

ABSTRACT

MORGAN, JESSICA KELLEY. Positive Outcomes in Military Mental Health. (Under the direction of Dr. Sarah L. Desmarais).

Trauma exposure is a public health issue with mental and physical health consequences (Lowe et al., 2015). The United States has now been at war for more than a decade and there has been a subsequent increase in pathological outcomes stemming from participation in both Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) for service members and Veterans, including major depression, generalized anxiety disorder, and post-traumatic stress disorder (PTSD; Hoge et al., 2004). PTSD in the military is associated with psychiatric comorbidity, suicide, physical health and mortality, substance abuse, homelessness, and risk of violence (Tanielian & Jaycox, 2008a).

Over the past two decades, evidence suggests that some people who experience trauma also report a phenomenon referred to as *posttraumatic growth* (PTG; Tedeschi & Calhoun, 1996)—defined as “positive personal changes that result from the struggle to deal with trauma and its psychological consequences” (Tedeschi & McNally, 2011, p. 19). The studies included in this dissertation provide empirical support for the conceptualization and operationalization of posttraumatic growth and identified it as a possible point of intervention.

In my first study (Chapter 2), I found that there are both shared and unique pathways to health and happiness. Religious attendance increased ease of readjustment to civilian life, thereby increasing overall well-being. Experiencing an emotionally traumatic or distressing event during military service decreased ease of readjustment to civilian life, and subsequently

led to reductions in well-being. Experiencing an emotionally traumatic or distressing event also was directly negatively associated with health, but not happiness. In contrast, increased appreciation of life was directly positively associated with happiness, but not health. Overall, readjustment to civilian life following military service was the strongest predictor of both health and happiness. My findings support the conceptualization of health and happiness as related but distinct components of well-being and indicate that ease of readjustment to civilian life is a critical contributor to the health and happiness of Veterans. Consequently, reentry may be the optimal time for implementing strategies designed to promote Veteran well-being.

In my second study (Chapter 3), I tested a comprehensive model of PTG, PTSD, and satisfaction with life in a Veteran population. I specifically explored the roles of challenge to core beliefs, rumination styles, sex, and time since event. I found that challenge to core beliefs was directly associated with both styles of rumination (deliberate and intrusive). Additionally, deliberate rumination was positively related to PTG, while intrusive rumination was positively related to PTSD symptoms. The relationship between rumination styles and satisfaction with life was fully mediated by PTG and PTSD, with PTG having positive direct effects on satisfaction with life, while PTSD was found to have negative direct effects on SWL. These results suggest that facilitating PTG may be a complementary and alternative approach to decreasing PTSD symptoms in order to improve overall well-being, and efforts to foster PTG should likely focus on strategies that promote deliberate styles of rumination (Morgan, 2015a).

In the third manuscript (Chapter 4), I examined the specific role of time since event in relation to PTG. I found significant heterogeneity in time vis-à-vis PTG across four different groups or clusters of participants. These groups also differed on many other PTG constructs, such as challenge to core beliefs, rumination styles, level of PTSD symptoms, and age. These results have implications for both researchers and clinicians, and suggest that we should be measuring PTG at multiple time points and take into account the dynamic nature of this phenomenon. Taken together, this body of work suggests that we may be able to foster posttraumatic growth in military Veterans.

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Positive Outcomes in Military Mental Health

by
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DEDICATION

To my husband, Timothy George Morgan.

BIOGRAPHY

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TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
Chapter 1: Introduction	1
Mental Health in the Military	2
Trauma in the Military	5
Positive Outcomes Following Trauma.....	6
Overview of the Research Chapters.....	8
Specific Aims.....	9
 Chapter 2: An Integrated Model of Health and Happiness among Post 9/11 Military Veterans	 13
Introduction.....	14
Methods.....	18
Results.....	21
Discussion.....	25
 Chapter 3: Posttraumatic Stress, Posttraumatic Growth, and Satisfaction with Life in Military Veterans	 35
Introduction.....	36
Methods.....	41
Results.....	46
Discussion.....	50
 Chapter 4: Associations between Time since Event and Posttraumatic Growth among Military Veterans	 62
Introduction.....	64
Methods.....	66
Results.....	69
Discussion.....	73
 Chapter 5: Integrative Review	 79
Summary of Findings.....	79
Implications.....	81
Future Directions	82
General Conclusion.....	88
 REFERENCES	 89

LIST OF TABLES

CHAPTER 2	
Table 1. Sample Descriptive Statistics.....	31
Table 2. Bivariate Correlations of Continuous Predictor, Mediator, and Dependent Variables	32
Table 3. Predictors of Self-Reported Happiness and Self-Rated Health	33
CHAPTER 3	
Table 1. Military Veteran Status by Criteria.....	57
Table 2. Bivariate Correlations between Study Variables	58
Table 3. Standardized Effects of Core Belief Challenge, Rumination, Time, PTSD, and Posttraumatic Growth on Rumination, PTSD, Posttraumatic Growth and Life Satisfaction.....	59
CHAPTER 4	
Table 1. Comparison of Constructs across Clusters	78

LIST OF FIGURES

CHAPTER 2	
Figure 1. Integrated Model of Health and Happiness in Military Veterans.....	34
CHAPTER 3	
Figure 1. Conceptual Model of Posttraumatic Growth, PTSD, and Satisfaction with Life in Military Veterans.	60
Figure 2. Proposed Structural Model of Posttraumatic Growth, PTSD, and Satisfaction with Life in Military Veterans.	61
CHAPTER 4	
Figure 1. Cluster Group Membership by PTG and Time Since Event.	77

CHAPTER 1

Introduction

There are roughly 22 million military Veterans living in the United States (National Center for Veterans Analysis and Statistics, 2014), and more than 2 million active duty and reserve component members serving today (Defense Manpower Data Center, 2015). Military service members and Veterans are more likely than their civilian counterparts to experience trauma and adversity more generally (Gradus, 2016). Trauma and adversity, in turn, are well-established risk factors for mental health problems (Lowe, Blachman-Forshay, & Koenen, 2015). Accordingly, a comprehensive understanding of outcomes related to adversity is vital to promote mental health and well-being among military Veterans. Considerable research has been conducted to address these issues, which consistently find high rates of mental health problems among military populations, including Veterans of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) (Adler et al., 2011; Hawkins, Lapham, Kivlahan, & Bradley, 2010; Helmer et al., 2009; Milliken, Auchterlonie, & Hoge, 2007; Santiago et al., 2010; Seal et al., 2009; Tanielian & Jaycox, 2008a) and the first Gulf War (Forman-Hoffman et al., 2005); active-duty, National Guard, and Reserve service members (Hoerster et al., 2012); and Veterans' spouses (Renshaw, Rodrigues, & Jones, 2008) and families (Galovski & Lyons, 2004). Consequently, there has been a growing focus on the promotion of mental health and well-being within the military, with the development of programs such as Comprehensive Soldier Fitness, among others (Casey, 2011a).

