Examining Associations between Major Negative Life Events, Changes in Weekly Reports of Posttraumatic Growth and Global Reports of Eudaimonic Well-Being

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Abstract

Research on posttraumatic growth (PTG) has been compromised by methodological limitations. Recent process-oriented accounts of personality suggest, however, that positive changes may occur through short-term (i.e., state-level) changes in PTG. In the current year-long study, 1247 participants provided weekly reports of significant negative events as well as state manifestations of PTG (up to 44 assessments per individual; 34,205 total). Trait assessments of eudaimonic well-being (EWB) were administered at intake and weeks 45 and 52. Experiencing negative life events predicted increases in state PTG, which in turn predicted increases in EWB. However, stability was observed when modelling prospective changes in overall state PTG before and after the initial negative life event or across all negative life events occurring during the study timeframe. These findings highlight the importance of studying PTG-related processes using appropriate research designs, analytic strategies, and timeframes.

Keywords: personality change, posttraumatic growth, psychological well-being, major life events, state assessments

Examining Associations between Major Negative Life Events, Changes in Weekly Reports of Posttraumatic Growth and Global Reports of Eudaimonic Well-Being

Can adversity change us, or our lives, for the better? Researchers in psychology have become increasingly interested in studying positive changes in individuals' personality and well-being after the occurrence of highly significant life events (Jayawickreme et al., 2021; Linley & Joseph, 2004; Tedeschi et al., 1998). Social scientists studying posttraumatic growth (PTG) have suggested that people frequently identify positive changes in their relationships, identities, and worldviews after overcoming stressful events, and critically, that this process may lead to greater adjustment over time (Infurna & Jayawickreme, 2021; Jayawickreme & Blackie, 2014).

However, little is known about *how* people may experience positive changes in the aftermath of major life events (Mangelsdorf et al., 2019), and the extent to which PTG is indeed linked to better adjustment (Tennen & Affleck, 2009). This is due in part to methodological limitations in current research on PTG, which is dominated by retrospective assessments of subjective perceptions (i.e., measures of people's own perceptions of change), rather than documented pre-post changes over time (Frazier et al., 2009). Do major negative events impact our well-being by changing how we see and feel about ourselves, our relationships, and the world on a day-to-day basis (i.e., state-level manifestations of PTG and well-being)? In addition, given the methodological limitations of past examinations of PTG, what is the most appropriate way to model post-adversity change (Infurna & Jayawickreme, 2019), and what are the implications of the choices we make for the conclusions we draw and how we proceed with

future work (Chopik, 2021)? In the present study, we aimed to add to current research on PTG by investigating changes in well-being resulting from the experience of major negative life events as well as clarifying the underlying processes of such changes.

Posttraumatic Growth

As explained above, PTG has been defined as positive psychological change experienced as a result of the struggle with highly challenging life circumstances (Tedeschi & Calhoun, 2004). PTG focuses on how negative events may serve as a springboard for growth. The five common forms of PTG (improved relations with others, identification of new possibilities for one's life, increased personal strength, spiritual change, and enhanced appreciation of life) may be understood as aspects of eudaimonic well-being (EWB), which emphasizes meaning, purpose, personal growth, and improved personal relationships (Joseph & Hefferon, 2013; Joseph et al., 2012; Linley & Joseph, 2004).

A growing literature has reported that some individuals grow and develop in the aftermath of personal adversity (Jayawickreme & Blackie, 2014; Tedeschi et al., 1998), including experiences of bereavement, military combat, cancer diagnosis, heart attacks, and HIV (Tedeschi & Calhoun, 2004). The veracity of such retrospective self-perceived growth, however, has been much debated (Blackie et al., 2015; Jayawickreme & Blackie, 2014). Despite broad interest in the phenomenon of PTG (Jayawickreme et al., 2021), it remains unclear what self-reports of PTG in fact reflect (Frazier et al., 2009; Jayawickreme & Infurna, 2021; Jayawickreme et al., 2018). Although it is possible that perceptions of PTG in the wake of adversity may reflect meaningful transformation (Tedeschi & Calhoun, 2004), these self-reports may also constitute a coping strategy to manage negative emotions resulting from the adverse event (Frazier et al., 2016; McFarland & Alvaro, 2000). Thus, to truly understand the occurrence and the process of

PTG, it is necessary to supplement retrospective self-reports with other methods for detecting change over time.

Examining Posttraumatic Growth as Positive Personality Change

Manifestations of phenomena like personality, well-being, and PTG can be measured in different timescales: the trait level, which reflects more stable characteristics, and the state level, which reflects shorter-term manifestations (e.g., fluctuating day-to-day experiences). EWB and PTG have been assessed at both the trait and state level (Blackie et al., 2017; Jayawickreme et al., 2020). Although EWB has been shown to be quite stable (Costa et al., 1987), its development across the lifespan has been characterized by changes based on age and developmental stage (Ryff & Singer, 1998). Recent research and theorizing on personality development further suggest that life events may impact people's levels of well-being by changing their state-level patterns of thoughts, feelings and behavior (Blackie et al., 2014: Blackie & Jayawickreme, 2015; Jayawickreme et al., 2018; Jayawickreme & Mendonça, 2021; Wrzus & Roberts, 2017).

According to Whole Trait Theory (Jayawickreme et al., 2018), for example, individuals display more or less of a certain personality trait depending on characteristics of the situation they find themselves in as well as their motivation to pursue various goals (McCabe & Fleeson, 2012). Although individuals' trait EWB tends to be stable when they report how they generally feel, their day-to-day EWB (at the state-level) fluctuates depending on situations and events in their lives. Following an adverse event, individuals may be motivated by both their goals and their altered situation to change their current state (i.e., their immediate behaviors, thoughts, and/or feelings). This short-term change may have consequences: for instance, it may lead to successful coping with the event, which in turn reinforces those state-level changes and leads to longer-lasting trait change (Jayawickreme et al., 2019; Wrzus & Roberts, 2017). Through these

linked processes, factors at a macro-level (e.g., negative life events) change well-being through micro-processes (e.g., state changes in PTG following those events; Jayawickreme & Mendonça, 2021). There is initial empirical support for the idea that negative life events may lead to personality changes through state changes, such as the relationship between EWB-promoting behaviors and subsequent well-being (Steger et al., 2008).

