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The Factor Structure of the Posttraumatic Growth Inventory: A Comparison of Five Models Using Confirmatory Factor Analysis

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There are different views about the dimensions of the positive changes resulting from the struggle with traumatic events. Using Posttraumatic Growth Inventory (PTGI) data reported by participants (N = 926) experiencing a variety of traumatic events, five models of the underlying structure of the PTGI were tested via confirmatory factor analyses to examine whether the PTGI comprises three domains (Changed Perception of Self, Changed Interpersonal Relationships, and Changed Philosophy of Life), five factors (Relating to Others, New Possibilities, Personal Strength, Spiritual Change, and Appreciation of Life), or a unitary dimension. Results indicated an oblique 5-factor model best fit the data, thus revealing the PTGI was multidimensional. Present findings offer implications for understanding the nature of posttraumatic growth.

As the systematic investigation of the personal growth that may occur as a result of the struggle with traumatic events has been conducted theoretically and empirically, a number of scales have been developed (Linley & Joseph, 2004; Park & Lechner, 2006; Tedeschi & Calhoun, 2004). The standardized measure most commonly used to assess personal growth following traumatic events is the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). The PTGI aims to capture the construct of posttraumatic growth (PTG), which has been defined as positive psychological changes experienced as the result of the struggle with major life crises or traumatic events (Calhoun & Tedeschi, 1999). Although the positive changes following trauma have been observed in a variety of distinct domains, it has still been open to debate whether the construct may be best understood as existing as a unitary dimension, as made up of multiple distinct factors, or as comprised of a few higher-order factors (Joseph & Linley, 2006; Park & Helgeson, 2006), and even whether separate dimensions of growth are meaningful (Park, 2004).

Three broad dimensions of personal growth have been discussed as the possible common elements of PTG (Schaefer & Moos, 1992; Tedeschi & Calhoun, 1995). These are changes in perception of self, changes in interpersonal relationships, and changes in philosophy of life (Calhoun & Tedeschi, 1999). First, changes in perception of self include a greater sense of personal strength, resiliency or self-reliance, coupled with developing a new path or opportunities. Second, changes in interpersonal relationships cover increased compassion or altruism, or a greater sense of closeness in relationships. Third, changes in philosophy of life involve a greater appreciation for each day, and may include possible changes in religious or spiritual/existential beliefs. These three dimensions have been observed in a questionnaire evaluated using exploratory factor analysis (e.g., Joseph, Linley, & Harris, 2005), in an interview method (e.g., Salter & Stallard, 2004), and with the translated version of the PTGI in Bosnian (Powell, Rosner, Butollo, Tedeschi, & Calhoun, 2003) and in Spanish (Weiss & Berger, 2006).

On the other hand, these three dimensions also have been found as more discrete factors at lower levels of analysis. The five subscales of the PTGI (Tedeschi & Calhoun, 1996): Relating to Others, New Possibilities, Personal Strength, Spiritual Change, and Appreciation of Life have been reported in several studies (e.g., Aldwin & Levenson, 2004; Fischer, 2006; Morris, Shakespeare-Finch, Rieck, & Newbery, 2005; Weiss, 2004). As different characteristics of the five subscales of the PTGI have been reported (e.g., Stanton, Bower, & Low, 2006), the idea that these five subscales of the PTGI may reflect different underlying psychological processes and that they are worth distinguishing has been indicated (Janoff-Bulman, 2004; McMillen, 2004).

However, because these five subscales have been found to be consistently correlated (Cobb, Tedeschi, Calhoun, & Cann, 2006;

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Sheikh & Marotta, 2005; Tedeschi & Calhoun, 1996), it would appear that PTG could also be meaningfully understood as comprising one underlying general factor. Partly because of the intercorrelations among the factors, many studies using the PTGI have looked only at the total score of the PTGI (e.g., Helgeson, Reynolds, & Tomich, 2006; Manne et al., 2004; Sheikh, 2004; Widows, Jacobsen, Booth-Jones, & Fields, 2005). There are other studies that have used a single second-order factor, while also keeping the five subscales as the first-order factors (e.g., Cadell, Regehr, & Hemsworth, 2003). Because the second-order models are potentially applicable when the lower-order factors are substantially correlated with each other, and there is a higher-order factor that is hypothesized to account for the relations among the lower-order factors (Chen, Sousa, & West, 2005), they may apply to the PTG construct. To date, there have been few reports of the factor structure of the PTGI, including a higher-order factor, and also examining the underlying structure by confirmatory factor analysis (CFA), and none with a large enough data set to provide a reliable assessment. Such an evaluation has been called for and is clearly needed (Morris et al., 2005). Exploring the factor structure of the PTGI using a confirmatory approach represents an advance in understanding the construct of PTG and evaluating the construct validity of the PTGI.