The focus of this dissertation research is to focus on a more holistic view of well-being and the overall promotion of mental health in the military. In the sections that follow, I

will outline what is currently known about mental health in the military and positive outcomes following trauma. I will then describe my dissertation research chapters and their individual contributions to the state of the science.

Mental Health in the Military

Research shows that Veterans are more likely than civilians to have a history of depressive and anxiety disorders, and are more likely than National Guard or Reserve members to have a history of a depressive disorder (Hoerster et al., 2012). Additionally, active duty men are more likely than civilians to have a history of anxiety disorder (Hoerster et al., 2012). Veterans and active duty men are more likely than National Guard or Reserve members and civilians to smoke and report heavy alcohol consumption (Hoerster et al., 2012). Specifically, young enlisted men are more likely than their civilian counterparts to engage in heavy drinking (Bray et al., 2009), and active duty men are more likely to use smokeless tobacco than civilians (Hoerster et al., 2012). Rates of illicit drug use by active duty military personnel has been on the decline since 1980, and remains lower than the civilian population; however, prescription drug misuse has increased dramatically in recent years, doubling from 2002 to 2005 and nearly tripling from 2005 to 2008 (Bray et al., 2009, 2010). This increase is accounted for in large part by an increase in the reporting of misuse of pain killers (Bray et al., 2010).

Several risk factors for mental health issues among military members have been outlined. Risk factors for screening positive for posttraumatic stress disorder (PTSD) among Veterans, specifically, include prior deployment (Hoge et al., 2004; Hoge, Auchterlonie, &

Milliken, 2006; Stimpson, Thomas, Weightman, Dunstan, & Lewis, 2003; Toomey et al., 2007), combat exposure (Hoge et al., 2004; Hoge et al., 2006), chronic pain (Helmer et al., 2009), and youth (aged 18-24 years) (Seal et al., 2009; Seal, Bertenthal, Miner, Sen, & Marmar, 2007). Deployment and combat exposure are also risk factors for screening positive for generalized anxiety disorder and depression (Hoge et al., 2004; Hoge et al., 2006; Toomey et al., 2007), and higher combat exposure is related to alcohol misuse (Santiago et al., 2010). Veterans younger than 25 are also at higher risk of alcohol use and drug use disorders (Seal et al., 2009, 2011a).

Research shows that Veterans who were deployed continued to have higher prevalence of mental health issues compared with non-deployed Veterans up to 10 years after return from deployment (Toomey et al., 2007). Research also shows that deployment itself is unrelated to suicidal ideation, although depression, manic-depressive disorder, heavy or binge drinking, and alcohol-related problems are related to risk of suicide (LeardMann et al., 2013). The United States Department of Veterans Affairs estimates that an average of 20 Veterans died by suicide each day in 2014 (Office of Suicide Prevention, 2016).

Although Veterans constitute only 8.5 percent of the U.S. adult population (aged 18 years and older), Veterans accounted for 18 percent of all deaths by suicide among U.S. adults (Office of Suicide Prevention, 2016). In 2014, rates of suicide (suicides per 100,000 persons) were highest among younger Veterans (aged 18-29 years), but the highest burden (total count) was highest among middle-aged and older Veterans (Office of Suicide Prevention, 2016). Roughly 65 percent of all Veterans who died suicide were aged 50 years

or older (Office of Suicide Prevention, 2016). Veterans were 21 more likely to die by suicide than U.S. civilian adults after adjusting for differences in age and gender (Office of Suicide Prevention, 2016). Among male Veterans, risk for suicide was 18 percent higher than U.S. civilian adult males after adjusting for age (Office of Suicide Prevention, 2016). Among female Veterans, risk for suicide was 2.4 times higher than U.S. civilian adult females after adjusting for age (Office of Suicide Prevention, 2016). Rates of suicide among Veterans Health Administration patients were highest among those who had been diagnosed with bipolar disorder or opioid use disorder, followed by substance use disorder, schizophrenia, anxiety, depression, and PTSD (Office of Suicide Prevention, 2016).

A study of first-time Veterans Affairs users between 2001 and 2009 showed that 11 percent had a substance use disorder, 10 percent abused or were dependent on alcohol, 5 percent abused or were dependent on an illicit drug, and 3 percent had both an alcohol and illicit drug use disorder (Seal et al., 2011a). Veterans with substance use disorders are more likely to have a co-occurring mental health issue, particularly PTSD, depression, or generalized anxiety (Santiago et al., 2010; Seal et al., 2011a), and Veterans with a mental health disorder, particularly PTSD, are more likely to have higher-risk opioid use, and to have resulting adverse clinical outcomes, such as overdose and other accidents and injuries (Seal et al., 2012). Taken together, these findings underscore the prevalence and consequences of mental health problems generally among military Veterans, and related to PTSD, specifically.

Trauma in the Military

Trauma exposure is a public health issue that has both mental and physical health consequences (Lowe et al., 2015). Military service members are more likely to experience trauma than their civilian peers (Breslau, Davis, Andreski, & Peterson, 1991), due in part to exposure to combat and the dead, dying, or wounded (Norris & Slone, 2013). According to the United States National Comorbidity Survey Replication (NCS-R), the lifetime prevalence rate of PTSD among adult Americans is estimated at 6.8 percent (Kessler, Berglund, et al., 2005) and PTSD prevalence for the past year was estimated at 3.5% (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). In contrast, the lifetime prevalence rate estimate for Vietnam Veterans has been estimated at 30.9% for men and 26.9% for women (Kulka et al., 1990). For OEF/OIF Veterans, current PTSD prevalence is estimated at 13.8% (Tanielian & Jaycox, 2008a).