Method

In the present study, we used an intensive micro-longitudinal design to test whether the experience of major negative life events over the course of one year was associated with changes in state PTG and subsequent changes in trait EWB, as well as the prospective impact of major negative life events on state PTG.

Participants and Procedure

Participants were recruited online through the survey company Qualtrics Panels. Inclusion criteria specified that participants must be aged 18 years or older and have had at least 2 years of active participation in the market research panels from which Qualtrics Panels is permitted to recruit. Participants who met these criteria were emailed by Qualtrics Panels with information about the study and a link to our survey and the informed consent document, which they signed before starting the survey.

Participants were first asked to complete an intake survey consisting of questions on mental health, well-being, personality, demographic information, and lifetime trauma history. They then completed a total of 44 five-minute surveys over the course of one year (with no survey on the week of each major U.S. holiday). These weekly five-minute surveys (weeks 1 to 52) asked questions concerning whether the participant had experienced any major negative

events during that week, daily positive and negative interactions they experienced that day, and their current standing on PTG-relevant domains.[1] In weeks 45 and 52, we repeated the personality, mental health, and well-being measures administered at intake. As recommended by Qualtrics, participants were paid in line with current reward incentives at the time of data collection (January 2016-February 2017) offered in these market research panels. Participants were compensated $0.25 for every survey completed, with a reward incentive of an additional $0.50 per survey if they completed a minimum of 40 surveys.

The initial sample consisted of 1247 adults, with a mean age of 36.50 years (*SD* = 11.17). Approximately half (51%) of participants were women; 84% identified their race as White, 9% as African American/Black, 4% as Asian, and 3% as Other. At week 52, the final survey was completed by 658 participants, 49% of whom were women (see Table 1 for detailed participant characteristics).

Table 1

Participant Characteristics

	M	*SD*
Female	51%	
Age	46.2	14.8
Household Income	$58,760	$40,102
Urban (vs. Rural)	62%	
Employed	56%	
Education		
No Degree	2%	
High School Degree	17%	
Some College	24%	
Associates Degree	12%	
Bachelor's Degree	30%	
Graduate Degree	15%	
Ethnicity		

[1] Other measures of personality and well-being not relevant to the current study were also included. Also, these analyses were not preregistered.

White	84%
Black	9%
Asian	4%
Other	3%

Note. Income was an ordinal variable (e.g., <$10,000; $10,000-$19,999; etc.), so we used the median value for each category ($15,000 for the "$10,000-$19,999" category)—except for the $150,000+ category, which was coded as $150,000—to compute the overall mean and standard deviation.

A comparison of participants with PTG data at each time point vs. participants with missing PTG data suggested that complete cases were older (49.38 vs. 45.41 years old), had higher levels of PTG Item 3 (reporting close interpersonal experiences; 3.74 vs. 3.58 points) at T1, and had a different distribution of education compared to participants missing PTG scores (see Supplementary Table 1).

Measures

Trait Well-Being

EWB at the trait level was measured using the Brief Inventory of Thriving (BIT; Su et al., 2014). This 10-item questionnaire assesses multiple domains of EWB by asking participants to rate statements (e.g., "I am achieving most of my goals") on a scale from 1 = "Strongly disagree" to 5 = "Strongly agree." Higher scores indicate a higher level of positive functioning. We consider this measure a trait-level measure of EWB because the measure was explicitly developed to capture a comprehensive set of domains relevant to EWB at the dispositional level (see Su et al., 2014, Table 1, p. 253). The observed reliability was $\omega_{Between}$ = .96 at the between-person level, and ω_{Within} = .81 at the within-person level.

Negative Life Events. Negative life events were assessed using an adapted version of the Major Life Events Checklist (Lüdtke et al., 2011). Sixteen items assessed the number of major

negative life events that may have happened to the participant within the past week. Participants were asked to mark either "yes" or "no" for each statement (e.g., "serious personal injury or illness to self" and "death of a close friend"). The 16 items and number of participants who experienced each life event during the study are reported in Table 2. For each event that the participant answered "yes" to, they then indicated how positive and how negative they felt about the event on a scale of 0 to 100.

State Posttraumatic Growth. We assessed state PTG by creating a 5-item composite measure assessing the five domains of PTG (Tedeschi & Calhoun, 2004): personal strength, awareness of new opportunities, personal relationships, spirituality, and appreciation of life. The items for personal strength ("Today, I felt very capable in what I did") and personal relationships ("Today, I felt close and connected with other people who are important to me") were based on Heppner et al.'s (2008) adaptation of a "need satisfaction" scale (Sheldon et al., 2001). The items for spirituality ("Today the spiritual part of my life was very important to me") and awareness of new possibilities ("Everywhere I went, I was out looking for new things or experiences") were adapted from a measure created to investigate the relationship between curiosity and well-being in daily life (Kashdan & Steger, 2007). The item for appreciation of life ("Today, I felt appreciative") was adapted from a measure created to assess the relationship between gratitude and well-being in daily life (Emmons & McCullough, 2003). Participants were asked to rate each statement on a scale from 1 = "Strongly disagree" to 5 = "Strongly agree." The observed reliability was $\omega_{Between} = .89$ at the between-person level, and $\omega_{Within} = .69$ at the within-person level.

Table 2

Number and Percentage of Participants who Experienced Specific Negative Life Events During the Study

Negative Life Event	*n*	%	Mean Negativity Rating (SD
Separated from spouse or long-term partner	69	6%	44.05 (23.29)
Serious personal injury or illness to self	178	14%	64.73 (36.27)
Serious personal injury or illness to close relative/family member	258	21%	69.42 (35.58)
Death of spouse or child	30	2%	41.98 (38.10)
Death of other close relative/family member (e.g., parent or sibling)	212	17%	64.06 (38.76)
Death of a close friend	192	15%	63.45 (38.40)
Victim of physical violence (e.g., assault)	44	4%	47.83 (39.38)
Victim of property crime (e.g., theft, housebreaking)	69	6%	54.97 (39.16)
Detained in jail/correctional facility	27	2%	40.27 (36.10)
Close family member detained in jail/correctional facility	70	6%	48.60 (37.89)
Fired or made redundant by an employer	54	4%	49.74 (37.84)
Major worsening in financial situation (e.g., went bankrupt)	137	11%	68.35 (37.82)
A weather-related disaster (e.g., flood, bushfire, cyclone) damaged or destroyed your home	50	4%	42.81 (35.67)
A fire/explosion damaged or destroyed your home/property	20	2%	34.39 (33.83)
Victim of sexual assault/violence	28	2%	40.60 (36.02)
Serious transportation accident (car accident, boat accident, shipwreck, airplane crash).	56	4%	49.04 (38.28)
At least one negative life event	600	48%	
Total *N*	1247	100%	

