

Is Perceived Growth Associated with Momentary Indicators of Health and Well-Being in People with Asthma or Rheumatoid Arthritis?

Dusti R. Jones , Jillian A. Johnson  and
Jennifer E. Graham-Engeland 

The Pennsylvania State University, USA

Crystal L. Park 

University of Connecticut, USA

Joshua M. Smyth* 

The Pennsylvania State University, USA

Background: Perceived growth (PG) refers to perceptions of positive changes that unfold over time after experiencing trauma. Higher PG is often associated with positive long-term health, but the processes through which PG may influence health are unclear. The present study examines two potential pathways among individuals living with asthma or RA: (1) by promoting momentary indicators of health and well-being in everyday life, and (2) by buffering against stress. **Method:** In a micro-longitudinal design, 128 participants with asthma ($n = 97$) or rheumatoid arthritis ($n = 31$) reported perceived growth using the Post-Traumatic Growth (PTG) Inventory and subsequently completed ecological momentary assessments (EMAs) for one week. Participants were signaled five times a day to report on health-related indicators, including affect, disease interference, social interactions, and stress. **Results:** Multilevel modeling revealed that higher PTG was associated with significantly less negative affect and greater positive affect in everyday life. There were no significant associations between PTG and momentary disease interference, pleasantness of social interactions, or stress, nor evidence that PTG buffered against effects of stress on health-related outcomes. **Conclusions:** This research highlights the utility of examining PG in everyday life. Results suggest that closer examination of momentary affect as a process by which PG may facilitate positive health outcomes is warranted.

Keywords: affect, ecological momentary assessment, health, post-traumatic growth, stress-related growth

* Address for correspondence: Joshua Smyth, Department of Biobehavioral Health, Biobehavioral Health Building, The Pennsylvania State University, University Park, PA 16802, USA. Email: Smyth@psu.edu

INTRODUCTION

Post-traumatic growth is the perception of positive life changes after experiencing traumatic or significant negative life events (Park, Cohen, & Murch, 1996; Tedeschi & Calhoun, 1996). Positive life changes can include greater appreciation for life, enhanced personal strength, stronger relationships, and the use of better coping strategies (Park, 2010; Tedeschi & Calhoun, 1996). A growing body of research indicates that more perceived growth in the months or years following negative life events may be associated with long-term health outcomes, such as decreased morbidity, mortality, and psychological distress (Barskova & Oesterreich, 2009; Helgeson, Reynolds, & Tomich, 2006). However, the processes through which perceived growth may influence long-term health-related outcomes have received limited empirical attention. Examining the impact of perceived growth on momentary outcomes may provide insight into two potential sets of processes by which growth may influence long-term health outcomes, namely through the accumulation of moments characterised by good health and well-being and by buffering against stress. That is, individuals who have perceived more growth in the months and years following their experience of trauma may be more likely to experience positive moments in their everyday lives, enabling them to cope with and recover from stress or trauma more quickly (Fredrickson, 2004; Tugade, Fredrickson, & Barrett, 2004). Moreover, previous research suggests that perceived growth may buffer against stress (Morrill et al., 2008; Wang et al., 2017). One way to examine such associations is through ecological momentary assessment (EMA). EMA is real-time, repeated data assessment of behaviors and states as they occur naturally in everyday life (Shiffman, Stone, & Hufford, 2008). EMA may be particularly useful for examining processes by which perceived growth may influence health because it allows for the characterisation of the effects of perceived growth in everyday life (Smyth, Zawadzki, Juth, & Sciamanna, 2017). The present study utilised a sample of individuals with chronic disease (rheumatoid arthritis or asthma) to explore whether perceived growth from a traumatic experience was associated with indicators of momentary health and well-being, and whether perceived growth buffered against stress.