From the extant literature, five possible models have been identified. Therefore, the present analyses test the five hypothesized models of the PTGI via CFA to reveal the best underlying factor structure for the PTGI. The first model specified a single general factor underlying the PTGI items, suggested by the high internal consistency for the whole scale (Sears, Stanton, & Danoff-Burg, 2003; Sheikh & Marotta, 2005) and the finding that posttraumatic growth could be understood as a unitary dimension (Park, Cohen, & Murch, 1996). This Model 1 assumed that the 21 items that make up the PTGI were associated with a general PTG factor. Model 2 specified three broad intercorrelated PTG factors (changes in perception of self, changes in interpersonal relationships, and changes in philosophy of life), as has been suggested theoretically (Schaefer & Moos, 1992; Tedeschi & Calhoun, 1995) and identified statistically (Joseph et al., 2005). Model 3 hypothesized an oblique 5-factor model (Relating to Others, New Possibilities, Personal Strength, Spiritual Change, and Appreciation of Life). Although the initial development of the PTGI was performed with a principal component analysis with Varimax rotation (orthogonal model; Tedeschi & Calhoun, 1996), few studies have tried to make the case that the five factors are uncorrelated. Therefore, Model 3 hypothesized an intercorrelated 5-factor model, being led by the findings of reliable correlations among five factors of the PTGI (e.g., Cobb et al., 2006; Sheikh & Marotta, 2005).

Model 4 and Model 5 tested higher-order models to examine whether the above-mentioned three or five seemingly distinct, but related constructs, could be accounted for by one common underlying higher-order construct. Specifically, Model 4 depicted three first-order factors with a single second-order factor, as suggested by Joseph et al. (2005). If the measurement was unidimensional, then the higher-order factor should explain the correlation between the lower order factors or the lower-order factors could be measures of a higher-order construct (Rubio, Berg-Weger, & Tebb, 2001). However, because the 3-factor intercorrelations are simply replaced by three higher-order paths, Model 4 should result in the same chi-square value with the same degrees of freedom and the same goodness-of-fit indices as Model 2. Finally, Model 5 hypothesized five first-order factors with a single second-order factor, consistent with the analyses of Cadell et al. (2003). As distinct from the relationship between Model 2 and Model 4, Model 5 has more than four latent variables; thus, Model 5 should have a different chi-square value with different degrees of freedom than Model 3. If the PTGI is multidimensional, consistent with the theoretical basis of the PTGI (Tedeschi & Calhoun, 1995), then Model 3 should show better fit to the data than Model 5. Thus, the purpose of this study was to examine whether the PTGI factors are correlated due to a higher-order factor or whether the correlation between factors of the PTGI could be a result of the factors measuring different dimensions of a PTG construct.

METHOD

Participants

The sample consisted of 926 adults (681 women, 242 men, 3 did not report gender) from 14 studies conducted with a variety of samples. Ages ranged from 17 to 85 years ($M = 30.7$, $SD = 15.4$), and the breakdown of participants' ages was 17–20 (39.2%), 21–30 (23.9%), 31–40 (13.7%), 40–50 (9.1%), 51–60 (7.9%), 61–70 (3.6%), and 71–85 (2.6%). The race of participants was 666 Caucasian, 112 African American, 24 Asian, 16 Latino, 34 Other, and 74 not reported. The marital status was 551 single, 241 married, 71 divorced or separated, 13 widowed, and 50 not reported. The types of highly stressful events experienced were mixed events not specified (14.4%), September 11th events (10.9%), death of a family member or a close friend (20.8%), serious medical problems (14.9%), abuse/assault (7.8%), relationship disruption (11.3%), school-related (7.5%), and others with low frequencies (12.4%). Participants reported these events occurred less than 6 months before in 32.9% of the cases, between 7 and 12 months before in 15.3%, between 13 and 24 months before in 19.8%, between 2 and 4 years before in 18.4%, more than 4 years before in 6.1%, and 7.6% not reported. The present data set was created as part of an ongoing research project evaluating patterns in PTG. Each study had addressed additional research questions that were separate and distinct from the current questions about the properties of the PTGI.