Note: Negativity ratings are on a 0-100 scale

Analytic Approach

We conducted analyses using MPlus Version 7 (Muthén & Muthén, 2012). We first conducted a multilevel confirmatory factor analysis (ML-CFA) on the state PTG items to test if a one-factor model fit the data, using fit criteria including CFI ≥ .90, and RMSEA and SRMR ≤ .08 (Hu & Bentler, 1999); we did not expect the chi-square test to be nonsignificant given its sensitivity to sample size (Kline, 2005). The analysesused robust maximum likelihood estimation

and full-information maximum likelihood (FIML) to deal with missing data. Standardized path coefficients are reported.[2]

We examined four sets of structural equation models to test our main hypotheses:

1. *Negative Life Events, PTG, and EWB Mediation Model*. The primary models used linear latent growth curve sub-models to estimate latent slopes representing changes in PTG over time (T1 to T51) and changes in psychological well-being over time (T0 to T52). The number of negative life events was included as a predictor of both the change in PTG and EWB and change in PTG predicted change in EWB (see Figure 1). We estimated the same models described above using the individual PTG items in separate models.
2. *Subjective Ratings of Negative Life Events, PTG, and EWB Mediation Model.* As a sensitivity analysis, we estimated a similar model (as in Model 1 above) in which we replaced the number of negative life events with participants' own subjective ratings of how negative these events were; the purpose of this was to determine whether results hold when using more subjective vs. more objective indicators of the level of adversity participants experienced. We also estimated the same models described above using the individual PTG items in separate models.
3. *First Negative Life Event-Related Change in PTG Trajectory*. The next set of models focused on assessing the shape of the potential negative life event-related change in PTG. More specifically, we examined whether the first negative life event reported in the study predicted changes in PTG trajectory. In order to test the potential effect of negative life events on PTG, we estimated PTG growth curves with "First Negative Life Event Elevation Change" (Model 1), "First Negative Life Event Slope Change" (Model 2), and both potential elevation and slope change (Model 3) predictor variables at Level 1 (see

[2] Syntax for these analyses is available at https://osf.io/rtzh4/?view_only=ae479165c70f44ba91de30c4f5d4cad4

Supplementary Table 2). We also estimated the same models described above using the individual PTG items in separate models.

4. *Cumulative Negative Life Event-Related Change in PTG Trajectory*. Finally, we estimated the same models described above (in bullet point 3), but assessed the potential cumulative effects of negative life events instead of just the first life event reported in the study (see Table 3). In other words, in order to test the potential effect of negative life events on PTG, we estimated PTG growth curves with "Cumulative Negative Life Event Elevation Change" (Model 1), "Cumulative Negative Life Event Slope Change" (Model 2), and both potential elevation and slope change (Model 3) predictor variables at Level 1 (see Supplementary Table 2). We also estimated the same models described above using the individual PTG items in separate models[3].

Confirmatory Factor Analysis

The one-factor Multi-Level Confirmatory Factor Analysis (ML-CFA) model fit the weekly PTG data well: $\chi^2(10) = 140.26$, $p < .001$; CFI = .99; RMSEA = .019; $SRMR_{Within} = .016$; $SRMR_{Between} = .035$. All factor loadings were $\geq .41$ with p-values less than .001, and 95% confidence interval limits ranging from .39 to .96.

Changes in PTG and EWB

Means, standard deviations, and sample size at each time point for PTG as well as the intercept and slope from a linear growth curve model for PTG are displayed in Supplementary Table 3. These data suggest that average PTG was relatively stable over time (as indicated by a zero slope). The standard deviations were also relatively stable over time. Means, standard deviations, and sample size for EWB at Time 0, 45, and 52 as well as the intercept and slope from a linear growth curve model for EWB are displayed in Supplementary Table 4. As with

[3] We thank a reviewer for suggesting that we run models 3 and 4.

PTG, the data suggest that average EWB was relatively stable over time (as indicated by a zero slope). The standard deviations were also relatively stable over time. We note that even though the slope variance point estimates for both PTG and EWB were close to zero, they were highly statistically significant (*z*-values of 9.50 and 4.52, respectively, both *p*s < .001; 95% CI [.00006, .00010] and 95% CI [.00003, .00009], respectively). These small but highly significant estimates may be because latent growth curve models with three or more waves of data produce true score change parameter estimates that are adjusted for measurement error. In studies with only two waves, large individual differences in change scores might be due to measurement error that cannot be separated from true change (Singer & Willett, 2003).

Models 1 and 2: Is the experience of major negative life events over the course of one year associated with changes in state PTG and subsequent changes in trait EWB?

Negative Life Events

Overall PTG. The model with Negative Life Events as the main predictor fit the data well: $\chi^2(1288) = 2{,}517.28$, $p < .001$; CFI = .95; RMSEA = .028, 90% CI [.026, .029]; SRMR = .056. Negative Life Events predicted increases in PTG (β = .20, $p = .016$, 95% CI [.04, .37]), and in turn, increases in PTG predicted increases in EWB (β = .49, $p < .001$, 95% CI [.34, .63]). These results indicate that changes in PTG mediated the effect of life events on changes in EWB (β = .10, $p = .027$, 95% CI [.01, .19]; see Figure 1). The direct effect of Negative Life Events on changes in EWB was not significant (β = -.05, $p = .23$, 95% CI [-.12, .03]). In a follow-up model with just Negative Life Events predicting changes in EWB (i.e., without PTG in the model), the direct effect was not significant (β = .03, $p = .26$, 95% CI [-.02, .09]). In other words, negative life events had no direct effect on changes in well-being; however, experiencing negative life

events predicted greater positive changes in state PTG, which in turn predicted greater positive changes in EWB (Figure 1).

PTG domains. The separate models with the individual PTG Items fit the data well (see Supplementary Table 5). In general, the mediation effect observed using the composite PTG scale (i.e., all five items) was replicated with the individual items, except for Item 4 ("Today, I felt very capable in what I did"; see Table 4)[4].