Previous research highlights the important link between PTSD and health behaviors in military Veterans (Bray & Hourani, 2009). Specifically, PTSD has been linked to maladaptive coping behaviors, such as drinking, smoking, taking drugs, or self-harm (Bray & Hourani, 2009). In addition to health behaviors, evidence is growing that emotional trauma and PTSD not only impact mental health, but physically alter the body and physical functioning as well (Hoge, Terhakopian, Castro, Messer, & Engel, 2007). In terms of mental health, there are both neurological changes and pain syndrome (Levine, Levine, & Levine, 2013). Physical health disorders linked to PTSD include hypertension, metabolic syndrome, impaired immunity, autoimmune conditions, and fibromyalgia, to name a few (Dobie et al.,

2004; Levine et al., 2013). In addition, several risk factors related to PTSD have been found for cardiometabolic disease (Levine et al., 2013). Overall, PTSD is related to more physical symptoms and lower rated physical health (Hoge et al., 2007). These statistics highlight the mental health needs of military Veterans, and the consequences of mental health on health behaviors and physical health.

In addition to being a significant humanitarian concern, there are societal costs to the public health issue of untreated trauma in the military as well. A 2008 study estimated the cost of PTSD and major depression within the first two years of post-deployment to be between \$4 Billion and \$6.2 Billion (Tanielian & Jaycox, 2008a). Additionally, the research suggested that evidence-based treatment for PTSD and depression could save \$1.7 billion in the two years following deployment (Tanielian & Jaycox, 2008a). The use of complementary and alternative therapies for PTSD treatment has become widespread in Veteran populations, with an estimated 96% of the Department of Veterans Affairs treatment programs including at least one complementary and alternative therapy treatment in their treatment protocols (Libby, Pilver, & Desai, 2012). Although the negative sequelae of trauma are undeniable, there is a growing literature supporting the possibility for individuals to experience positive outcomes following trauma, as well.

Positive Outcomes Following Trauma

In 1963, Viktor Frankl, an Austrian neurologist and psychologist, released his seminal work, *Man's Search for Meaning*, (Frankl, 1963). The book recounts his experiences in a Nazi concentration camp and his assertions, as both a psychologist and man, that the key to

well-being is the discovery of meaning in suffering. Although a few other notable psychologists and clinicians (e.g., Caplan, 1964; Dohrenwend, 1978; Yalom, 1980) have discussed the positive life changes that may emerge from negative events, the primary focus, historically, has been on the long-term negative sequelae of trauma in the general population, and among military Veterans, specifically (Tedeschi & McNally, 2011).

At the same time, however, there has been an increasing focus in research, policy, and practice on health promotion and the measurement of positive outcomes following trauma. In the past three decades, researchers have begun to study growth outcomes of adversity more systematically (Affleck & Tennen, 1996; Calhoun & Tedeschi, 1998; Cann, Calhoun, Tedeschi, Taku, et al., 2010; Kaler, Erbes, Tedeschi, Arbisi, & Polusny, 2011; Tedeschi & Calhoun, 2004; Tedeschi & McNally, 2011) including research on constructs such as resilience (Bonanno, 2004), hardiness (Kobasa, 1979; Maddi, 2002), growth (Park, Cohen, & Murch, 1996; Tedeschi & Calhoun, 1996), and coping (Antonovsky, 1979). This body of research suggests that people are sometimes able to struggle with extraordinarily traumatic events and perceive positive outcomes as coming from the tragedy (Kaler et al., 2011; Tedeschi & Calhoun, 1996). This shift toward a more holistic understanding of well-being (Aspinwall & Tedeschi, 2010) has been palpable in modern military training (Casey, 2011b).

This line of research led to the concept of *posttraumatic growth* (PTG), a term coined more than two decades ago to refer to positive personal changes following adversity or trauma (Tedeschi & Calhoun, 1995). Since then, there have been many empirical efforts to better understand PTG and its antecedents, correlates, and consequences. Research has

additionally shown that military Veterans are more likely than civilians to experience trauma and PTSD, making PTG a topic of particular interest to military psychologists (Gradus, 2016). Overall, findings of the extant work support PTG following trauma in diverse samples, including military Veterans (Marotta-Walters, Choi, & Shaine, 2015), and suggest that it is related to both psychological distress and well-being (Kaler, Erbes, Tedeschi, Arbisi, & Polusny, 2011; Tedeschi & McNally, 2011; Tsai, Mota, Southwick, & Pietrzak, 2016). There has been a growing interest in the military community to examine PTG as a framework for informing prevention and intervention efforts, with the overall goal of improving satisfaction with life among military Veterans (Casey, 2011b; Tedeschi & McNally, 2011). Several theoretical models of PTG have been proposed and tested, and studies have shown the importance of constructs like challenge to core beliefs and rumination styles (Calhoun & Tedeschi, 2004; Cann et al., 2010, 2011). However, no research has yet been conducted on the PTG model in the military community, and little research looks at growth and distress outcomes simultaneously.

Overview of the Research Chapters

In sum, the impact of trauma on mental health in the military is a critical issue. Research demonstrates that military service members are more likely than their civilian counterparts to experience a wide range of consequences from trauma exposure, including mental health disorders such as PTSD. At the same time, research is uncovering post-trauma phenomena that suggest people are also able to grow from extreme adversity. However, limitations remain. In particular, the conceptual model of PTG has primarily been built on

retrospective reports using undergraduate students; measures have been developed in college samples and relationships have been examined piecemeal, without integrating all constructs to be tested in a comprehensive model. Additionally, few studies have attempted to understand the process by which posttraumatic growth may occur; yet, knowledge of such trajectories may inform the development of complementary or alternative programs to enhance mental health in military populations. Further, there is a need for a better understanding of factors associated with the timing and trajectories of individuals following adversity. Given the interest in using the PTG model as a foundation for interventions with Veterans, it becomes important to empirically verify whether predicted relationships exist among Veteran populations (Kaler et al., 2011). The manuscripts in this dissertation attempt to address some of these limitations.