Measures

The Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996) is a 21-item scale that measures the degree of the positive changes experienced in the aftermath of a traumatic event. The PTGI consists of five subscales: Relating to Others (seven items), New Possibilities (five items), Personal Strength (four items), Spiritual Change (two items), and Appreciation of Life (three items). Internal consistency for the total score and subscales of the PTGI has been reported as satisfactory (α coefficient for the total scale = .90, Relating to Others = .85, New Possibilities = .84, Personal Strength = .72, Spiritual Change = .85, and Appreciation of Life = .67), and the test–retest reliability (.71) over 2 months has also been reported based on the sample of university students in the original study. In addition, the concurrent, discriminant, and construct validity of the PTGI were examined by assessing the correlations among the PTGI, social desirability, and personality variables, and by comparing those who had experienced severe trauma and those who had not (Tedeschi & Calhoun, 1996). Each item is rated using a 6-point Likert scale, with values ranging from 0 (*I did not experience this change as a result of my crisis*) to 5 (*I experienced this change to a very great degree as a result of my crisis*). The possible total scores can therefore range from 0 to 105. Based on the theoretical suggestions by Calhoun and Tedeschi (2006), the three dimensions were calculated by summing the following numbers of items: Changes in Perception of Self (nine items from both Personal Strength and New Possibilities), Changes in Interpersonal Relationships (seven items from relating to others), and Changes in Philosophy of Life (five items from both Spiritual Change and Appreciation of Life).

All participants in the 16 studies completed a demographic questionnaire to provide basic descriptive statistics, such as gender, age, race, and marital status. All participants completed the measures anonymously.

Data Analysis

To compare the five alternative hypothesized models, confirmatory factor analyses (CFA) using the AMOS 4.01 statistical package (Arbuckle, 1994–1999) were conducted. The covariance matrix of the items was subject to the maximum-likelihood (ML) estimation. ML is the most popular normal theory estimator (DiStefano, 2002). Although the data could be considered ordinal (0–5), they were treated as interval data for ML. In each model, it was expected that each observable variable would load only on the factor it was intended to measure and would not load on the other factors; that measurement error associated with these variables would be uncorrelated, and that all covariance between each of the first-order factors would be explained by a higher-order factor, which we term general PTG. Although there are two approaches that are typically used to identify the models of CFA (Chen et al., 2005), we used the marker variable strategy, which fixes one of the factor loadings to a value of 1 for each factor. To decrease the likelihood of a Type I error and prevent the probability of the trivial findings being influenced by chance, model modification based on the modification indices was not adopted in the current analyses.[1] In comparing the fit of the five hypothesized models, we first used the chi-square statistic to assess the overall fit of the model; however, it is sensitive to the sample size and may be unreliable given the current large sample, and alternative methods are usually recommended where sample size exceeds 150–200 (Smyth & MacLachlan, 2005). Therefore, as suggested by Hu and Bentler (1999), we employed a combination approach to evaluate model fit, including two baseline close-fit indices: the maximum-likelihood based standardized root mean squared residual (SRMR) and the root mean square error of approximation (RMSEA), and two incremental close-fit indices: comparative fit index (CFI) and Tucker-Lewis index (TLI). As for the baseline fit indices, the SRMR values of .08 or less and the RMSEA values of .06 or less are generally taken to indicate reasonable model fit (Hu & Bentler, 1999; Thompson, 2004). The incremental fit indices (CFI and TLI) with .95 or greater indicate acceptable fit (Hu & Bentler, 1999; Schreiber, Stage, King, Nora, & Barlow, 2006). Finally, the descriptive statistics and Cronbach's alpha coefficients for each of the PTGI factors were obtained. All analyses were performed using either SPSS (version 13.0 for Windows) or AMOS (version 4.01 for Windows).