Table 4

Standardized Parameter Estimates from Models Testing the Indirect Effect of Negative Life Events on Changes in EWB Through Changes in PTG

Parameter	Estimate	95% CI	*p*
PTG (All 5 Items)			
NLE → ΔPTG (a)	.20	[.09, .32]	0.016
ΔPTG → ΔEWB (b)	.49	[.34, .63]	<.001
NLE → ΔEWB (c')	-.05	[-.16, .07]	0.232
NLE → ΔPTG → ΔEWB (a*b)	.10	[.05, .15]	0.027
PTG Item 1 - Today, I felt appreciative			
NLE → ΔPTG (a)	.14	[.02, .26]	0.050
ΔPTG → ΔEWB (b)	.56	[.42, .69]	<.001
NLE → ΔEWB (c')	-.01	[-.13, .11]	0.787
NLE → ΔPTG → ΔEWB (a*b)	.08	[.01, .14]	0.061
PTG Item 2 - Today the spiritual part of my life was very important to me			
NLE → ΔPTG (a)	.27	[.16, .38]	0.002
ΔPTG → ΔEWB (b)	.39	[.20, .57]	<.001
NLE → ΔEWB (c')	-.07	[-.20, .05]	0.112
NLE → ΔPTG → ΔEWB (a*b)	.11	[.06, .15]	0.020
PTG Item 3 - Today, I felt close and connected with other people who are important to me			
NLE → ΔPTG (a)	.17	[.06, .28]	0.016
ΔPTG → ΔEWB (b)	.38	[.23, .52]	<.001
NLE → ΔEWB (c')	-.02	[-.13, .10]	0.670
NLE → ΔPTG → ΔEWB (a*b)	.06	[.02, .11]	0.033
PTG Item 4 - Today, I felt very capable in what I did			
NLE → ΔPTG (a)	.08	[-.03, .20]	0.184
ΔPTG → ΔEWB (b)	.41	[.27, .54]	<.001

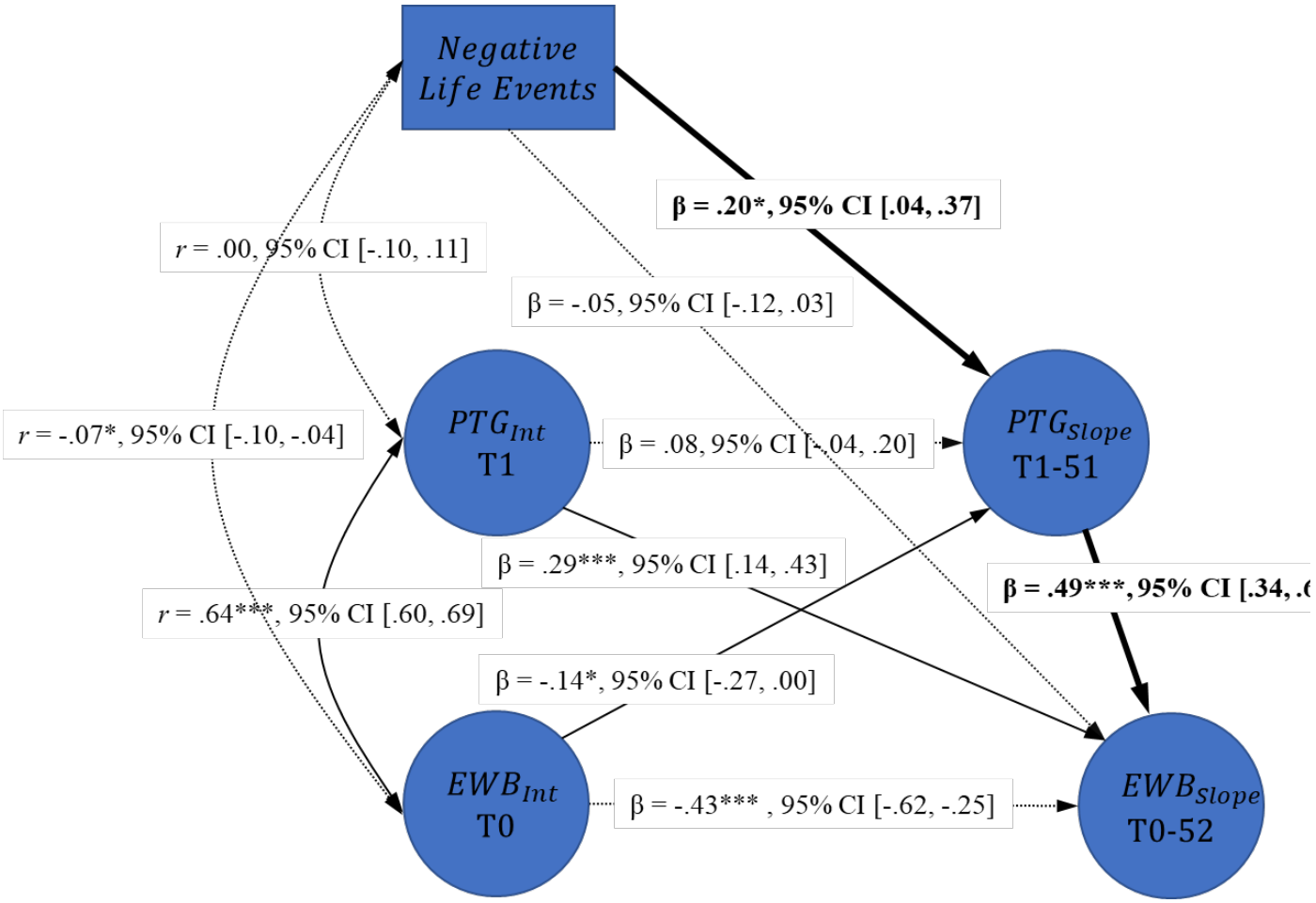
[4] We thank a reviewer for suggesting that we include the item-level analyses in this paper.

NLE → ΔEWB (c')	.03	[-.09, .14]	0.454
NLE → ΔPTG → ΔEWB (a*b)	.03	[-.01, .08]	0.196
PTG Item 5 - Everywhere I went, I was out looking for new things or experiences			
NLE → ΔPTG (a)	.13	[.01, .25]	0.016
ΔPTG → ΔEWB (b)	.36	[.22, .50]	<.001
NLE → ΔEWB (c')	-.19	[-.31, -.07]	0.560
NLE → ΔPTG → ΔEWB (a*b)	.05	[.00, .09]	0.028

Note. NLE = Negative Life Events. PTG = Posttraumatic Growth. EWB = Eudaimonic Well-Being.