Specific Aims

Aim 1. Leverage population-based data to examine an integrated model of well-being, with a particular focus on the role of growth. The goal of this first study was to develop an integrated model of well-being, defined by happiness and physical health, among post-9/11 Veterans. Specifically, we sought to examine associations of religious attendance, trauma, appreciation in life, and ease of readjustment with health and happiness, and to explore whether ease of readjustment to civilian life mediated associations between these factors and Veteran well-being. Data on 712 post-9/11 military Veterans (81.0% male) were drawn from the Pew Research Center's 2011 Veterans Study. We conducted multiple regression analyses to identify factors associated with self-rated physical health and

happiness. We then used structural equation modeling to examine ease of readjustment to civilian life as a mediator in an integrated model of Veteran well-being.

Analyses revealed shared and unique pathways to health and happiness. Religious attendance was indirectly related to health and happiness through ease of readjustment, as was experiencing emotionally traumatic or distressing event during their military service. Experiencing an emotionally traumatic or distressing event also was directly negatively associated with health, but not happiness. In contrast, increased appreciation of life was directly positively associated with happiness, but not health. Overall, readjustment to civilian life was the strongest predictor of both health and happiness. Our findings support the conceptualization of health and happiness as related but distinct components of well-being and indicate that ease of readjustment to civilian life is a critical contributor to the health and happiness of Veterans. Consequently, reentry may be the optimal time for implementing strategies designed to promote Veteran well-being.

Aim 2. Develop and test a comprehensive model of posttraumatic growth in military Veterans. This study tested a comprehensive model of PTG, PTSD, and satisfaction with life in a Veteran population, exploring the roles of challenges to core beliefs, types of rumination, sex, and time since event. Data were collected via Amazon's Mechanical Turk, an online crowdsourcing website, from Veterans ($N = 197$) who had experienced a stressful event within the last three years ($M = 16.66$ months, $SD = 12.27$ months). Structural equation modeling was used to test an integrated conceptual model of PTG, PTSD, and satisfaction with life. Results showed that challenge to core beliefs was directly associated with both

deliberate and intrusive rumination. Deliberate rumination was positively related to PTG, while intrusive rumination was positively related to symptoms of PTSD. PTG and PTSD, in turn, mediated the relationship between rumination styles and satisfaction with life; PTG was related to higher satisfaction with life; PTSD was negatively related to satisfaction with life. Results failed to show differences on any model variables as a function of time since event or sex. Our results indicate that the intentional facilitation of PTG may be a complementary and alternative option to the reduction of PTSD symptoms for improving satisfaction with life. Findings suggest that efforts to facilitate PTG should focus on strategies for promoting deliberate rumination.

Aim 3. Examine the role of time in the development of posttraumatic growth and explore factors associated with different groups. Despite efforts to understand the antecedents, correlates, and consequences of posttraumatic growth (PTG), the role of time since event vis-à-vis PTG is not well understood. Part of a larger project exploring experiences following emotionally distressing events among military Veterans ($N = 197$) using Amazon's Mechanical Turk (Mturk), the current study sought to clarify associations between time since event and PTG. We used cluster analytic techniques and analyses of variance to: 1) determine the number of clusters, and 2) assess differences in core constructs of PTG and participant characteristics across clusters. Results revealed four significantly different groups (i.e., clusters) characterized by differential associations between PTG and time since event. These groups also differed significantly in challenge to core beliefs, level of PTSD symptoms, intrusive and deliberate rumination, and age. The Immediate Moderate

Growth group (Cluster 1) experienced moderate levels of PTG over shorter periods of time, high levels of PTSD symptoms, and was significantly younger in age. The Low Growth group (Cluster 2) was characterized by minimal PTG regardless of time, the least amount of challenge to core beliefs, and low amounts of both intrusive and deliberate rumination. The Long-term Small Growth group (Cluster 3) was primarily characterized by small amounts of PTG over longer periods of time. The High Growth group (Cluster 4) was characterized by high PTG regardless of time, greater challenge to core beliefs, the highest amount of deliberate rumination, and the highest amount of PTSD symptoms. Findings underscore heterogeneity within military Veterans' experiences of PTG over time.

CHAPTER 2

An Integrated Model of Health and Happiness among Post 9/11 Military Veterans

We developed an integrated model of well-being, defined by happiness and physical health, among post-9/11 Veterans by examining associations of religious attendance, trauma, appreciation in life, and ease of readjustment to civilian life with well-being. Data on 712 post-9/11 military Veterans (81.0% male) were drawn from the Pew Research Center's 2011 Veterans Study. We conducted multiple regression analyses to identify predictors of health and happiness, and used structural equation modeling to develop an integrated model of Veteran well-being. Our findings indicate that ease of readjustment to civilian life is a critical contributor to the health and happiness of Veterans.

Military Behavioral Health, 2017.

Introduction

There are roughly 22 million Veterans living in the United States (National Center for Veterans Analysis and Statistics, 2014), and more than 2 million active duty and reserve component members serving today (Defense Manpower Data Center, 2015). The focus in psychology and public health has historically been on the long-term negative sequelae of trauma in the general population, and among military Veterans, specifically (Tedeschi & McNally, 2011). Such a pathological focus is commensurate with the high rates of mental health symptoms among military Veterans; for instance, a recent study reported that 14% of returning Veterans experience posttraumatic stress disorder (PTSD) (Tanielian & Jaycox, 2008). At the same time, however, there has been an increasing focus in research, policy, and practice on health promotion and the measurement of positive outcomes following trauma, such as resilience (Bonanno, 2004), hardiness (Kobasa, 1979; Maddi, 2002), growth (Tedeschi & Calhoun, 1996), and well-being (Ryan & Deci, 2001), as well as individual factors that may be associated with these positive outcomes. This shift toward a more holistic understanding of well-being (Aspinwall & Tedeschi, 2010) has been palpable in modern military training (Casey, 2011b).