RESULTS

To evaluate the factor structure of the PTGI, the five models were tested using CFA. The models were as follows: (a) single factor, (b) three broad dimensional factors, (c) five factors based on the subscales, (d) three dimensional factors with a single higher-order factor, and (e) five factors with a single higher-order factor. The data were screened for errors and there were no missing data for any of the items of the PTGI. Univariate statistics for the 21 items of the PTGI revealed no substantial skewness problems at the level of the individual items (ranging from −.50 to .33). Due to the limited number of options available on the 6-point scales, moderate deviations on kurtosis were evident (ranging from −1.48 to −.87), but these should not affect the outcomes because the deviations of kurtosis have little effect with samples of 250 or more (Tabachnick & Fidell, 2007; Waternaux, 1976) and standard errors decrease at larger sample sizes (Lei & Lomax, 2005). Overall, the data in the present study appeared to be appropriate for the planned analyses; therefore, the hypothesized models were estimated with maximum likelihood estimation.

[1] The largest modification index values in Model 5 are found in the following pairs of residual covariances. That is, the covariance of e5 ("I have a better understanding of spiritual matters") with e12 ("I am better able to accept the way things work out") is expected to be .451 if we were to respecify the model with that covariance added and then refit the model. However, any path of covariance between error terms based on the modification indices was not added in the current analyses.

Table 1. Fit Indices for the Five Hypothesized Models

Model	Description	χ^2	*df*	CFI	TLI	RMSEA	CI	SRMR
1	1 Factor	2071.18***	189	.939	.925	.104	.100–.108	.065
2	3 Factors	1334.79***	186	.963	.954	.082	.078–.086	.051
3	5 Factors	962.53***	179	.975	.967	.069	.065–.073	.045
4	3 Factors with 1 higher-order factor	1334.79***	186	.963	.954	.082	.078–.086	.051
5	5 Factors with 1 higher-order factor	1045.70***	184	.972	.965	.071	.067–.075	.050

Note. CFI = Comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; CI = 90% confidence interval; SRMR = standardized root mean squared residual.
*** $p < .001$.

Table 1 reports the fit indices for the five models. As expected, due to the large sample, the results using the chi-square statistic showed all of the hypothesized models should be rejected. Both the baseline fit indices (SRMR and RMSEA) and the incremental close-fit indices (CFI and TLI) revealed that Model 1, the one-factor model, was a poor fit to the data. Although the analyses revealed a good fit for Model 2 or Model 4, yielding .95 or greater for CFI and TLI, Model 3 (oblique 5-factor model) was considered to provide the best fit to the data among the hypothesized five models, $\chi^2(179) = 962.53$, CFI = .975, TLI = .967, SRMR = .045 and RMSEA = .069. Table 2 gives an overview of the parameters of Model 3 (oblique 5-factor model), including the standardized regression weights and correlations among factors, as well as the descriptive statistics for each of the 21 items of the PTGI. Model 3 showed that the standardized regression weights from each latent construct to the 21 observed variables ranged from .58 to .84. The correlations between the five factors were all significant (*r*s ranged from .56 to .85).

Alternatively, Model 5 (five factors with a single higher-order factor) also showed a good fit to the data, $\chi^2(184) = 1045.70$, CFI = .972, TLI = .965, SRMR = .050, and RMSEA = .071, showing that all five factors appeared to tap a common underlying construct of PTG. When a higher-order construct of PTG was allowed to explain the intercorrelations of the five factors, Relating to Others loaded at .846, New Possibilities loaded at .877, Personal Strength loaded at .887, Spiritual Change loaded at .724, and Appreciation of Life at .884, on the higher-order construct. As can be seen in Table 1, Model 5 provided a poorer fit to the data than Model 3, $\Delta\chi^2(5) = 83.17$, $p < .001$, but not a bad fit according to the cutoff criteria (Hu & Bentler, 1999).

Taken together, the results indicate that the construct captured by the PTGI was characterized best by the intercorrelated five first-order factors (i.e., Relating to Others, Personal Strength, New Possibilities, Spiritual Change, and Appreciation of Life). The mean of the total score was 53.04 ($SD = 24.17$), with a range from 0 to 105. The descriptive statistics of each factor were Relating to Others, $M = 16.98$, $SD = 8.99$; New Possibilities, $M = 11.92$, $SD = 7.07$; Personal Strength, $M = 11.10$, $SD = 5.34$; Spiritual Change, $M = 4.34$, $SD = 3.47$; and Appreciation of Life, $M = 8.69$, $SD = 4.31$. The alpha coefficient of the total score of the PTGI was .94. Each score of the five factors showed moderate to high internal consistency (αs = from .79 to .87). Overall, these results are similar to those obtained from the original sample of university students sampled by Tedeschi and Calhoun (1996) in developing the PTGI. Those students also were reporting PTG as the result of a wide variety of traumatic experiences.