Perceived Growth and Health

Although life-altering events may initially increase distress, perceived growth in response to the event has been hypothesised to promote better health outcomes over time (Janoff-Bulman, 2004; Linley & Joseph, 2004). A meta-analysis of 87 studies suggested that higher perceived growth was associated with lower depression and better overall well-being (Helgeson et al., 2006). Empirical studies suggest that higher perceived growth may be associated with better immunity among patients with cancer (Dunigan, Carr, & Steel, 2007; McGregor et al.,

2004), lower morbidity among those who have experienced myocardial infarction (Affleck, Tennen, Croog, & Levine, 1987), and less distress among patients with rheumatoid arthritis (Danoff-Burg & Revenson, 2005). Moreover, longitudinal studies indicate that the positive health benefits associated with perceived growth may persist over time (Barskova & Oesterreich, 2009; Wang et al., 2017).

Perceived growth may facilitate better health outcomes through a number of pathways, including promoting positive affect (Stanton & Low, 2004), increasing social support (Schroevers, Helgeson, Sanderman, & Ranchor, 2010), and decreasing distress (Wang et al., 2017). These constructs are all robustly linked with health outcomes such as morbidity and mortality (Blazer, 1982; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Pressman & Cohen, 2005). Although constructs such as affect, social support, and distress are typically assessed as relatively stable phenomena in research examining perceived growth, these indicators of health and well-being occur in the context of everyday life and therefore could be examined using intensive assessment techniques such as EMA. EMA is particularly well suited to approximate causal processes, and further provides temporal granularity, improves reliability, and provides information in the context of everyday life (Shiffman et al., 2008).

Although, to our knowledge, no studies have examined these pathways in the context of perceived growth and in everyday life, related research supports the premise that perceived growth may indeed promote momentary indicators of health and well-being. Although most research has examined perceived growth more generally, several studies have examined growth in medical contexts as well. For example, research on the effects of benefit-finding after experiencing medical adversity suggests that those who more frequently remind themselves of perceived benefits report more daily positive affect (Affleck & Tennen, 1996). Moreover, those who perceive more benefits to illness report less pain in daily life (Tennen, Affleck, Urrows, Higgins, & Mendola, 1992). Thus, individuals who experience more perceived growth and acknowledge the benefits of life-altering events may also experience a build-up of moments characterised as health promoting and that translate to better overall health and well-being over time (Tugade et al., 2004). These moments of health and well-being may include (although are likely not limited to) increased positive affect, decreased disease interference in engaging in daily activities, and better social support.

Stress buffering may be another important process by which perceived growth promotes health. Morrill et al. (2008) found that higher perceived growth weakened the relationship between stress symptoms and reduced quality of life among cancer patients. Similarly, Wang et al. (2017) found that women who perceived more growth after breast cancer surgery showed a weaker association among perceived physical vulnerability and psychological distress than did women who perceived less growth. Although these previous studies were conducted in cancer populations, it is possible that stress buffering occurs in other populations as

well. Perceived growth has been associated with better health among myriad populations, including women who have recently given birth (Sawyer & Ayers, 2009), chronically ill patients (Barskova & Oesterreich, 2009), and veterans (Tsai, El-Gabalawy, Sledge, Southwick, & Pietrzak, 2015). Perceived growth may protect against the general wear and tear of stress that occurs over time. For example, those high in perceived growth may not experience decreases in positive affect during times of stress, mitigating psychological and physiological reactivity and speeding recovery time from stressors. Those higher in perceived growth may therefore experience less severe consequences when encountering stressful situations in everyday life.

The Present Study

The goal of the present research was to examine whether perceived growth is associated with momentary indicators of health and well-being in the everyday lives of patients living with asthma or rheumatoid arthritis (RA) using EMA. We examine perceived growth in samples of individuals with these diseases for three reasons. First, asthma and RA are chronic diseases, which allows us to examine everyday outcomes among patient groups where treatment and symptoms are ongoing. Moreover, examining perceived growth across two disease populations allows us to see whether perceived growth is robust across multiple diseases; that is, not due to aspects specific of a particular disease. Second, although prevalence rates of RA and asthma differ (0.5% versus 8.4%, respectively; Hunter et al., 2017; Moorman et al., 2012), disease burden related to controlling disease symptoms and engaging in everyday activities is often high in both patient populations (Aburuz, Gamble, & Heaney, 2007; Ferreira et al., 2016; Lee, Obi, Paknis, Kavati, & Chipps, 2018). Finally, perceived growth from a stressful/traumatic event may promote the build-up of positive emotion, allowing individuals living with asthma and RA to better engage in everyday life activities.