The construct of well-being is complex and inconsistent in its conceptualization and operationalization, but refers generally to “optimal experience and functioning” (Ryan & Deci, 2001, p. 141). Though there are varying perspectives on what exactly comprises well-being, it likely includes both aspects of happiness and physical health. Correspondingly, extant research supports an association between physical health and happiness (Ryan & Deci,

2001) and broader measures of well-being (Ryff, Singer, & Dienberg Love, 2004). However, health and happiness are infrequently measured in the same study. An understanding of factors associated with health and happiness may help us to create interventions that promote overall well-being. Drawing on the extant theoretical and empirical literature, there are several individual-level constructs (i.e., characteristics of the person and of his/her experiences) that may be associated with well-being in military Veterans, including religiosity, distressing or emotionally traumatic events, appreciation in life, and readjustment to civilian life. In the sections that follow, we briefly review the literature on the associations of these factors with happiness and health.

Individual Factors

Research demonstrates that religious involvement is associated with better mental and physical health and decreased mortality (George, Ellison, & Larson, 2002). Indeed, many studies find positive associations between spirituality and mental health in the military. For example, in a sample of Active Duty soldiers, spirituality was negatively associated with depression and PTSD (Hourani et al., 2012). More recently, several specific aspects of spirituality (e.g., daily spiritual experiences, private practices, and organizational religiousness) were negatively associated with PTSD symptoms among Veterans in residential treatment (Currier, Holland, & Drescher, 2015). Further research suggests that frequency of attendance at religious services, in particular, has been linked to increased happiness (Ferriss, 2002) and quality of life (Idler, McLaughlin, & Kasl, 2009).

Growing evidence shows that exposure to distressing or emotionally traumatic events not only impact mental health, but also physically alter the body and physical functioning as well (Hoge et al., 2007). To demonstrate, trauma exposure is linked to both neurological changes and pain syndrome (Levine, Levine, & Levine, 2013). Moreover, PTSD resulting from trauma exposure also has been shown to contribute to decreases in health, including increased symptoms of physical illness and lower ratings of physical health overall (Dobie et al., 2004; Hoge et al., 2007; Levine, Levine, & Levine, 2013). Research with military samples, specifically, has consistently shown that combat stress is associated with symptoms of physical illness (Nillni et al., 2014; Schnurr, Spiro, & Paris, 2000). However, emotional trauma can contribute to positive outcomes, including increased appreciation in life (Tedeschi, Calhoun, & Cann, 2007).

Much of the discussion regarding positive outcomes following emotional trauma has centered on military Veterans. Indeed, for decades there have been reports of Veterans who experience an increased appreciation in life following service (Elder, Jr. & Clipp, 1989; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012). Such an increased appreciation has been conceptualized as one domain of posttraumatic growth (Tedeschi & Calhoun, 1996; Tedeschi et al., 2007). Specifically, adverse experiences may challenge one's core beliefs (Cann et al., 2010) or shatter world assumptions (Janoff-Bulman, 1992), which provides an opportunity for cognitive work that may result in growth, including increased appreciation of life. In one study of military Veterans returning from Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF), for example, more than half of participants reported an increased

appreciation in life following return from deployment (Pietrzak et al., 2010). Though posttraumatic growth has been linked to increased health and happiness (Aspinwall & Tedeschi, 2010; Tedeschi et al., 2007), increased appreciation of life has not been investigated in relation to either indicator of well-being.

Finally, military personnel face many challenges readjusting to civilian life following military service (Harris, 1972; Moore & Kennedy, 2011). Recent analyses predicting ease of readjustment have revealed that emotional trauma and service-related injury were associated with a more difficult time readjusting to civilian life (Morin, 2011). Interestingly, research shows that readjustment is actually more difficult for those who were married and/or had children than for those Soldiers who were single without children (Morgan, 2015b). Although there is a dearth of information on how ease of readjustment impacts long-term well-being, this transition may operate as a turning point in life (Elder, Jr. & Clipp, 1989), mediating the association between trauma and well-being.

Although extant research has many strengths, our understanding of well-being in Veterans is limited in a number of important ways. First, although previous research has examined factors associated with *either* health *or* happiness, we are not aware of any study that has examined predictors of both health and happiness in the same sample of Veterans. Second, health and happiness are typically examined as distinct constructs; yet, the indicators of well-being are known to be associated with one another and such parallel analyses do not account for their shared association. Third, operationalization of spirituality or religiosity has varied considerably across studies, limiting our understanding of the role of religious service

attendance, specifically, in well-being in Veterans. Fourth, prior research suggests that appreciation of life may play a key role in posttraumatic growth; however, it has rarely been examined vis-à-vis Veteran well-being more generally. Fifth, theory and research suggest that readjustment to civilian life may mediate associations between life experiences and Veteran well-being; yet, the potential mediating role of readjustment to civilian life has not been tested with respect to either health or happiness.

The Present Study

The current study addresses these limitations through secondary analysis of data from a survey of a population-based representative sample of military Veterans. The overall goal was to develop an integrated model of well-being, defined by happiness and physical health, in a Veteran population. To accomplish this goal, this study had three specific aims. First, we sought to identify individual experiences—religious attendance, emotional trauma, appreciation in life, and ease of readjustment—associated with self-rated physical health. Second, we sought to determine whether these same factors are associated with self-reported happiness. Third, we explored ease of readjustment to civilian life as a mediator of the association between experiences with health and happiness, in one integrated model of well-being.

Method

Participants

Data source. Data were drawn from the Pew Research Center's 2011 Veterans Study in which a representative sample of 1,853 Veterans who formerly served in the U.S. armed

forces was interviewed. Of the full sample Veterans, 1,134 (62.2%) had separated from military service before 9/11 and 712 (38.4%) served after 9/11. These post-9/11 Veterans ($n = 712$) served as the sample for the current study, as some the constructs of interest to this study were only measured among this subsample of respondents. Of these, a total of 336 Veterans (47.2%) served in Afghanistan or Iraq since combat operations began in those countries. The other half of Veterans met alternate requirements for Veteran status (e.g., served in support of OEF/OIF in another country, such as Bahrain). Data were released to the public in 2012.

Sampling and data collection. Social Science Research Solutions (SSRS) conducted the sampling, data collection, and survey weighting. There was an emphasis on interviewing an adequate number of post-9/11 Veterans. The majority of interviews came from random digit dialing (RDD) studies that were conducted by both SSRS and the Pew Research Center. Additionally, 214 interviews with post-9/11 Veterans were conducted through a random sample panel of households obtained by Knowledge Networks in August of 2011. Further details can be found at pewresearch.org.