DISCUSSION

The aim of this study was to investigate the dimensionality of the PTGI (Tedeschi & Calhoun, 1996). Although some studies have reported the factor structure of the PTGI using CFA with non-American samples (e.g., Ho, Chan, & Ho, 2004), or combined with other inventories (e.g., Cadell et al., 2003), this is the first study to report the dimensionality of the PTGI in an American population, and with a large sample, using a CFA. Of the five models evaluated, Model 3, the five first-order factors (i.e., Relating to Others, Personal Strength, New Possibilities, Spiritual Change, and Appreciation of Life) best fit the current data set, which indicates that the 5-factor structure of the PTGI that had been proposed originally is relatively robust. The principal components analysis accompanied by orthogonal rotation used for developing the PTGI (Tedeschi & Calhoun, 1996) requires adjustment to recognize the acknowledged relationships among the factors. Regardless of the method of statistical analysis, however, the fact that the same five factors, rather than the alternative theoretical three broad dimensions, are supported is noteworthy. The factor loadings for the individual items showed that all of the 21 items of the PTGI had loadings that were between .575 and .840, indicating that they are appropriate indicators of their respective factors. The results obtained here imply that the PTGI has good construct validity of its factor structure and add strong support to the assumption that PTGI is a multidimensional measure. Also, the magnitude of the correlations among factors was similar to those found in Tedeschi and Calhoun (1996). That

Table 2. Summary of Parameter Estimates for Model 3 and Descriptive Statistics for Each of the 21 Items of the Posttraumatic Growth Inventory (PTGI)

		Standardized regression weights						
	PTGI Item	RO	NP	PS	SC	AL	*M*	*SD*
15	I have more compassion for others.	.73					2.48	1.77
20	I learned a great deal about how wonderful people are.	.72					2.34	1.76
9	I am more willing to express my emotions.	.71					2.11	1.71
21	I better accept needing others.	.70					2.29	1.73
8	I have a greater sense of closeness with others.	.67					2.52	1.72
16	I put more effort into my relationships.	.66					2.47	1.83
6	I more clearly see that I can count on people in times of trouble.	.58					2.76	1.73
11	I am able to do better things with my life.		.84				2.49	1.82
7	I established a new path for my life.		.76				2.34	1.86
3	I developed new interests.		.67				2.17	1.83
17	I am more likely to try to change things which need changing.		.64				2.91	1.70
14	New opportunities are available which wouldn't have been otherwise.		.63				2.01	1.93
10	I know better that I can handle difficulties.			.74			2.98	1.62
19	I discovered that I'm stronger than I thought I was.			.72			2.91	1.78
4	I have a greater feeling of self-reliance.			.66			2.54	1.77
12	I am better able to accept the way things work out.			.66			2.77	1.67
5	I have a better understanding of spiritual matters.				.83		2.23	1.88
18	I have a stronger religious faith.				.81		2.12	1.92
13	I can better appreciate each day.					.80	2.76	1.79
2	I have a greater appreciation for the value of my own life.					.76	2.92	1.70
1	I changed my priorities about what is important in life.					.65	3.01	1.69
	PTGI factors	Correlation among factors						
	New possibilities	.71						
	Personal strength	.73	.85					
	Spiritual change	.71	.59	.56				
	Appreciation of life	.76	.76	.77	.69			

Note. RO = Relating to Others; NP = New Possibilities; PS = Personal Strength; SC = Spiritual Change; AL = Appreciation of Life. Blank cells indicate where parameters are constrained to zero in this model.

is, the correlations among the factors ranged from .62 to .83 in their study and from .56 to .85 for the present study based on Model 3.