Given this background, the present study had two aims. Aim 1 was to examine whether higher perceived growth (measured at baseline) was associated with better indicators of momentary health and well-being in individuals living with asthma or RA (measured the week following baseline). We expected that individuals higher in perceived growth would have less disease interference, less stress, less negative affect, more positive affect, and more pleasant social interactions in everyday life than those lower in perceived growth. Aim 2 was to examine whether perceived growth buffered against stress to promote momentary indicators of health and well-being. We expected that those higher in perceived growth would have weaker associations between momentary stress and disease interference, negative affect, positive affect, and pleasantness of social interactions compared to those with lower perceived growth.

METHODS

Participants

This study received all appropriate ethics approvals. Participants consisted of a community sample and were recruited via medical professionals, news advertisements, flyers, and brochures as part of a larger study examining a stress/affect regulation intervention for individuals living with either asthma or RA. The data used in this paper are from the baseline (i.e. pre-intervention) period. Eligibility criteria included physician diagnosed asthma ($n = 97$) or RA ($n = 31$) for at least two years without major medication or treatment changes in the previous three months (to ensure that participants were in a fairly stable state of disease), and being over 18 years of age. Participants were excluded if they had received emergency room treatment(s) in the previous three months, were diagnosed with a mental illness in the previous three months, reported drug or alcohol abuse, or were pregnant.

Participants ($N = 128$) were predominantly Caucasian (85%; 7% African American; 4% other, less than 1% each Asian American, Latino/a, American Indian), female (73%), middle aged ($M_{\text{age}} = 44.16$, $SD = 14.2$, $\text{range} = 18\text{--}80$), with annual incomes reflective of the economic diversity of the region (13.3% reported annual income $< \$20,000$, 33.3% reported annual income between $\$20,000$ and $\$40,000$, 53.3% reported annual income $> \$40,000$). Participants with asthma were not significantly different from those with RA in gender ($X^2(1, N = 128) = 0.05$, $p = .825$) or race/ethnicity ($X^2(1, N = 128) = 0.12$, $p = .727$). However, there were significant differences by diagnoses in terms of age ($t(126) = 2.71$, $p = .008$), with those diagnosed with RA being older on average ($M = 50.03$, $SD = 13.08$) than those diagnosed with asthma ($M = 42.28$, $SD = 14.09$).

Procedure

Recruitment advertisements specified that the study was designed to examine daily health and well-being in those living with chronic disease and instructed interested participants to contact the research office via telephone numbers provided. Participants were pre-screened for eligibility by a trained staff member. Eligible participants were scheduled for an in-lab session where they provided informed consent and completed baseline measures, which included a measure of perceived growth (based on a past traumatic/stressful event) and a number of psychological, social, and disease-related assessments, as well as basic demographics. Disease diagnosis was confirmed by a physician, and objective measures of disease severity were taken. Participants were then given instructions regarding participation in the EMA portion of the study and trained to use study equipment (e.g. Palm Pilots). After completion of the baseline assessments and

initial training, participants provided seven days of EMA data via Palm Pilots provided to them. This week of data collection was the baseline assessment from the larger study, and occurred prior to randomisation or delivery of treatment in the parent study. During this week of EMA data collection, participants were beeped five times a day on stratified intervals between the hours of 8 am and 9 pm. The beeps served as a prompt for participants to provide momentary indicators of health and well-being. Upon completion of the larger study, participants were thanked and provided compensation for their time.

Measures

Baseline Measures. The Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) was used to assess perceived growth in response to participants' most stressful/traumatic experience at the time of the study. Traumatic events therefore were not specifically related to disease unless participants chose their disease as their most traumatic event. The PTGI is a 21-item scale designed to assess overall perceived growth in five factors: relating to others, new possibilities, personal strength, appreciation in life, and spiritual change. The PTGI utilises a 6-point Likert scale 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 PTGI demonstrated good internal consistency (total score: $\alpha = .91$).

