and .50 as large.

METHOD

Participants and Procedure

Participants included 327 National Guard soldiers from a brigade combat team deployed to Iraq from March 2006 to July 2007 who were enrolled in a larger, prospective, predeployment–postdeployment study ($N = 522$) of risk and protective factors associated with postdeployment mental health (Polusny et al., in press). Study procedures were approved by the relevant institutional review boards and the National Guard command. All participants provided written informed consent prior to participating in the study. Postdeployment data reported here were collected at two separate time points using standard mailed survey methodology: 2–3 months following soldiers' return from Iraq (Time 1) and about 1 year later (Time 2). Survey measures tapped soldiers' demographics, current mental health, social role functioning, and well-being. Measures for each of the constructs of interest were chosen for having demonstrated evidence of their validity in soldier samples. Participants were compensated $50 for completion of each postdeployment survey.

In the larger prospective study, 424 soldiers responded to the Time 1 postdeployment survey (81% of the total prospective study sample) and 343 responded to the Time 2 postdeployment survey (66% of the total sample and 81% of the Time 1 sample). For the present study, only the 327 soldiers who completed both postdeployment time points were included in analyses. Participants were predominantly White ($n = 306$, 94%), male ($n = 288$, 88%), married at the time of the survey ($n = 172$, 53%), and ranged in age from 21 to 59 ($Mdn = 31$, $M = 33.13$, $SD = 8.80$). A minority of the participants ($n = 16$, 5%) reported more than one previous deployment to Iraq or Afghanistan. Participants' average length of deployment was 16.24 months ($SD = 2.78$). Responders at each time point did not differ from nonresponders on gender, $\chi^2(1, N = 424) = .15$, *ns*, ethnicity, $\chi^2(1, N = 424) = .21$, *ns*, or predeployment PTSD, $t(417) = -1.36$, *ns*, or depressive, $t(417) = -1.20$, *ns*, symptoms. In contrast, responders were a) older, $t(422) = 2.41$, $p = .02$; b) married, $\chi^2(1, N = 424) = 8.17$, $p = .004$; and c) of officer-level rank, $\chi^2(1, N = 424) = 4.49$, $p = .03$ than nonresponders. Additionally, Time 2 responders exhibited less PTSD symptomatology at Time 1 than did nonresponders (PTSD Checklist-Military [PCL-M] $M = 34.88$, $SD = 13.34$ for responders, $M = 38.28$, $SD = 15.68$ for nonresponders), $t(421) = -2.11$, $p = .04$, though the groups did not differ on depressive symptomatology at Time 1, $t(417) = -.47$, *ns*.

Using cutoffs for screening measures of PTSD and depression (described below), 12.1% of the current sample screened positive for presumed PTSD and 20.1% for presumed depression. This figure falls within the range of screening estimates among combat-exposed OIF soldiers following deployment observed in other studies with similar screening criteria (Hoge et al., 2004; Ramchand et al., 2010).

Time 1 Measures

Two subscales from the Deployment Risk and Resilience Inventory (King et al., 2003), the Combat Experiences and Perceived Threat subscales, were used to characterize participants' postdeployment reports of trauma exposure. More specifically, the Combat Experiences subscale assesses the frequency with which a participant encountered 15 combat events (e.g., "I received hostile incoming fire from small arms, artillery, rockets, mortars, or bombs"). Individuals rated each item on a 5-point scale of ranging from 1 (*never*) to 5 (*daily or almost daily*), present sample $\alpha = .84$. The Perceived Threat subscale consists of 15 items, which assess the degree to which participants felt they were endangered while deployed (e.g., "I felt that I was in great danger of being killed or wounded"). Participants rated each item on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), present sample $\alpha = .82$. Evidence for reliability, discriminant, and criterion-related validity has been found among OIF veterans on both subscales (Vogt, Proctor, King, King, & Vasterling, 2008).

The Deployment Social Support subscale from the Deployment Risk and Resilience Inventory was used to assess participants' subjective sense of received social support from the soldiers and leadership in their military units. The subscale consists of 12 items that participants rate on a 5-point likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), present sample $\alpha = .92$. Evidence for validity and reliability for the subscale has been shown in OIF veteran samples (Vogt et al., 2008).

Time 2 Measures

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996), a 21-item self-report questionnaire, was used to assess the presence and severity of symptoms of depression. The BDI-II is one of the most widely used scales for measuring depressive symptoms, and evidence for its internal consistency reliability and validity has been documented (e.g., Dozois, Dobson, & Ahnberg,

1998). The internal consistency of the scale was .93 in the current sample. Screening rates for moderate depressive symptoms were determined using a score of 20 or greater (Beck et al., 1996).

The PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report measure that was used to assess the severity of each of the 17 PTSD symptoms from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*; American Psychiatric Association, 1994) as they relate to a stressful military experience over the past month. The original scale development study was conducted on the PCL-S, a version of the scale written so items refer to a general "stressful experience." Whereas a version for military populations, the PCL-M (in which items refer to a "stressful military experience"), was used in this study. Evidence for the PCL-M's validity and reliability has been documented (e.g., Forbes, Creamer, & Biddle, 2001), and it can be summed for a total score or to tap clusters of symptoms (e.g., intrusive reexperiencing cognitions). The internal consistency coefficient for the reexperiencing subscale (five items) that was used in the current study was high ($\alpha = .90$). The internal consistency reliability for the avoidance cluster from the *DSM-IV* (seven items) was also high ($\alpha = .89$). The full-scale score, used to estimate probable PTSD rates within the sample was also found to be reliable ($\alpha = .95$). On the PCL-M, screening used to determine possible PTSD rates included a total score of 50, plus endorsement of moderate levels of at least one reexperiencing, three avoidance, and two hyperarousal symptoms (Hoge et al., 2008).

Six items from the Navy Quality of Life Survey (Wilcove, Schwerin, & Wolosin, 2003) were used to assess global subjective well-being across multiple domains (i.e., friendships, leisure, finances, family, primary relationship, and relationships with children). Respondents rate their overall satisfaction in each of the domains assessed on a 7-point Likert scale ranging from "*completely satisfied*" to "*completely dissatisfied*." For those who do not have children or a primary romantic relationship, the response scale for these items also contains a "*does not apply*" response option. For the current study, a mean score for these six items (or fewer for those without children and/or relationships) was calculated across domains with high scores indicating greater satisfaction. The internal consistency for the items in this sample was satisfactory ($\alpha = .82$).

The format of the PTGI-SF (Cann et al., 2009) is described above. Participants responded to an opening query that read "As a result of my military deployment to Iraq (2006–2007), I experienced this change to the following degree" on a 6-point Likert scale ranging from 0 (*did not experience this change*) to 5 (*a very great degree*). High scores reflect reports of greater positive change. The total score had high internal consistency reliability ($\alpha = .90$). Internal consistency coefficients were calculated for each factor of the PTGI-SF. Cronbach's α for each of the 2-item subscales were as follows: Relating to Others = .72, New Possibilities = .76, Personal Strength = .82, Spiritual Change = .89, and Appreciation of Life = .69.

The subscale of the Deployment Risk and Resilience Inventory tapping postdeployment social support solicits a response ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) for each of 15 items describing ways in which a soldier may have received support after returning from Iraq (e.g., "When I returned, people made me feel proud to have served my country in the armed forces"). Evidence for the subscale's validity and reliability has been found in military populations (Fikretoglu, Brunet, Poundja, Guay, & Pedlar, 2006), and the scale was used in the study of posttraumatic growth in Gulf War veterans reviewed above (Maguen et al., 2006), present study $\alpha = .88$.

Data Analysis

Confirmatory factor analyses were conducted using MPlus 5.21 (Muthen & Muthen, 2007). For each, items were modeled as ordered-categorical (i.e., ordinal) indicators and robust weighted least squares (RWLS) estimation was used. The models tested included a 1-factor model (Model A), in which all items loaded on one factor; a model with five correlated factors reflecting the subscales measured by the original PTGI (Model B); and a second-order model in which items loaded directly on the same five factors and those factors loaded on one higher-order factor (Model C). Error covariances for the items were constrained to zero for each model. These models are analogous to those supported in previous confirmatory factor analyses of the PTGI (Linley et al., 2007; Taku et al, 2008) and those inspected in the PTGI-SF development article (Cann et al., 2009). Bivariate correlations between PTGI-SF scores and demographic variables and depression, subjective well-being, reexperiencing symptoms, and social support were computed to examine concurrent validity.

RESULTS

The data for all of the variables were approximately normally distributed, although the BDI-II and Deployment Risk and Resilience Inventory Combat Experiences measures were very slightly positively skewed. Potential ranges, means, and standard deviations for each of the variables are in Table 1.