Measures

Outcome variables. *Self-reported happiness* was assessed with the following item: “Generally, how would you say things are these days in your life -- would you say that you are very happy, pretty happy, or not too happy?” Response options were coded from 1 = not too happy to 3 = very happy. *Self-rated health* was assessed with the following question: “How would you rate your own health in general these days? Would you say your health is

excellent, good, only fair or poor?” Response options were coded from 1 = poor to 4 = excellent.

Predictors. *Religious attendance* was measured with one item that assessed the frequency of religious attendance for reasons other than weddings and funerals. Response options ranged from 1 = never to 6 = more than once a week. *Experience of an emotionally traumatic or distressing event* was self-reported in reference to their time in military service using a single dichotomous variable, where 1 = experienced an emotionally traumatic or distressing event and 0 = did not experience an emotionally traumatic or distressing event. *Appreciation of life* was measured with one item asking whether or not the participant experienced increased appreciation in life since they were discharged from the service (0 = no, 1 = yes). *Readjustment to civilian life* was measured with the following self-report item, “After your military service, would you say your re-adjustment to civilian life was...” Response options ranged from 1 = very difficult to 4 = very easy.

Covariates. Several sociodemographic characteristics were obtained, including *age*, measured continuously in years, *sex* (0 = male, 1 = female), *race* (1 = white, 0 = other), *marital status* (1 = married or living as married, 0 = single, widowed, or divorced), and *education* (none or grade 1-8; high school incomplete [grades 9-11]; high school graduate [grade 12 or GED certificate]; technical, trade, or vocational school after high school; some college, associate degree, no 4-year degree; college graduate [B.S., B.A., or other 4-year degree]; or post-graduate training or professional schooling after college [Master’s Degree, Ph.D., Law or Medical School]).

Analytic Strategies

Prior to addressing our research aims, we computed descriptive statistics to describe the sample and ran bivariate analyses to identify covariates for inclusion in our subsequent multivariate analyses. To address our first two research aims, multiple regression analyses were conducted to examine associations of religious attendance, emotional trauma, appreciation in life, and ease of readjustment with physical health and happiness, in separate models. To address our third research aim, structural equation modeling was used to examine an integrated model of Veteran well-being, as indicated by both health and happiness, with ease of readjustment to civilian life as a mediator. This integrated model was first tested without and then with covariates.

Results

Descriptive Statistics

Table 1 shows the descriptive statistics for the participant characteristics and variables of interest. The sample was evenly split between participants 18-39 years old (48.0%) and those aged 40 years or older (52.0%). The vast majority of participants were male (81.0%) and had completed at least some post-secondary education (79.3%). Most were white (78.8%), and did not identify as Hispanic or Latino (91.2%). Additionally, most participants (72.2%) also were married or living with a partner. All branches of the military were represented, with the largest portion of the sample (35.3%) indicating they had served in the Army.

Participants reported, on average, that their happiness fell between “pretty happy” and “very happy” ($M = 2.22$, $SD = 0.64$). Health, on the other hand, was endorsed as being slightly less than “good” on average ($M = 2.96$, $SD = 0.78$). Religious service attendance showed greater variability, with a mean endorsement across the sample of 3.39 ($SD = 1.64$). Not surprisingly, rates of experiencing an emotionally traumatic or distressing event during their time in military service were high: reported by almost half of the participants (43.9%). Strikingly, almost all participants (85.2%) reported that they experienced an increased appreciation in life since they were discharged from the service. On average, most Veterans reported a somewhat easy time readjusting ($M = 2.76$, $SD = 0.93$).

Bivariate Results

Bivariate analyses showed relationships among many predictor and outcome variables. In particular, results of correlational analyses, depicted in Table 2, showed that religious attendance, appreciation in life, ease of readjustment to civilian life, and education were positively correlated with happiness, whereas experience of an emotionally traumatic or distressing event was negatively correlated with happiness. Similarly, religious attendance, appreciation in life, ease of readjustment, and education were positively correlated with health, and experience of an emotionally traumatic or distressing event was negatively correlated with health (see Table 2). Finally, health and happiness demonstrated a moderate positive correlation with each other ($r = .36$) (Cohen, 1988), supporting their inclusion as two related, but distinct, constructs (Rubin, 2010) in one integrated model of well-being (see Table 2).

In terms of the sociodemographic characteristics, age was not correlated with either outcome, but education was positively associated with both health and happiness (see Table 2). Additionally, one-way ANOVAs showed that White participants compared to participants of other races reported significantly higher levels of happiness ($M = 2.26$, $SD = 0.62$ vs. $M = 2.08$, $SD = 0.70$), $F(1, 697) = 9.22$, $p = .002$, $\eta^2 = .013$, and health ($M = 3.01$, $SD = 0.76$ vs. $M = 2.76$, $SD = 0.83$), $F(1, 700) = 11.54$, $p = .001$, $\eta^2 = .016$. Additionally, participants who were married or living with a partner reported higher levels of happiness ($M = 2.27$, $SD = 0.64$) than participants who were not married or living with a partner ($M = 2.09$, $SD = 0.62$), $F(1, 704) = 10.73$, $p < .001$, $\eta^2 = .015$. Ratings of health did not differ as a function of marital status, $p = .621$. There were no differences in health and happiness between Hispanic and non-Hispanic participants, nor between participants who had served in Active Duty and non-Active Duty (i.e., Reserves and National Guard) branches, $ps \geq .103$.

Multivariate Results

Table 3 provides the results of the regression models with religious attendance, prior trauma, appreciation in life, and ease of readjustment predicting health and happiness. Age, sex, education, race, and marital status were included as covariates due to their significant bivariate associations with the outcome variables. Overall, the model predicting self-rated happiness was significant and accounted for 21.3% of the variance in happiness, $F(10, 661) = 19.17$, $p < .001$, $R^2_{adjusted} = .213$. Health, appreciation in life, ease of readjustment, age, and education emerged as significant predictors (see Table 3). Specifically, higher ratings of health, increased appreciation in life, easier readjustment to civilian life, greater education,

younger age, being married, and identifying as white were associated with higher levels of happiness. The model predicting self-rated health also was significant and accounted for 25.0% of the variance in health, $F(10, 661) = 23.40, p < .001, R^2_{adjusted} = .250$. Happiness, ease of readjustment, age, education, race, marital status, as well as experiencing an emotionally traumatic or distressing event, emerged as significant predictors. Higher ratings of happiness, easier readjustment to civilian life, greater education, younger age, not being married or living as married, and identifying as White were associated with higher levels of health, while experiencing an emotionally traumatic or distressing event was associated with lower ratings of health (see Table 3).