In participants with asthma, lung function was assessed at baseline to provide an objective indicator of disease severity. Lung function was measured in the laboratory via spirometry assessment, which includes volume, time, and flow rate of inspiration and expiration. In patients with RA, a rheumatologist assessed disease severity at baseline, which included assessments of joint swelling and tenderness. Disease severity for patients with asthma and RA were z-scored to create a measure of baseline disease severity.

EMA Measures. For all EMA measures, internal consistency was estimated per instructions from Wilhelm and Schoebi (2007); this estimation can be interpreted similarly to Cronbach's alpha. Momentary indicators of health included disease interference with everyday life activities; momentary indicators of well-being included stress, negative affect, positive affect, and pleasantness of social interactions, all of which have been used in prior work (Russell, Smith, & Smyth, 2016; Smyth, Juth, Ma, & Sliwinski, 2017).

Disease interference comprised two items on a 7-point Likert scale that assessed disease interference with activities of daily living since the last beep. These items were disease specific and asked, "How much did asthma/RA interfere with your daily routine since the last beep?" and "How much did asthma/RA force you to restrict activities since the last beep?" Responses ranged from 0

(*Not at all*) to 6 (*Extremely*). These items demonstrated acceptable internal consistency ($\alpha = .86$).

Stress was assessed by asking participants if anything stressful had occurred since the last beep, and if participants indicated that they had experienced a stressful event, they were asked how stressful that event was on a scale from 0 (*Not at all*) to 6 (*Extremely*). Participants rated their current affect on a 7-point Likert scale ranging from 0 (*Not at all*) to 6 (*Extremely*). Five items were averaged to indicate negative affect (depressed, unhappy, angry, frustrated, worried), and four were averaged to indicate positive affect (happy, joyful, enjoyment, pleased). Internal consistency for negative and positive affect was acceptable (0.82 and 0.92, respectively). Finally, social interaction was assessed by asking participants if they were with others and, if they indicated yes, participants were then asked how pleasant this company was on a scale from 0 (*Not at all*) to 6 (*Extremely*).

Data Preparation and Analysis Plan

All data were managed and analyzed in SASv.9.4. Multilevel modeling (via PROC MIXED) was used to test all hypotheses. Gender, race/ethnicity, disease severity, and age were included as covariates as previous research has indicated that these may be associated with post-traumatic growth (PTG), health, and health indicators (Barskova & Oesterreich, 2009; Helgeson et al., 2006). Gender (0 = women, 1 = men), race/ethnicity (0 = White, 1 = Non-white), and disease status (0 = asthma, 1 = RA) were dummy coded. Age was grand-mean centered; baseline disease severity was z-scored; momentary independent measures (e.g. disease interference, stress) were person-mean centered. PTG, age, race/ethnicity, gender, disease status, and disease severity were tested at Level 2 (person variables); momentary indicators of health and well-being were tested at Level 1. To correct for multiple comparisons, we have set alpha at $p = .01$.

Our first study aim was to examine whether PTG predicts better momentary health and well-being for individuals living with asthma or RA. Thus, we tested whether the PTGI (Level 2; measured at baseline) predicted momentary indicators of health (disease interference) and well-being (stress, negative affect, positive affect, and pleasantness of social interactions; all at Level 1 and measured the week following baseline assessment) after covarying out age, race/ethnicity, gender, disease status, and disease severity (Level 2; measured at baseline). Our second study aim was to determine whether self-reported PTG buffered against negative stress effects on momentary health and well-being. To test this aim, stress intensity (Level 1), PTGI score (Level 2), and their interaction were entered into the model to predict momentary disease interference in everyday life (indicator of health), as well as negative affect, positive affect, and pleasantness of social interactions (indicators of well-being; all health and well-being

indicators at Level 1) after covarying out age, race/ethnicity, gender, disease status, and disease severity (Level 2).