Figure 1

Changes in State PTG Mediate the Relationship between Negative Life Events and Trait EWB.



Note: Gender and age are included as covariates but not shown in this figure for parsimony/clarity.

Subjective Ratings of Negative Life Events

Overall PTG. The model for the sensitivity analysis with Subjective Ratings of Negative Events as the main predictor fit the data well: $\chi^2(1288) = 2{,}522.62$, $p < .001$; CFI = .95; RMSEA = .028, 90% CI [.026, .029]; SRMR = .057. Subjective Ratings of Negative Life Events did not predict changes in either PTG (β = -.06, p = .30, 95% CI [-.17, .05]) or EWB (β = .01, p = .84, 95% CI [-.11, .13]). However, changes in PTG did predict changes in EWB (β = .47, $p < .001$, 95% CI [.33, .62]).

PTG domains. The separate models with the individual PTG items fit the data well (see Supplementary Table 6). In general, the pattern of results observed using the composite PTG scale (i.e., all five items) was replicated with the individual items except for Item 3 ("Today, I felt close and connected with other people who are important to me"; (see Table 5).

Table 5

Standardized Parameter Estimates from Models Testing the Indirect Effect of Subjective Ratings of Negative Life Events on Changes in EWB Through Changes in PTG

Parameter	Estimate	95% CI	*p*
PTG (All 5 Items)			
NLE → ΔPTG (a)	-.06	[-.17, .05]	0.295
ΔPTG → ΔEWB (b)	.47	[.33, .62]	<.001
NLE → ΔEWB (c')	.01	[-.11, .13]	0.844
NLE → ΔPTG → ΔEWB (a*b)	-.03	[-.08, .02]	0.303
PTG Item 1 - Today, I felt appreciative			
NLE → ΔPTG (a)	-.04	[-.16, .08]	0.522
ΔPTG → ΔEWB (b)	.55	[.42, .68]	<.001
NLE → ΔEWB (c')	-.01	[-.13, .11]	0.87
NLE → ΔPTG → ΔEWB (a*b)	-.02	[-.09, .04]	0.521
PTG Item 2 - Today the spiritual part of my life was very important to me			
NLE → ΔPTG (a)	-.04	[-.15, .07]	0.444
ΔPTG → ΔEWB (b)	.37	[.18, .55]	<.001

NLE → ΔEWB (c')	.01	[-.12, .13]	0.931
NLE → ΔPTG → ΔEWB (a*b)	-.02	[-.06, .03]	0.449
PTG Item 3 - Today, I felt close and connected with other people who are important to me			
NLE → ΔPTG (a)	-.13	[-.24, -.02]	0.027
ΔPTG → ΔEWB (b)	.37	[.22, .52]	<.001
NLE → ΔEWB (c')	.01	[-.11, .12]	0.917
NLE → ΔPTG → ΔEWB (a*b)	-.05	[-.09, .00]	0.046
PTG Item 4 - Today, I felt very capable in what I did			
NLE → ΔPTG (a)	-.05	[-.16, .07]	0.432
ΔPTG → ΔEWB (b)	.41	[.27, .54]	<.001
NLE → ΔEWB (c')	-.03	[-.14, .08]	0.597
NLE → ΔPTG → ΔEWB (a*b)	-.02	[-.07, .03]	0.439
PTG Item 5 - Everywhere I went, I was out looking for new things or experiences			
NLE → ΔPTG (a)	-.02	[-.14, .10]	0.75
ΔPTG → ΔEWB (b)	.35	[.22, .49]	<.001
NLE → ΔEWB (c')	.01	[-.12, .13]	0.906
NLE → ΔPTG → ΔEWB (a*b)	-.01	[-.05, .04]	0.75

Models 3 and 4: Does the experience of major negative life events lead to changes in the manifestation of state PTG?

First Negative Life Event

Overall PTG. In the models with the composite PTG scale as the outcome, the elevation and slope change predictor variables were not significant (see Table 6). In other words, there was no significant immediate increase in state-level PTG after the first negative event a participant experienced in the study timeframe.

PTG domains. In general, the pattern of results observed using the composite PTG scale (i.e., all five items) was replicated with the individual items except for Items 3 (“Today, I felt close and connected with other people who are important to me”) and 4 (“Today, I felt very capable in what I did”; see Table 6). Specifically, for the Item 3 models, the first negative life event predicted a subsequent increase in the PTG trajectory slope (Model 2 $b = 0.002$; $p = .043$; Model 3 $b = 0.002$; $p = .051$). For the Item 4 models, the first negative life event predicted

subsequent decreases in the level of the PTG trajectory (Model 1 b = -0.059, p = .005; Model 3 $\underline{b}$ = -0.061, p = .004). In other words, participants tended to experience increased feelings of connection/closeness but decreased feelings of mastery immediately after the first negative event experienced in the study timeframe, and no other significant changes in other PTG domains.

Table 6

Unstandardized Estimates from Models Testing First Negative Life Event-Related Changes in PTG Trajectory

Model	PTG Intercept	PTG Week Slope	1st NLE ΔElevation	1st NLE Δslope
PTG				
0: Week Only	3.358***	0.000	-	-
1: NLE DisCon	3.359***	0.000	-0.006	-
2: NLE Slope	3.359***	0.000	-	0.001
3: NLE Discon + Slope	3.361***	0.000	-0.008	0.001
PTG1 - Today, I felt appreciative				
0: Week Only	3.492***	0.000	-	-
1: NLE DisCon	3.500***	0.000	-0.020	-
2: NLE Slope	3.497***	-0.001	-	0.002
3: NLE Discon + Slope	3.505***	-0.001	-0.030	0.002†
PTG2 - Today the spiritual part of my life was very important to me				
0: Week Only	3.164***	0.000	-	-
1: NLE DisCon	3.164***	0.000	0.004	-
2: NLE Slope	3.164***	0.000	-	0.000
3: NLE Discon + Slope	3.163***	0.000	0.003	0.000
PTG3 - Today, I felt close and connected with other people who are important to me				
0: Week Only	3.506***	-0.001*	-	-
1: NLE DisCon	3.510***	-0.001*	0.003	-
2: NLE Slope	3.510***	-0.002**	-	0.002*
3: NLE Discon + Slope	3.515***	-0.002**	-0.007	0.002†
PTG4 - Today, I felt very capable in what I did				
0: Week Only	3.752***	-0.002***	-	-
1: NLE DisCon	3.768***	-0.001**	-0.059**	-
2: NLE Slope	3.753***	-0.002***	-	0.000
3: NLE Discon + Slope	3.771***	-0.002**	-0.061**	0.001
PTG5 - Everywhere I went, I was out looking for new things or experiences				
0: Week Only	2.862***	0.002***	-	-
1: NLE DisCon	2.853***	0.002***	0.025	-
2: NLE Slope	2.860***	0.003***	-	-0.001
3: NLE Discon + Slope	2.849***	0.002***	0.030	-0.001