The comparison of models revealed that Model 5, the single higher-order factor with five second-order factors, had a poorer fit than Model 3. This result indicates that PTGI should be considered as a multidimensional measurement instrument; however, Model 5 seems to be an acceptable option for interpreting the PTG construct. The whole scale and each of the five subscales showed high levels of internal consistency. These findings would be in line with several studies that have used effectively both the total score and individual scores for the five subscales of the PTGI for their analyses (e.g., Bellizzi, 2004; Polatinsky & Esprey, 2000). However, the results of the comparison of models provided here should be carefully interpreted because the reason why Model 5, the single higher-order factor with five second-order factors, had a poorer fit than Model 3, the five-factor model, could be based on the fact that the factor correlations in Model 3 were not uniform (ranging from .56 for Personal Strength–Spiritual Change to .85 for New Possibilities–Personal Strength). Future research will need to elaborate on the fundamental differences among the five factors of the PTGI, especially because new possibilities and personal strength factors showed poor discriminant validity in the current data.

Overall, the current study verified that the five separate factors assumed to be captured by the PTGI can be used meaningfully in interpretations of posttraumatic growth. Given that the PTGI has been revealed to be a multidimensional measure, it would be expected that each of the five factors could relate differently to other variables. In fact, research has reported somewhat different

relationships between the PTGI subscales and a variety of outcome variables (e.g., Cordova, Cunningham, Carlson, & Andrykowski, 2001; Epel, McEwen, & Ickovics, 1998). Tedeschi and Calhoun (2004) have indicated that different aspects of PTG might be particularly sensitive to certain kinds of cognitive processing or might be influenced differently by other variables. For example, the more an individual engages in deliberate rumination (i.e., seeking to construct a new assumptive world or to highlight the positive aspects of the experience) after the event, thinking about the ways to make sense out of the trauma, the more likely it is that PTG will be experienced (Calhoun & Tedeschi, 2006); however, the pattern of these relationships may differ among the five domains of the PTGI. Above all, one should be careful not to expect that growth in all of the domains identified should occur at the same time or eventually. In clinical applications, it would be important to recognize where growth is occurring, and where it is absent. The likely psychological by-products of growth would be different if one has grown in relating to others, as opposed to recognizing new personal strengths or gaining spiritual insights. Interventions to enhance growth would have to consider where the opportunity for growth exists. Additionally, although the current study focused only on examining the construct validity of the factor structure of the PTGI, now that this has been supported, further studies should investigate the predictive or concurrent validity of the separate factors of PTGI to better understand the potential importance of growth in each area as an outcome.

There are several issues that should be considered in appreciating the strengths and potential limitations of these analyses. These findings are based on data sets collected independently, so the sample consists of a very broad and heterogeneous collection of the studies using the PTGI. Different studies were based on different populations of participants in terms of age and the traumatic or highly stressful event they had experienced. This could be considered a potential weakness in terms of the heterogeneity of the experiences or the potential impact of the various events. We cannot determine from the current analyses whether the factor structure of the PTGI might differ within groups that experienced a specific trauma. On the other hand, the broad sample could be seen as a strength because despite the heterogeneity the 5-factor structure of the PTGI was clear. It remains to be seen if the factor structure might vary depending on specific characteristics of a sample or particular traumatic events that might be experienced. Research also will be needed that investigates the consistency and validity of the PTGI factors across cultural variations. Initial indications are that some differences may exist depending upon culture (Taku et al., 2007). In addition, there may be a large number of alternative equivalent and nonequivalent models that could fit the observed data equally well or better (Tomarken & Waller, 2003). Although the five models that we have examined here are based on the theoretical and empirical hypotheses, other models may have been overlooked because the theory to support them has not been specified.

In conclusion, present findings applying confirmatory factor analyses to the PTGI support the presence of the five separate and meaningful, but correlated factors of PTG, and that the PTGI has high reliability and construct validity of its factor structure, that is, factorial validity (see Byrne, 2001). It seems desirable, then, for future investigations to consider both the total score and scores on the subscales of the PTGI in analyses. Investigators hoping to understand the complexity of the experience of posttraumatic growth should pay attention to the 5-factor structure of the PTGI when considering the construct in relation to other psychological outcomes.

REFERENCES

Aldwin, C. M., & Levenson, M. R. (2004). Posttraumatic growth: A developmental perspective. Psychological Inquiry, 15, 19–22.

Arbuckle, J. L. (1994–1999). AMOS 4.01 [Computer Software]. Chicago: SmallWaters.

Bellizzi, K. M. (2004). Expressions of generativity and posttraumatic growth in adult cancer survivors. International Journal of Aging and Human Development, 58, 267–287.