RESULTS

Attrition and Missing Data Patterns

Five participants with RA had missing data on the PTGI; there were no missing data on the PTGI from participants with asthma. Two participants with asthma were missing data on disease severity. There was no attrition from either group. Therefore, final analyses were conducted on 92 participants with asthma and 29 participants with RA. Regarding number of ecological momentary assessments provided, participants with RA were marginally more likely to provide a greater number of assessments ($b = 3.09$, $SE = 1.80$, $p = .090$) than those with asthma. Participants with RA provided an average of 21.65 ($SD = 14.41$) assessments, while those with asthma provided an average of 18.86 ($SD = 11.16$) assessments.

Preliminary Analyses

Preliminary analyses indicated that participants reported low disease interference in everyday life ($M = 1.44$, $SD = 1.52$), low stress ($M = 0.72$, $SD = 1.53$), low negative affect ($M = 1.02$, $SD = 1.13$), moderate positive affect ($M = 2.62$, $SD = 1.45$), and moderately pleasant social interaction ($M = 3.82$, $SD = 1.68$). Individuals with an ethnic or racial minority background had significantly worse disease severity and tended to be marginally younger in this sample. In addition, younger participants had marginally worse baseline disease severity (see Table 1 for baseline correlations). Preliminary analyses further indicated that participants with RA reported significantly more momentary disease interference ($b = 1.09$, $SE = 0.24$, $p < .001$) and marginally less momentary positive affect ($b = -0.33$, $SE = 0.19$, $p = .076$), but otherwise there were no other statistically significant differences between patients with asthma or RA on momentary indicators of health. Participants reported a moderate amount of perceived growth on the PTGI ($M = 4.12$, $SD = .94$, $min = 1.71$, $max = 6.00$). PTGI scores were not significantly correlated with any demographic variables (Table 1) and PTGI scores did not differ between disease types (asthma/RA). All outcome variables demonstrated significant between- and within-person variability in unconditional models (Table 1). Intraclass correlation coefficients and pseudo R^2 effect sizes for all models are presented in Table 1.

Our first aim was to examine whether more perceived growth was associated with better momentary indicators of health and well-being. Results indicated that PTGI scores were not significantly associated with disease interference,

TABLE 1
Correlations among Demographic Variables and Perceived Growth and
Intraclass Correlation Coefficients and Percentage of Variance Accounted for in
Models Examining the Effects of Perceived Growth on Momentary Health and
Well-Being Indicators

	<i>Age</i>	<i>Gender</i>	<i>Race</i>	<i>Disease severity</i>
Age	—	—	—	—
Gender	.11	—	—	—
Race	-.16†	-.05	—	—
Disease severity	-.15†	-.12	-.20*	—
Post-traumatic growth	.05	-.15	-.05	<.01

<i>Outcome variable</i>	<i>ICC unconditional model</i>	<i>ICC full model</i>	<i>Percent of variance explained by condition</i>
Disease interference	0.686	0.630	8.16
Stress	0.083	0.071	14.86
Negative affect	0.426	0.392	8.02
Positive affect	0.371	0.328	11.74
Pleasantness of social interactions	0.299	0.290	3.12

Note: Gender (Female = 0, Male = 1) and race (White = 0, Non-white = 1). † $p < .10$; * $p < .05$. ICC is the inter-class correlation coefficient.

momentary stress, or pleasantness of social interaction in everyday life (Table 2). PTGI scores were significantly associated with momentary negative and positive affect, such that those with more perceived growth reported less momentary negative affect and more momentary positive affect (Table 2).

Our second aim was to examine whether higher perceived growth buffered the negative consequences of momentary stress on momentary indicators of health and well-being. Although there were main effects of momentary stress on health and well-being indicators (with more stress predicting worse health and well-being), none of these associations were moderated by PTGI scores (see Table 3).