Note. In order to get all Model 2s—and Model 3 for Item 3—to converge, we constrained the average and variance of the slope change effect to zero.[3]

Cumulative Negative Life Events

Overall PTG. In the models with the composite PTG scale as the outcome, the elevation and slope change predictor variables were not significant (see Table 7).[5] In other words, there were no significant increases in state-level PTG following the negative events a participant experienced in the study timeframe.

PTG domains. In general, the pattern of results observed using the composite PTG scale (i.e., all five items) was replicated with the individual items except for Items 4 ("Today, I felt very capable in what I did") and 5 ("Everywhere I went, I was out looking for new things or experiences"; see Table 7). More specifically, for the Item 4 models, cumulative negative life events predicted a decrease in the level of the PTG trajectory (Model 1 b = -0.012; p = .038; Model 3 b = -0.017; p = .025). In the Item 5 Model 3 with both the elevation and slope change predictor variables, cumulative negative life events predicted an increase in the level of the PTG trajectory (Model 3 b = 0.016; p = .015). In other words, participants tended to experience an increased sense of new possibilities but decreased feelings of personal strength or mastery after the negative events experienced in the study timeframe, and no other significant changes in other PTG domains.

Table 7

[5] For both the entire PTG Scale as well as the five individual items, the models with just the slope change effect (Model 2)—as well as the model with both the level and slope change effects (Model 3) for item 3—would not converge. These models produced parameter estimates, but not standard errors. Because the average effect as well as the variance of the slope change effect were close to zero, we were able to get the models to converge by constraining the average and variance of the effect to zero. However, by constraining the effect, we cannot test it.

Unstandardized Estimates from Models Testing Cumulative Negative Life Event-Related Changes in PTG Trajectory

	PTG Intercept	PTG Week Slope	NLE DisCon	NLE Slope
PTG Scale (All 5 Items)				
0: Week Only	3.358***	0.000	-	-
1: NLE DisCon	3.359***	0.000	0.000	-
2: NLE Slope	3.358***	0.000	-	0.000
3: NLE Discon + Slope	3.354***	0.000	0.000	0.000
PTG Item 1 - Today, I felt appreciative				
0: Week Only	3.492***	0.000	-	-
1: NLE DisCon	3.497***	0.000	-0.007	-
2: NLE Slope	3.491***	0.000	-	0.000
3: NLE Discon + Slope	3.5***	0.000	-0.014	0.000
PTG Item 2 - Today the spiritual part of my life was very important to me				
0: Week Only	3.164***	0.000	-	-
1: NLE DisCon	3.162***	0.000	0.001	-
2: NLE Slope	3.166***	0.000	-	0.000
3: NLE Discon + Slope	3.158***	0.000	0.014†	0.000
PTG Item 3 - Today, I felt close and connected with other people who are important to me				
0: Week Only	3.506***	-0.001*	-	-
1: NLE DisCon	3.506***	-0.001**	0.003	-
2: NLE Slope	3.514***	-0.001**	-	0.000
3: NLE Discon + Slope	3.508***	-0.001**	0.000	0.000
PTG Item 4 - Today, I felt very capable in what I did				
0: Week Only	3.752***	-0.002***	-	-
1: NLE DisCon	3.758***	-0.002**	-0.012*	-
2: NLE Slope	3.752***	-0.002***	-	0
3: NLE Discon + Slope	3.759***	-0.002**	-0.017*	0.000
PTG Item 5 - Everywhere I went, I was out looking for new things or experiences				
0: Week Only	2.862***	0.002***	-	-
1: NLE DisCon	2.856***	0.002***	0.008	-
2: NLE Slope	2.861***	0.002***	-	0.000
3: NLE Discon + Slope	2.846***	0.002**	0.016*	0.000

Discussion

We examined whether the experience of major negative life events over the course of one year was associated with changes in state PTG and subsequent changes in trait EWB, as well as the prospective impact of major negative life events on state PTG. As seen in the results for

Models 1 and 2, mean-levels of state PTG exhibited high levels of stability over the course of the year. Despite this stability, we found that the experience of negative life events across a one-year period predicted increases in state-level manifestations of PTG over the course of the year. This relationship between changes in state PTG and trait EWB over a one-year period was in line with accounts of dynamic personality change (e.g., Wrzus & Roberts, 2017). While this relationship was observed even after accounting for the initial status of both PTG and EWB, we note however that this may also in part reflect both similarity in content as well as methods effects (e.g., self-report), which might obscure the substantive relationship between the two constructs.

Additionally, increases in state-level PTG predicted increases in trait-level EWB, and mediated the effect of negative life events on trait EWB. In other words, as the number of major negative life events increased, state PTG tended to increase, and these gains predicted increases in trait-level EWB over the year. At first glance, these results provide an account of the process by which trait-level EWB may change in the wake of major negative events, consistent with both contemporary accounts of dynamic personality change (Jayawickreme et al., 2018; 2020; Wrzus & Roberts, 2017) and theoretical accounts of PTG (Joseph et al., 2012; Tedeschi & Calhoun, 2004): that is, negative events may lead to PTG-related thoughts, feelings, and behaviors in daily life, which then lead to increased well-being.