Additional analyses were conducted to examine relations between posttraumatic growth and demographic variables. Posttraumatic growth was unrelated to age ($r = -.08$, *ns*). There was also no significant difference on level of growth between married and unmarried soldiers. Though women reported marginally more growth than men, women $M = 23.70$, $SD = 8.90$; men $M = 19.95$, $SD = 12.17$, this difference was not significant, $t(323) = 1.85$, *ns*. White soldiers reported significantly less growth ($M = 19.91$, $SD = 11.73$) than soldiers who identified as multiracial, African American, Hispanic American, Native American, or Asian American, $M = 27.57$, $SD = 11.91$, $t(323) = 2.89$, $p = .004$.

Fit indices for the 3-item factor models are reported in Table 3. For Models B (five correlated factors) and C (single second-order,

Table 1. Potential Ranges, Observed Means, and Standard Deviations for Variables Included in Analyses

Time	Variable	Min–Max	*M*	*SD*
1	Combat Experiences	16–80	28.03	7.62
	Perceived Threat	15–75	44.04	9.48
	Unit Social Support	12–60	38.99	11.38
2	Depression (BDI-II)	0–63	11.08	9.36
	PTSD symptoms (PCL-M)	17–85	35.59	14.71
	Reexperiencing (PCL-M subscale)	5–25	9.94	4.54
	Avoidance (PCL-M subscale)	7–35	13.71	6.21
	Subjective Well-Being (NQOLS)	1–7	5.12	1.03
	PTGI-SF	0–50	20.40	11.88
	Postdeployment social support	15–75	57.55	9.51

Note. $N = 327$; Min = Minimum value of scale; Max = Maximum value of scale; PTSD = posttraumatic stress disorder; PTGI-SF = Posttraumatic Growth Inventory–Short Form; PCL-M = Posttraumatic Stress Disorder Checklist; BDI-II = Beck Depression Inventory – II; NQOLS = Navy Quality of Life Survey.

five first-order factors), which showed greater evidence of model fit, individual item-factor loadings ranged from .67 to .97. In Model B, correlations among the five factors (ψ-coefficients) ranged from .56 to .91 (see Table 2) . In Model C, first-order factor loadings on the second-order factor ranged from .71 to .98.

Table 2. Five-Factor PTGI-SF Factor Loadings, Variances, Covariances, and Correlations

Item #	AL	NP	SC	RO	PS
1	.67	-	-	-	-
2	.87	-	-	-	-
3	-	.83	-	-	-
6	-	.80	-	-	-
4	-	-	.97	-	-
8	-	-	.89	-	-
5	-	-	-	.81	-
10	-	-	-	.78	-
7	-	-	-	-	.85
9	-	-	-	-	.90
AL	**.45**	.87	.56	.73	.77
NP	.49	**.70**	.66	.91	.90
SC	.36	.53	**.94**	.77	.60
RO	.40	.62	.61	**.67**	.87
PS	.44	.64	.49	.60	**.72**

Note. $N = 327$. AL = Appreciation of Life; NP = New Possibilities; SC = Spiritual Change; RO = Relating to Others; PS = Personal Strength. Factor loadings are displayed in the upper two thirds of the table; factor variances are bolded on the diagonal of the lower third of the table; factor covariances are under the diagonal in the lower third of the table; and factor correlations are above the diagonal in the lower third of the table.

Table 3. Fit Indices for Item-Level Confirmatory Factor Analyses of the PTGI-SF

Model	χ^2	*df*	CFI	TLI	RMSEA	WRMR
A	363.42*	15	.86	.92	.26	2.02
B	58.18*	15	.98	.99	.09	0.58
C	90.66*	17	.98	.99	.11	0.80

Note. $N = 327$. PTGI-SF = Posttraumatic Growth Inventory–Short Form. Model A = single-factor model; Model B = 5-correlated-factor model; Model C = 5 first-order and 1 higher-order factor model; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean squared error of approximation; WRMR = weighted root mean squared residual.
* $p < .05$.

Findings on concurrent validity included bivariate correlations between the PTGI-SF total score and the BDI-II ($r = -.01$, *ns*), the Navy Quality of Life Survey overall score ($r = .21$, $p < .001$), the PCL Reexperiencing Symptoms subscale ($r = .12$, $p = .03$), the PCL Avoidance Symptoms subscale ($r = .04$, *ns*), the Deployment Risk and Resilience Inventory Postdeployment Social Support subscale ($r = .22$, $p < .001$), and the Deployment Risk and Resilience Inventory Unit Social Support subscale ($r = .09$, *ns*). A full matrix of bivariate correlations for each of the variables included in the study can be found in Table 4.