DISCUSSION

The present study examined whether perceived growth was associated with multiple indicators of momentary health and well-being and whether perceived growth buffered against stress in individuals living with either asthma or rheumatoid arthritis. To our knowledge, this work is the first to examine the effects of perceived growth on momentary processes in everyday life. We hypothesised that individuals with more perceived growth would report less disease interference in everyday life, less momentary stress and negative affect, more momentary positive affect, and more pleasant social interactions. We found

TABLE 2

Aim 1: Post-Traumatic Growth Predicting Momentary Indicators of Health and Well-Being in Patients with Asthma or Rheumatoid Arthritis after Covarying Age, Race/Ethnicity, Gender, Disease Severity, and Disease Status

Disease Interference in Patients with Asthma and Rheumatoid Arthritis				
	Coefficient (SE)		df	p
Intercept	1.07 [^]	(.14)	108	<.001
Age	<.01	(.01)	108	.799
Race/Ethnicity	0.71	(.31)	108	.027
Gender	−0.27	(.24)	108	.257
Disease severity	−0.17	(.11)	108	.113
Disease status	1.10	(.24)	108	<.001
Post-traumatic growth	−0.10	(.11)	108	.379
<i>Momentary Stress</i>				
Intercept	0.74 [^]	(.06)	108	<.001
Age	−0.01	(<.01)	108	.007
Race/Ethnicity	0.02	(.14)	108	.863
Gender	−0.12	(.11)	108	.256
Disease severity	0.05	(.05)	108	.267
Disease status	0.06	(.11)	108	.583
Post-traumatic growth	−0.08	(.05)	108	.101
<i>Momentary Negative Affect</i>				
Intercept	1.08 [^]	(.09)	108	<.001
Age	−0.01	(.01)	108	.062
Race/Ethnicity	0.34	(.21)	108	.107
Gender	−0.14	(.15)	108	.369
Disease severity	−0.06	(.07)	108	.421
Disease status	−0.11	(.16)	108	.479
Post-traumatic growth	−0.19	(.07)	108	.010
<i>Momentary Positive Affect</i>				
Intercept	2.78 [^]	(.11)	108	<.001
Age	0.01	(.01)	108	.339
Race/Ethnicity	−0.18	(.24)	108	.450
Gender	−0.13	(.18)	108	.483
Disease severity	−0.10	(.08)	108	.230
Disease status	−0.41	(.18)	108	.028
Post-traumatic growth	0.32	(.08)	108	<.001
<i>Momentary Pleasantness of Social Interactions</i>				
Intercept	3.87 [^]	(.13)	107	<.0001
Age	<.01	(.01)	107	.986
Race/Ethnicity	−0.46	(.28)	107	.101
Gender	−0.37	(.21)	107	.080
Disease severity	−0.02	(.10)	107	.868
Disease status	−0.01	(.22)	107	.953
Post-traumatic growth	0.12	(.10)	107	.236

Note: [^] Indicates random slope or intercept.

TABLE 3
 Aim 2: Post-Traumatic Growth Buffering against Momentary Stress to Predict
 Momentary Indicators of Health and Well-Being in Patients with Asthma or
 Rheumatoid Arthritis after Covarying Age, Race/Ethnicity, Gender, Disease
 Severity, and Disease Status