However, the results of Models 3 and 4 casts doubts on the causal role of life events on immediate changes in PTG. Specifically, overall state PTG remained stable when examining change prospectively both following the initial negative life event, and across all life events. At the item level, a modest decrease in personal strength was observed. These results suggest that at least in the short term, people on average do not shift in their daily manifestation of PTG in the immediate wake of major negative life events (and furthermore experience a negative shift in

their sense of personal strength). They further align with past research showing that PTG is not a typical response in the wake of adversity and is a rarer phenomenon than is often assumed (Frazier et al., 2009), and shed light on the time-course of PTG. It has been suggested that PTG may often take significant time to emerge (e.g., Tedeschi & Calhoun, 2004), although people have also reported increases in PTG in the immediate aftermath of adversity (e.g., Danhauer et al., 2013, 2015) and more time may not necessarily translate into more opportunity for growth to unfold (see Marziliano et al., 2020, for a recent meta-analysis).

These results contribute to the debate about the developmental trajectory of PTG occurring over an extended period (Seery et al., 2010) by suggesting that levels of PTG may not immediately increase following a negative event, even though PTG may more gradually emerge over the course of the year. In other words, in the immediate aftermath of adversity, the focus for most people may be more on managing or coping with the event, rather than experiencing positive changes. This is consistent with our finding that participants experienced a *decreased* sense of mastery in the wake of negative events, suggesting that they may have been devoting their emotional and attentional resources to re-stabilizing their lives (rather than transforming the event into growth at such an early stage). It may be that once this stabilization happened, individuals were better able to devote their psychological resources to growth as the year continued.

Another possibility is that while immediate growth was not observed *on average* among the participants, we did not assess key moderators that may influence whether a given individual experiences PTG in the immediate aftermath of an event. For example, individuals who receive greater social support following the negative life event may experience growth following adversity, while those left without such support do not grow (Mancini, 2019). More generally,

the divergent findings of our models highlight the importance of using appropriate approaches to modeling and analyzing data on PTG. Specifically, the present results show how differences in methodological approaches can lead to different conclusions about whether people grow following adversity (Chopik, 2021; Infurna & Jayawickreme, 2019).

One strength of this study was the weekly assessment of the number and affective ratings of negative life events, which reduced the possibilities for inaccurate self-reporting (Jayawickreme et al., 2021; Wrzus et al., 2021). We did not however measure other characteristics of the events. It is likely that other life event characteristics, over and above their affective quality, may predict changes in state PTG and trait EWB (Luhmann et al., 2020). Future research should examine whether specific characteristics of major life events (e.g., predictability, perceived controllability, acute vs. chronic nature, etc.) predict positive changes. For example, Boals et al. (2010) found that the subjective evaluation of the event's impact on one's sense of self was more critical for self-reported PTG rather than whether the event met the official clinical criteria defining trauma.

Another strength of this study was that we examined weekly state-level assessments of PTG in this study. Although this allowed us to gain a snapshot of participants' experiences across one year, it is possible that more intensive assessment (such as using experience sampling [ESM] multiple times per day, e.g., Blackie et al., 2017) could provide a more detailed within-person account of changes in daily behavior in the wake of adversity due to fewer issues with retrospective bias in recall (Fleeson, 2014). A multi-wave ESM design would provide this type of data. However, we note that while ESM studies have advantages and some research on PTG has used this design (Blackie et al., 2017) careful consideration is needed regarding how PTG is defined in these studies. As noted by Blackie et al. (2017), some domains of PTG are less

suitable for ESM because they are less likely to show sufficient variability hour by hour (e.g., searching for new possibilities in life) whereas other domains (e.g., spiritual well-being) are likely more variable across the day and thus more suited to ESM designs.

We note some limitations with the current study. First, the sample recruited for this study mostly comprised established adult U.S. residents. Although this sample was quite representative of the general population in terms of gender and other characteristics, future research should examine samples in other cultures where beliefs about growth and redemption from adversity may differ from the U.S. context (McLean et al., 2020). Second, many of the participants experienced adverse events that fell short of the clinical diagnostic criteria for trauma, and we did not assess symptoms of posttraumatic stress disorder or other mental health disorders; thus, these data may not reveal how these processes may play out in individuals experiencing severe trauma or psychopathology. Third, these results do not reveal how coping with a new negative event may differ for people with or without prior histories of trauma from earlier periods in their lives; past research suggests that lifetime adversity may influence functional impairment with moderate levels predicting the most adaptive levels of functioning (Seery et al., 2010). Finally, we had a somewhat high attrition rate across the year that we conducted the study.

In summary, the present study both provides a novel paradigm for examining processes associated with PTG using both valid assessments and an appropriate research design and highlights the importance of utilizing appropriate analytic strategies for testing specific research questions. We hope that future research will adapt similar designs (ideally over longer time periods with an examination of additional social-contextual factors) and the methodological limitations of past work on PTG and uncover new insights into how people can recover and potentially benefit from adversity.

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Examining Associations between Major Negative Life Events, Changes in Weekly Reports of Posttraumatic Growth and Global Reports of Eudaimonic Well-Being

Supplementary Tables

Supplementary Table 1

Differences between participants with PTG data at each time point vs. participants with missing PTG data

	Complete		Missing			
	M	*SD*	*M*	*SD*	*t or* χ^2	*p*
Female	46%		52%		2.625	0.105
Age	49.38	14.47	45.41	14.78	3.741	<.001
Household Income	$58,021.03	$37,106.20	$56,394.49	$41,691.38	0.552	0.581
Urban (vs. Rural)	61%		64%		0.369	0.544
Education					15.827	0.007
No Degree	2.6%		0.8%		-	-
High School Degree	15.9%		20.2%		-	-
Some College	26.4%		17.2%		-	-
Associates Degree	11.7%		11.8%		-	-
Bachelor's Degree	28.4%		36.6%		-	-
Graduate Degree	15.1%		13.4%		-	-
Ethnicity					3.353	0.340
White	82.7%		87.0%		-	-

Black	9.5%		7.6%		-	-
Asian	4.4%		3.8%		-	-
Other	3.4%		1.7%		-	-
EWB T0	3.70	0.78	3.59	0.84	1.885	0.060
PTG T1	3.48	0.69	3.41	0.74	1.275	0.203
PTG1 T1	3.67	0.86	3.59	0.93	1.253	0.210
PTG2 T1	3.26	1.26	3.22	1.25	0.417	0.677
PTG3 T1	3.74	0.96	3.58	1.03	2.210	0.027
PTG4 T1	3.95	0.89	3.83	0.99	1.673	0.095
PTG5 T1	2.76	1.03	2.82	1.07	0.816	0.415

Note. Chi-square tests were used for categorical variables, and *t*-tests were used for continuous variables.