DISCUSSION

These findings replicate and extend evidence supporting the reliability, factor structure, and concurrent validity of the PTGI-SF. Internal consistency for the measure was high. Factor structures reflecting the 5-factor measurement model of the PTGI (Models B and C) received strong support for fitting the data. Each of these two models produced parameter estimates reflecting the proposed measurement model including high item-factor loadings and parameter estimates showing that the five factors were highly related (either through large interfactor correlations or through large loadings on a higher-order factor). Although none of the models produced fit indices unanimously supportive of fit, Models B and C produced results supportive of fit on most of the indices; that is, whereas the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Weighted Root Mean Square Residual (WRMR) fell within ranges indicating satisfactory fit, χ^2 was significant and root mean square error of approximation (RMSEA) values exceeded .08 for both, the upper limit of the range indicating adequate fit (Browne & Cudeck, 1992). Overall, Model B, the 5-correlated-factor model, showed superior fit to Model A and marginally superior fit to Model C on the RMSEA and WRMR. Although no strong consensus yet exists regarding the best fit indices for confirmatory factor analyses performed on ordinal data using polycoric correlations and RWLS estimation, the lone

Table 4. Bivariate Correlations Between Variables Included in Analyses

	1	2	3	4	5	6	7	8	9
1. PTGI-SF									
2. CE	.06								
3. PT	.11	.35							
4. USS	.09	.18	−.11						
5. PCL-M	.08	.34	.37	−.10					
6. PCL-M R	.12	.35	.37	−.08	.90				
7. PCL-M A	.04	.28	.33	−.14	.94	.75			
8. BDI-II	−.01	.20	.29	−.15	.80	.62	.84		
9. PDSS	.22	−.09	−.21	.29	−.48	−.38	−.52	−.45	
10. NQOLS	.21	−.06	−.19	.21	−.43	−.29	−.50	−.56	.48

Note. $N = 327$. PTGI-SF = Posttraumatic Growth Inventory–Short Form; CE = Combat Experiences; PT = perceived threat; USS = unit social support; PCL-M = PTSD Checklist-Military; PCL-M R = PCL Reexperiencing subscale; PCL-M A = PCL Avoidance subscale; BDI-II = Beck Depression Inventory – II; PDSS = postdeployment social support; NQOLS = Navy Quality of Life Survey. For $|r| = .11$, $p = .05$. For $|r| = .14$, $p = .01$. For $|r| = .19$, $p = .001$.

simulation study suggests that the CFI is the most reliable in characterizing fit of the model if it equals or exceeds a value of .96 (Yu, 2002). Both Models B and C achieved high levels of fit according to this index as well as the TLI and WRMR. This finding is consistent with previous confirmatory factor analyses of the full PTGI (Linley et al., 2007; Taku et al., 2008) as well as the scale development study (Cann et al., 2009).

Additionally, the interfactor correlations on Model B were large and the internal consistency reliability coefficient for the total score was high; this inspires confidence that a single full-scale score can reasonably be calculated to represent an overall posttraumatic growth score. At first glance, the finding that the Model B factor structure has marginally stronger fit than Model C might suggest that a total score for the scale should not be computed and instead that subscale scores for the 2-item factors should be. In differentiating between these two models, it bears mention that the hypothesized covariance matrices for both models (which are tested against observed covariance matrices among the items to produce fit statistics) would be very similar to one another. Furthermore, we believe that the high total-scale internal consistency reliability as contrasted with reliabilities for the 2-item clusters (some of which are lower than desirable) reinforces Cann and colleagues' (2009) view that computation of a total-scale score is more psychometrically appropriate in using the PTGI-SF.

As evidence of concurrent validity, the PTGI-SF total score correlated as hypothesized with reexperiencing PTSD symptoms, overall subjective well-being, and postdeployment social support. The lack of support for the hypothesized relation between the PTGI-SF and depression might be because soldiers' combat exposure occurred 1.5 years prior to their participation in this study; however, the meta-analysis (Helgeson et al., 2006) suggested an increase in the magnitude of the relation between depression and posttraumatic growth over time (i.e., the relation becomes more strongly negative over time). This finding might also signify that some soldiers experiencing posttraumatic growth have completed processing of their traumas and are less distressed while others exhibiting posttraumatic growth might still be processing and be substantially distressed—masking the overall relation. Nonetheless, the absence of a significant relation inspires confidence that the PTGI-SF does not merely tap a lack of distress. Although it is unclear why exactly the null finding occurred, the same has been found in other studies (e.g., Weinrib et al., 2006). Further, findings did not replicate the significant relation between posttraumatic growth and unit social support found in Pietrzak et al.'s (2010) study; however, Pietrzak and colleagues' study is the only one to report that relation and it utilized an untested short form of the PTGI to assess posttraumatic growth. Last, unlike reexperiencing symptoms, avoidance symptoms did not correlate with posttraumatic growth in our sample. Helgeson et al. (2006) merged reexperiencing and avoidance symptoms in their meta-analysis because many of the studies included in their meta-analysis offered findings solely on a composite assessment of these symptoms (e.g., a total score across subscales) rather than separating the constructs. It may be that reexperiencing symptoms account for much of the relation reported in their meta-analysis. Thus, the short scale replicated half of the proposed relations in total and three of five hypothesized concurrent relations (unit social support was only measured at Time 1 and posttraumatic growth at Time 2).