Disease Interference in Patients with Asthma and Rheumatoid Arthritis				
	<i>Coefficient (SE)</i>		<i>df</i>	<i>p</i>
Intercept	1.08 [^]	(.14)	108	<.0001
Age	<.01	(.01)	108	.606
Race/Ethnicity	0.73	(.31)	108	.020
Gender	−0.28	(.23)	108	.239
Disease severity	−0.19	(.11)	108	.071
Disease status	1.03	(.24)	108	<.001
Post-traumatic growth	−0.10	(.11)	108	.390
Momentary stress	0.05 [^]	(.01)	3417	<.001
Post-traumatic growth*Momentary stress	<.01	(.01)	3417	.885
<i>Negative Affect</i>				
Intercept	1.08 [^]	(.09)	108	<.001
Age	−0.01	(.01)	108	.065
Race/Ethnicity	0.33	(.21)	108	.109
Gender	−0.14	(.15)	108	.350
Disease severity	−0.06	(.07)	108	.401
Disease status	−0.11	(.16)	108	.506
Post-traumatic growth	−0.19	(.07)	108	.010
Momentary stress	0.30 [^]	(.02)	3417	<.001
Post-traumatic growth*Momentary stress	<.01	(.02)	3417	.815
<i>Positive Affect</i>				
Intercept	2.78 [^]	(.11)	108	<.001
Age	0.01	(.01)	108	.279
Race/Ethnicity	−0.12	(.23)	108	.597
Gender	−0.13	(.18)	108	.469
Disease severity	−0.09	(.08)	108	.270
Disease status	−0.42	(.18)	108	.022
Post-traumatic growth	0.32	(.08)	108	<.001
Momentary stress	−0.25 [^]	(.02)	3417	<.001
Post-traumatic growth*Momentary stress	−0.01	(.02)	3417	.702
<i>Pleasantness of Social Interactions</i>				
Intercept	3.88 [^]	(.13)	107	<.0001
Age	<.01	(.01)	107	.980
Race/Ethnicity	−0.44	(.28)	107	.114
Gender	−0.37	(.21)	107	.084
Disease severity	−0.03	(.10)	107	.778
Disease status	−0.01	(.22)	107	.967
Post-traumatic growth	0.12	(.10)	107	.221
Momentary stress	−0.14 [^]	(.03)	1903	<.001
Post-traumatic growth*Momentary stress	<.01	(.03)	1903	.945

Note: [^] Indicates random slope or intercept.

only partial support for our hypotheses overall, with clear evidence that perceived growth was associated with affect in everyday life (but not other indicators of health and well-being). Our results indicated that those with higher perceived growth reported more momentary positive affect and less momentary negative affect. As noted, however, there were no statistically significant associations between perceived growth and momentary disease interference, stress, or pleasantness of social interactions. We also did not find evidence that perceived growth buffered against the consequences of momentary stress.

Our results support the notion that perceived growth influences affect in everyday life. Positive affect, in particular, may play a pivotal role in the effect of perceived growth on health outcomes. Studies examining positive affect in both everyday life and laboratories have suggested that more positive affect is associated with healthier cortisol profiles, lower inflammation, and lower cardiovascular activity (Pressman & Cohen, 2005; Steptoe, Wardle, & Marmot, 2005). Positive affect may also help build personal resources, “undo” stress-related physiological dysregulation, and promote adaptive coping strategies (Folkman & Moskowitz, 2000; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Fredrickson, Mancuso, Branigan, & Tugade, 2000). Similarly, negative affect also plays a role in health. That is, greater daily negative affect has been associated with more daily stress (Jones, Lehman, Kirsch, & Hennessy, 2017; Mroczek & Almeida, 2004) and higher ambulatory blood pressure (Kamarck et al., 2002), which is an indicator of cardiovascular disease risk (Kamarck et al., 2005). It is thus possible that among individuals with chronic disease, those with higher perceived growth experience better health outcomes because, at least in part, they experience more positive affect and less negative affect in everyday life. Such differences in everyday affect may accumulate to represent a reduction in risk (and/or enhancement of resources) that leads to more salutogenic long-term outcomes.

In contrast to our results on affect, we did not find that perceived growth was associated with other indicators of momentary health or well-being, or that perceived growth buffered against stress. We think there are a few reasons for the lack of associations. First, it is possible that the momentary health and well-being indicators assessed here (other than affect) are simply not related to perceived growth. It may be that perceived growth has a more robust influence on momentary psychological states (e.g. affect) rather than more objective experiences (e.g. disease interference), but more work is needed before definitive conclusions can be drawn.