Supplementary Table 2

Illustration of the long data structure and discontinuity predictor variables

ID	Week	NLEs	1st NLE	1st NLE ΔSlope	Cumulative NLE	Cumulative NLE ΔSlope	PTG
1	1	0	0	0	0	0	$DV_{1.1}$
1	2	0	0	0	0	0	$DV_{1.2}$
1	3	0	0	0	0	0	$DV_{1.3}$
1	4	0	0	0	0	0	$DV_{1.4}$
1	5	0	0	0	0	0	$DV_{1.5}$
1	6	0	0	0	0	0	$DV_{1.6}$
1	7	0	0	0	0	0	$DV_{1.7}$
2	1	1	1	1	1	1	$DV_{2.1}$
2	2	0	1	2	1	2	$DV_{2.2}$
2	3	0	1	3	1	3	$DV_{2.3}$
2	4	0	1	4	1	4	$DV_{2.4}$
2	5	0	1	5	1	5	$DV_{2.5}$
2	6	0	1	6	1	6	$DV_{2.}$

2	7	0	1	7	1	7	$DV_{2.7}$
3	1	0	0	0	0	0	$DV_{3.1}$
3	2	0	0	0	0	0	$DV_{3.2}$
3	3	0	0	0	0	0	$DV_{3.3}$
3	4	1	1	1	1	1	$DV_{3.4}$
3	5	0	1	2	1	2	$DV_{3.5}$
3	6	0	1	3	1	3	$DV_{3.6}$
3	7	0	1	4	1	4	$DV_{3.7}$
4	1	0	0	0	0	0	$DV_{4.1}$
4	2	1	1	1	1	1	$DV_{4.2}$
4	3	0	1	2	1	2	$DV_{4.3}$
4	4	0	1	3	1	3	$DV_{4.4}$
4	5	1	1	4	2	5	$DV_{4.5}$
4	6	0	1	5	2	7	$DV_{4.6}$
4	7	0	1	6	2	9	$DV_{4.7}$
…	…	…	…	…	…	…	…

Note. NLE = Negative Life Event. PTG = Posttraumatic Growth.

Supplementary Table 3

Means and Standard Deviations for Weekly PTG and Sample Size at Each Assessment as well as Intercept and Slope from a Linear Growth Curve Model.

	M	*SD*	*n*

PTG1	3.43	0.73	1036
PTG2	3.42	0.74	1005
PTG3	3.38	0.75	734
PTG4	3.39	0.73	948
PTG5	3.34	0.73	956
PTG6	3.36	0.72	919
PTG7	3.36	0.70	911
PTG8	3.36	0.72	862
PTG9	3.34	0.74	877
PTG10	3.33	0.72	857
PTG11	3.32	0.73	844
PTG12	3.32	0.72	845
PTG13	3.33	0.74	821
PTG14	3.31	0.74	844
PTG15	3.32	0.75	843
PTG17	3.33	0.73	806
PTG18	3.34	0.75	804
PTG19	3.32	0.75	792
PTG20	3.33	0.74	791
PTG22	3.34	0.73	768
PTG23	3.34	0.74	773
PTG24	3.35	0.73	772
PTG25	3.34	0.75	768
PTG26	3.36	0.73	756
PTG27	3.34	0.73	757
PTG28	3.37	0.73	740
PTG29	3.36	0.73	736
PTG31	3.38	0.72	727
PTG32	3.36	0.73	726
PTG33	3.36	0.73	713
PTG34	3.36	0.75	714
PTG35	3.35	0.74	700
PTG36	3.37	0.73	699
PTG37	3.34	0.77	699
PTG38	3.38	0.74	703
PTG39	3.36	0.77	692
PTG40	3.44	0.73	691
PTG42	3.37	0.75	684
PTG43	3.39	0.74	676
PTG44	3.39	0.77	668
PTG48	3.31	0.78	628
PTG49	3.39	0.77	642
PTG50	3.35	0.75	639

PTG51	3.36	0.75	637
PTG Intercept (T0)	3.36	0.58	1149
PTG Slope	0.00	0.00	1149

Supplementary Table 4

EWB Means, Standard Deviations, and Sample Size at Each Time Point as well as Intercept and Slope from a Linear Growth Curve Model.

	M	*SD*	*n*
EWB T0	3.61	0.83	1247
EWB T45	3.62	0.82	644
EWB T52	3.61	0.79	592
EWB Intercept (T0)	3.61	0.77	1247
EWB Slope	0.00	0.01	1247

Supplementary Table 5

Fit Statistics from Models Testing the Indirect Effect of Negative Life Events on Changes in Eudaimonic Well-Being Through Changes in PTG

Model	χ^2	*df*	*p*	CFI	RMSEA	RMSEA 90% CI	SRMR
PTG Scale	2517.283	1288	<.001	0.950	0.028	0.026-0.029	0.056
PTG Item 1	2439.229	1288	<.001	0.930	0.027	0.025-0.028	0.065
PTG Item 2	2346.462	1288	<.001	0.962	0.026	0.024-0.027	0.037
PTG Item 3	2195.139	1288	<.001	0.945	0.024	0.022-0.025	0.057
PTG Item 4	2137.891	1288	<.001	0.950	0.023	0.021-0.025	0.058
PTG Item 5	2192.544	1288	<.001	0.951	0.024	0.022-0.025	0.053

Note. PTG = Posttraumatic Growth.

Supplementary Table 6

Fit Statistics from Models Testing the Indirect Effect of Subjective Ratings of Life Events on Changes in EWB Through Changes in PTG

Model	χ^2	*df*	*p*	CFI	RMSEA	RMSEA 90% CI	SRMR
PTG Scale	2522.618	1288	<.001	0.949	0.028	0.026-	0.057

						0.029	
PTG Item 1	2398.026	1288	<.001	0.932	0.026	0.025-0.028	0.064
PTG Item 2	2366.311	1288	<.001	0.961	0.026	0.024-0.028	0.037
PTG Item 3	2151.784	1288	<.001	0.948	0.023	0.021-0.025	0.057
PTG Item 4	2126.962	1288	<.001	0.951	0.023	0.021-0.025	0.058
PTG Item 5	2157.907	1288	<.001	0.953	0.023	0.022-0.025	0.053