Byrne, B. M. (2001). Structural equation modeling with AMOS, EQS, and LISREL: Comparative approaches to testing for the factorial validity of a measuring instrument. International Journal of Testing, 1, 55–86.

Cadell, S., Regehr, C., & Hemsworth, D. (2003). Factors contributing to posttraumatic growth: A proposed structural equation model. American Journal of Orthopsychiatry, 73, 279–287.

Calhoun, L. G., & Tedeschi, R. G. (1999). Facilitating posttraumatic growth: A clinician's guide. Mahwah, NJ: Erlbaum.

Calhoun, L. G., & Tedeschi, R. G. (2006). The foundations of posttraumatic growth: An expanded framework. In L. G. Calhoun & R. G. Tedeschi (Eds.), Handbook of posttraumatic growth (pp. 3–23). Mahwah, NJ: Erlbaum.

Chen, F. F., Sousa, K. H., & West, S. G. (2005). Testing measurement invariance of second-order factor models. Structural Equation Modeling, 12, 471–492.

Cobb, A. R., Tedeschi, R. G., Calhoun, L. G., & Cann, A. (2006). Correlates of posttraumatic growth in survivors of intimate partner violence. Journal of Traumatic Stress, 19, 895–903.

Cordova, M. J., Cunningham, L. L. C., Carlson, C. R., & Andrykowski, M. A. (2001). Posttraumatic growth following breast cancer: A controlled comparison study. Health Psychology, 20, 176–185.

DiStefano, C. (2002). The impact of categorization with confirmatory factor analysis. Structural Equation Modeling, 9, 327–346.

Epel, E. S., McEwen, B. S., & Ickovics, J. R. (1998). Embodying psychological thriving: Physical thriving in response to stress. Journal of Social Issues, 54, 301–322.

Fischer, P. C. (2006). The link between posttraumatic growth and forgiveness: An intuitive truth. In L. G. Calhoun & R. G. Tedeschi (Eds.), Handbook of posttraumatic growth (pp. 311–333). Mahwah, NJ: Erlbaum.

Helgeson, V. S., Reynolds, K. A., & Tomich, P. L. (2006). A meta-analytic review of benefit finding and growth. Journal of Consulting and Clinical Psychology, 74, 797–816.

Ho, S. M. Y., Chan, C. L. W., & Ho, R. T. H. (2004). Posttraumatic growth in Chinese cancer survivors. Psycho-Oncology, 13, 377–389.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 6, 1–55.

Janoff-Bulman, R. (2004). Posttraumatic growth: Three explanatory models. Psychological Inquiry, 15, 30–34.

Joseph, S., & Linley, P. A. (2006). Growth following adversity: Theoretical perspectives and implications for clinical practice. Clinical Psychology Review, 26, 1041–1053.

Joseph, S., Linley, P. A., & Harris, G. J. (2005). Understanding positive change following trauma and adversity: Structural clarification. Journal of Loss and Trauma, 10, 83–96.

Lei, M., & Lomax, R. G. (2005). The effect of varying degrees of nonnormality in structural equation modeling. Structural Equation Modeling, 12, 1–27.

Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. Journal of Traumatic Stress, 17, 11–21.

Manne, S., Ostroff, J., Winkel, G., Goldstein, L., Fox, K., & Grana, G. (2004). Posttraumatic growth after breast cancer: Patient, partner, and couple perspectives. Psychosomatic Medicine, 66, 442–454.

McMillen, J. C. (2004). Posttraumatic growth: What's it all about? Psychological Inquiry, 15, 48–52.

Morris, B. A., Shakespeare-Finch, J., Rieck, M., & Newbery, J. (2005). Multidimensional nature of posttraumatic growth in an Australian population. Journal of Traumatic Stress, 18, 575–585.

Park, C. L. (2004). The notion of growth following stressful life experiences: Problems and prospects. Psychological Inquiry, 15, 69–76.

Park, C. L., Cohen, L. H., & Murch, R. L. (1996). Assessment and prediction of stress-related growth. Journal of Personality, 64, 71–105.

Park, C. L., & Helgeson, V. S. (2006). Introduction to the special section: Growth following highly stressful life events—current status and future directions. Journal of Consulting and clinical Psychology, 74, 791–796.