Finally, we tested a structural equation model with health and happiness as the outcome variables, including three predictor variables (emotionally traumatic or distressing event, increased appreciation in life, and religious service attendance) and one mediating variable (adjustment) using SPSS AMOS Version 7.0 (Arbuckle, 2006). Because results of our missing data analysis (not presented but available upon request) indicated that the data were missing completely at random (MCAR), full information maximum likelihood (FIML) was used, as it is the preferred method in structural equation modeling (Enders & Bandalos, 2001). The model produced an excellent fit ($\chi^2[7] = 9.68, p = .208$; NFI = .98, TLI = .98, CFI = .99, RMSEA = 0.02 [0.00, 0.06]). Standardized path coefficients are presented in Figure 1, showing both shared and unique pathways to health and happiness. Religious attendance was indirectly related to health and happiness through ease of readjustment, as was experience of an emotionally traumatic or distressing event. Experiencing an emotionally traumatic or

distressing event, however, also was directly and negatively associated with health, but not happiness. In contrast, increased appreciation of life was directly and positively associated with happiness, but not health. Overall, readjustment to civilian life demonstrated the strongest associations with health and happiness.

Accounting for participant demographic characteristics (i.e., age, education, race, and marital status), while allowing them to correlate with one another, did not improve model fit ($\chi^2[21] = 29.79, p = .096$; NFI = .96, TLI = .97, CFI = .99, RMSEA = 0.02 [0.00, 0.04]), nor did it alter pathways reported above. (Full results are not presented, but available upon request.) However, results did reveal pathways from these sociodemographic characteristics to health and happiness, including associations between age and health ($\beta = -0.14$) and happiness ($\beta = -0.14$); education and health ($\beta = 0.16$) and happiness ($\beta = 0.12$); race and health ($\beta = -0.10$) and happiness ($\beta = -0.09$); and marital status and happiness ($\beta = -0.18$), but not health.

Discussion

The purpose of this study was to develop an integrated model of post-9/11 Veterans' well-being, as measured by health and happiness. Specifically, we first sought to identify individual characteristics and experiences associated with self-rated physical health and happiness in a large sample of post-9/11 Veterans. We then explored whether ease of readjustment to civilian life acted as a mediator of the association between these individual characteristics and experiences with health and happiness, in one integrated model. To our knowledge, this is the first study to examine predictors of both health and happiness in the

same sample of Veterans or to explore the potential mediating role of readjustment to civilian life with respect to either health or happiness in this population.

Results of our first multiple regression analysis revealed that, after controlling for relevant covariates, ease of readjustment and increased appreciation in life predicted higher levels of happiness. These findings are consistent with prior research that has similarly found appreciation in life to be related to happiness in the general population (Calhoun & Tedeschi, 2006) and provide the first empirical evidence of ease of readjustment as a predictor of happiness. However, results also showed that frequency of religious attendance was not associated with happiness, which is inconsistent with prior work supporting frequency of attendance of religious services as predictors of happiness in the general population (Ferriss, 2002). In other work, we have found that Veterans endorsed items of posttraumatic growth related to spirituality at rates notably lower than the general population (Morgan, 2015a), which may account for these null findings. However, further efforts are needed to clarify the role of religiosity, and frequency of religious attendance, in particular, as it relates to happiness in military Veterans.

Results of our second multiple regression analysis showed that greater ease of readjustment was associated with higher levels of health, and experiencing an emotionally traumatic or distressing event during their time in military service was associated with lower levels of health, while appreciation in life and religious attendance did not emerge as significant predictors. These results are consistent with prior findings demonstrating adverse effects of traumatic and distressing events on health in Veterans (Dobie et al., 2004; Nillni et

al., 2014; Schnurr et al., 2000), but are in contrast with some work suggesting posttraumatic growth to be associated with better health outcomes (Aspinwall & Tedeschi, 2010).

However, many of these prior studies on posttraumatic growth and health were in the context of the traumatic medical events, such as receiving a serious medical diagnosis, which may differ meaningful from the service-related events reported on by military Veterans in this study. As was found for happiness, these findings provide the first evidence supporting ease of readjustment as a predictor of health.

Results of our structural equation model analyses provide a more nuanced understanding of the associations of these factors with health and happiness, conceptualized as two distinct but related components of well-being. Specifically, readjustment to civilian life emerged not only as the strongest predictor of both health and happiness, but also as an important mediating mechanism. In the integrated model, the direct associations of appreciation in life with happiness and of trauma or distress with health remained, but the latter was mediated by ease of readjustment. Namely, experiencing an emotionally traumatic or distressing event during their time in military service had a direct, negative effect on military Veteran's ease of readjustment to civilian life, which mediated the relationship between trauma and happiness. Ease of readjustment additionally mediated associations between religious attendance and both health and happiness, which is congruent with the results of the bivariate correlations in Table 2.

Our results regarding age are worth comment. Specifically, in bivariate correlations, age was not significantly related to health or happiness, but was positively related to religious

attendance and readjustment. In our regression analyses and SEM, older age was related to lower health and happiness. The findings add to the mixed literature regarding associations of age and health and happiness in this population. For example, some research findings younger age to increase risk for negative outcomes, including poorer physical and mental health, following trauma among military Veterans (Fear et al., 2010; Pietrzak, Pullman, Cotea, & Nasveld, 2013). Further research is needed to clarify the ways that age may be related to well-being in this population.