Second, previous research on perceived growth indicates differential effects depending on population and disease severity (Barskova & Oesterreich, 2009; Wang et al., 2017). Although the present study examined participants with either asthma or RA, all participants were relatively healthy and their diseases largely well managed. It may be that perceived growth has a stronger relationship with momentary health and well-being indicators in patients with more severe or uncontrolled diseases. Indeed, Wang and colleagues (2017) found that in women

undergoing a mastectomy, a very invasive procedure removing the entire breast and muscle tissue, perceived growth buffered against psychological distress; in contrast, in women undergoing a lumpectomy, a less invasive procedure where only the mass is removed, perceived growth did not buffer against distress. Together, results from previous research and the present study suggest that perceived growth makes everyday life somewhat more pleasant among chronically ill individuals by promoting positive affect and decreasing negative affect, but may exert even stronger protective effects when individuals experience highly distressing life events. This study was not optimised to capture highly distressing life events, which occur infrequently; the examination of the role of perceived growth on distressing events over time may be a promising area of inquiry for future studies.

Limitations and Future Directions

The present study assessed global perceived growth using the PTGI, and therefore only assessed perceived growth in five factors: relating to others, new possibilities, personal strength, appreciation in life, and spiritual change. Other measures assess perceived growth differently, and include assessments of growth in personal resources or coping skills (Park et al., 1996). Recently, a measure of state perceived growth has also been developed (Blackie et al., 2017), which is particularly promising for use in EMA studies. These other measures of perceived growth detect important aspects of growth that we did not assess, but which may influence momentary indicators of health and well-being. For example, measures including assessments of coping skills may robustly buffer against stress. Moreover, other research indicates that perceived growth and the effects it exerts on health outcomes may differ by disease or disease severity (Barskova & Oesterreich, 2009; Wang et al., 2017). Momentary indicators of health and well-being may therefore be more or less robustly associated with perceived growth when assessed by other measures, or in other populations, and may exert different effects on health outcomes. Replication is therefore necessary to determine the robustness of the associations observed in this study. Given the well-established relationship of affect to chronic disease (e.g. self-management, symptoms, etc.), it would be informative to examine the extent to which everyday well-being predicts clinically relevant health outcomes for various diseases.

Additionally, although our measure of perceived growth temporally preceded the momentary reports of affect, it is possible that the relationship is reversed, such that when individuals have sustained periods (weeks or months) of higher positive affect and/or lower negative affect they may report more perceived growth. Future studies should address this issue by using more sophisticated methods of causal inferencing.

Another limitation is timing of traumatic events. Time since the traumatic occurrence may have important implications, especially for health and well-

being. A meta-analysis by Helgeson et al. (2006) indicated that time since trauma was an important moderator of perceived growth and some measures of well-being. Specifically, this review indicated that distress and anxiety were only related to perceived growth when the traumatic event occurred within the past two years, whereas positive well-being was related to perceived growth in studies whether or not the event occurred within the two-year timeframe. These prior findings of moderation by time suggest that our results for negative affect could be less robust for individuals with a longer duration since experiencing the traumatic event, but are perhaps less relevant to our results for positive affect. Future studies should ascertain a comprehensive assessment of the timing and nature of traumatic events to determine the potential influence of time since event on observed outcomes.

Finally, previous research has indicated that perceptions of growth may not indicate actual growth (Frazier et al., 2009), and that perceived growth may be a proxy for positive or successful coping or for ongoing, unsuccessful coping. It is possible, then, that actual growth, rather than perceived growth, may more strongly and consistently influence momentary indicators of health and well-being. More work examining associations between actual growth and momentary indicators of health and well-being as well as health outcomes more broadly is needed.

CONCLUSION

The present study examined two potential pathways by which perceived growth might influence health outcomes: (1) by promoting momentary indicators of health and well-being in everyday life, and (2) by buffering against stress in everyday life. In a sample of individuals with either asthma or RA, we examined associations between perceived growth and momentary indicators of health and well-being reported via EMA across one week. We found that higher perceived growth was associated with significantly higher daily positive affect and lower daily negative affect, but that perceived growth was not associated with momentary disease interference, stress, or pleasantness of social interactions. Further, we found no evidence that perceived growth buffered against the consequences of momentary stress in everyday life. These results indicate that examining momentary affect as a potential mechanism by which perceived growth influences long-term health outcomes may be a promising avenue for future research.

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