Park, C. L., & Lechner, S. (2006). Measurement issues in assessing growth following stressful life experiences. In L. G. Calhoun & R. G. Tedeschi (Eds.), Handbook of posttraumatic growth (pp. 47–67). Mahwah, NJ: Erlbaum.

Polatinsky, S., & Esprey, Y. (2000). An assessment of gender differences in the perception of benefit resulting from the loss of a child. Journal of Traumatic Stress, 13, 709–718.

Powell, S., Rosner, R., Butollo, W., Tedeschi, R. G., & Calhoun, L. G. (2003). Posttraumatic growth after war: A study with former refugees and displaced people in Sarajevo. Journal of Clinical Psychology, 59, 71–83.

Rubio, D. M., Berg-Weger, M., & Tebb, S. S. (2001). Using structural equation modeling to test for multidimensionality. Structural Equation Modeling, 8, 613–626.

Salter, E., & Stallard, P. (2004). Posttraumatic growth in child survivors of a road traffic accident. Journal of Traumatic Stress, 17, 335–340.

Sears, S. R., Stanton, A. L., & Danoff-Burg, S. (2003). The yellow brick road and the emerald city: Benefit finding, positive reappraisal coping, and posttraumatic growth in women with early-stage breast cancer. Health Psychology, 22, 487–497.

Schaefer, J. A., & Moos, R. H. (1992). Life crises and personal growth. In B. N. Carpenter (Ed.), Personal coping: Theory, research, and application (pp. 149–170). Westport, CT: Praeger.

Schreiber, J. B., Stage, F. K., King, J., Nora, A., & Barlow, E. A. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. Journal of Education Research, 99, 323–337.

Sheikh, A. I. (2004). Posttraumatic growth in the context of heart disease. Journal of Clinical Psychology in Medical Settings, 11, 265–273.

Sheikh, A. I., & Marotta, S. A. (2005). A cross-validation study of the posttraumatic growth inventory. Measurement and Evaluation in Counseling and Development, 38, 66–77.

Smyth, C. L., & MacLachlan, M. (2005). Confirmatory factor analysis of the Trinity Inventory of Precursors to Suicide (TIPS) and its relationship to hopelessness and depression. Death Studies, 29, 333–350.

Stanton, A. L., Bower, J. E., & Low, C. A. (2006). Posttraumatic growth after cancer. In L. G. Calhoun & R. G. Tedeschi (Eds.), Handbook of posttraumatic growth (pp. 138–175). Mahwah, NJ: Erlbaum.

Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics (5th ed.). Boston: Allyn and Bacon/Pearson Education.

Taku, K., Calhoun, L. G., Tedeschi, R. G., Gil-Rivas, V., Kilmer, R. P., & Cann, A. (2007). Examining posttraumatic growth among Japanese university students. Anxiety, Stress & Coping, 20, 353–367.

Tedeschi, R. G., & Calhoun, L. G. (1995). Trauma and transformation: Growing in the aftermath of suffering. Thousand Oaks, CA: Sage.

Tedeschi, R. G., & Calhoun, L. G. (1996). The Posttraumatic Growth Inventory: Measuring the positive legacy of trauma. Journal of Traumatic Stress, 9, 455–471.

Tedeschi, R. G., & Calhoun, L. G. (2004). Posttraumatic growth: Conceptual foundations and empirical evidence. Psychological Inquiry, 15, 1–18.

Thompson, B. (2004). Exploratory and confirmatory factor analysis: Understanding concepts and applications. Washington DC: American Psychological Association.

Tomarken, A. J., & Waller, N. G. (2003). Potential problems with "well fitting" models. Journal of Abnormal Psychology, 112, 578–598.

Waternaux, C. M. (1976). Asymptotic distribution of the sample roots for a nonnormal population. Biometrika, 63, 639–645.

Weiss, T. (2004). Correlates of posttraumatic growth in married breast cancer survivors. Journal of Social and Clinical Psychology, 23, 733–746.

Weiss, T., & Berger, R. (2006). Reliability and validity of a Spanish version of the Posttraumatic Growth Inventory. Research on Social Work Practice, 16, 191–199.

Widows, M. R., Jacobsen, P. B., Booth-Jones, M., & Fields, K. K. (2005). Predictors of posttraumatic growth following bone marrow transplantation for cancer. Health Psychology, 24, 266–273.