Findings on demographic differences, namely that both gender and race contrasts on reported posttraumatic growth were significant or trending significant replicate previous findings (Helgeson et al., 2006; Vishnevsky, Cann, Calhoun, Tedeschi, & Demakis, 2010)—that women tend to report greater posttraumatic growth than men and that those identifying as racial-ethnic minorities also tend to report greater posttraumatic growth than White people. However, given that the vast majority of our sample consisted

of White men, we hesitate to consider these particular findings strong evidence for validity. Overall, our tests supported three of five hypothesized concurrent relations (i.e., relations between posttraumatic growth and subjective well-being, reexperiencing symptoms of PTSD, and postdeployment social support) and supplement evidence for validity. Certainly, evidence on any measure's validity should be considered as contributing to confidence in that measure among a specific population or populations rather than a pronouncement of the measure as valid per se.

Though our focus has been primarily upon measurement issues as related to the PTGI-SF and less so on theory testing, it bears mention that these concurrent validity findings generally accord with theory on posttraumatic growth. For example, intrusive thoughts and ruminative cognitive processing play a prominent role in Calhoun, Cann, and Tedeschi's (2010) comprehensive model of posttraumatic growth and Joseph and Linley's (2005) theory of growth through adversity. Additionally, these specifically relate posttraumatic growth to subjective well-being and a supportive social environment in facilitating these processes.

As a matter for future consideration, questions remain about the degree to which self-reports of posttraumatic growth represent actual change. Findings on the validity of self-reports of growth have been mixed (e.g., Frazier & Kaler, 2006; Weinrib et al., 2006). Whereas some evidence suggests that self-reports of growth may be more related to styles of coping than pre-to-post-trauma changes (Frazier et al., 2009), others have leveled significant methodological concerns over the strength of this evidence, critiquing sample characteristics, study design, and operationalizations of "actual," versus perceived growth (Aspinwall & Tedeschi, 2010). In any case, posttraumatic growth shows significant and substantial relations with a number of important outcomes. Thus, it remains a variable of interest.

Several limitations to the study and the measure bear mention. First, although response rates for the sample were generally high—usually at least 80% of each wave's respondents completed the subsequent survey—it is impossible for us to determine whether posttraumatic growth relates to attrition (e.g., whether those exhibiting more growth were more likely to complete the survey) because the PTGI-SF was administered at only one time point. Thus, the potential for sampling bias must be considered with our results. Second, all of the data we considered here was self-report survey data; observable indicators of growth would have provided stronger evidence of criterion-related validity. Last, the present sample, although quite different from the sample of undergraduates used to develop the PTGI-SF, was comprised predominantly of White men.

More evidence on the nature of self-reported growth and the variables to which it relates should be sought—ideally in the context of a large prospective study of trauma among a diverse adult sample. Research on the scale's validity among more racially and ethnically heterogeneous samples is particularly imperative. More data concerning the scale with treatment-seeking populations would also be useful in considering the question of using posttraumatic growth measures in diagnostic and therapeutic settings; this would interface usefully with efforts toward clinical applications of posttraumatic growth (e.g., Calhoun & Tedeschi, 1999). In addition, continued study of posttraumatic growth among military samples will be important because this population is at high risk for trauma exposure as an occupational hazard.

As a whole, our findings support the psychometric properties of the Posttraumatic Growth Inventory–Short Form. A strength of the current study is that it assesses the psychometric properties of the measure in a population distinct from the original scale-development sample, one that has presumably experienced higher levels of trauma exposure. This suggests that, across different populations, the short form offers the benefits of a more succinct measure that allows for quick administration when brevity is of the essence (e.g., military combat operations) without major sacrifices to the psychometric quality of the original Posttraumatic Growth Inventory.

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