Taken together, our findings supporting an integrated approach to the promotion of health and happiness in military Veterans. Specifically, because health and happiness are related but distinct constructs, our findings suggest that efforts to improve one may also have beneficial effects on the other. For example, Wounded Warrior Project's Physical Health and Wellness programs, such as Soldier Ride, provide physical health support to improve well-being and psychological functioning (Wounded Warrior Project, 2016). The complex and interconnected nature of these factors makes it difficult to determine at which point programs should attempt to intervene. Our findings suggest that reentry into civilian life may be a crucial "turning point" in the lives of deployed soldiers (Elder & Clipp, 1989). Indeed, events occurring during this sensitive period may be a catalyst for future well-being or distress, both physical and psychological. Consequently, reentry could be the optimal time for implementing strategies designed to promote Veteran well-being. Finally, although the pathways were indirect, findings support aspects of spirituality or religiosity as a focus in well-being promotion efforts in military populations, such as through Comprehensive Soldier

Fitness (Casey, 2011), a resilience training program for military personnel that includes a module on Spiritual Fitness (K. I. Pargament & Sweeney, 2011).

Limitations and Future Directions

When considering the implications of these findings, some limitations of the study design should be taken into account. First, the cross-sectional and correlational nature of these study data and analyses precludes inferences of causality or the determination of temporal aspects of this process. As such, future research should examine associations between trauma, increased appreciation in life, and readjustment with health and happiness in a prospective, longitudinal design. Second, constructs of interest were assessed using one-item measures, as part of a large population-based study. Though typical of epidemiological and representative sample survey methods (Bowling, 2005), such one-item measures have relatively limited sensitivity and range. Future research should examine these constructs using standardized and validated measures, such as the Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996), the RCOPE (Pargament, Koenig, & Perez, 2000) for religious coping, and the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). Third, all variables were measured using self-report, which has the possibility to introduce social desirability bias. That said, more recent research suggests that the effects of social desirability bias are not as pronounced as some believe, particularly in contexts in which the individual is not being evaluated, such as a job interview (Chan, 2009). Additionally, extant research suggests that self-rated health is a valid measure of health status (Miilunpalo, Vuori, Oja, Pasanen, & Urponen, 1997) that contributes uniquely to the prediction of all-cause

mortality (Idler & Benyamini, 1997; Idler, Russell, & Davis, 2000). Future studies should additionally incorporate measures of psychological health and outcomes salient to the military Veteran population, such as suicidality.

Conclusion

These limitations notwithstanding, this study represents the first effort to develop an integrated model of well-being—as defined by health and happiness—in military Veterans. Our findings show that readjustment to civilian life is an important mediator of the relationship between trauma and well-being, as well as of religious service attendance and well-being. Findings also speak to how military Veterans come to appreciate life more, as a result of their experiences during service. Consequently, programs supporting reintegration and mental health in post-deployment services may be best poised to promote Veteran well-being in the long-term. For example, these programs could focus on a specific aspect of well-being, such as health or happiness, or promote readjustment to civilian life through novel methods, such as heart rate variability biofeedback or expressive writing. Additionally, the differential associations of trauma with health and happiness merits further investigation, but underscores the complexity of the intersection of trauma and well-being suggests there may be many potential points of intervention. Continued research efforts are needed to explore the unique and shared correlates of health and happiness, as measures of well-being, so that we may most efficiently and effectively foster well-being in military Veterans.

Table 1. *Sample Descriptive Statistics*

Variable	<i>M</i>	<i>SD</i>
Age	40.9	12.7
	<i>n</i>	Percent
Interview Mode		
Telephone	498	69.9
Internet	214	30.1
Sex		
Male	577	81.0
Female	135	19.0
Education		
None/Grade 1-8	1	0.1
High School Incomplete (Grades 9-11)	10	1.4
High School Graduate/GED	136	19.1
Technical, Trade, Vocational	10	1.4
Some College/Associate Degree	279	39.2
College Graduate	142	19.9
Post-Graduate Training (Master's Degree, Ph.D., Law or Medical School)	134	18.8
Race		
White	561	78.8
Black or African-American	86	12.1
Asian or Asian-American	5	0.7
Some other race	35	4.9
Two or more races	17	2.4
Hispanic/Latino Ethnicity		
Yes	60	8.4
No	649	91.2
Marital Status		
Married	478	67.1
Living with a partner	36	5.1
Divorced	59	8.3
Separated	24	3.4
Widowed	4	0.6
Never been married	110	15.4
Branch		
Army	251	35.3
Navy	140	19.7
Air Force	139	19.5
Marines	98	13.8
Coast Guard	7	1.0
Army National Guard/Army Reserves	53	7.4
Navy Reserves	7	1.0
Air Force Reserves/Air National Guard	13	1.8
Marine Reserves	2	0.3

Notes. $N = 712$.

Table 2*Bivariate Correlations of Continuous Predictor, Mediator, and Dependent Variables*

	Health	Readjustment	Religious Attendance	Increased Appreciation in Life	Emotionally Traumatic or Distressing Event	Education	Age
Happiness	.36***	.34***	.11**	.13***	-.12***	.16***	.02
Health	--	.34***	.09*	.08*	-.29***	.17***	-.03
Readjustment		--	.15***	.09*	-.34***	.21***	.24***
Religious Attendance			--	.07	.01	.18***	.23***
Increased Appreciation in Life				--	-.07	-.02	-.03
Emotionally Traumatic or Distressing Event					--	.01	.01
Education						--	.33***

Note. $N = 712$. * $p < .05$ ** $p < .01$ *** $p < .001$

Table 3*Predictors of Self-Reported Happiness and Self-Rated Health*

Variables	Model Statistics					
	Model 1: Self-Reported Happiness			Model 2: Self-Rated Health		
	B	β	<i>p</i>	B	β	<i>p</i>
Intercept	1.01			2.09		
Health	.22	.26	<.001	--	--	--
Happiness	--	--	--	.30	.25	<.001
Readjustment	.17	.24	<.001	.17	.20	<.001
Trauma/Distress	.07	.05	.175	-.29	-.19	<.001
Appreciation in Life	.20	.11	.003	.01	.01	.864
Religious Attendance	.02	.06	.127	.02	.03	.378
Age	-.01	-.12	.003	-.01	-.10	<.001
Education	.04	.08	.036	.07	.13	.001
Sex	-.01	-.01	.800	-.07	-.04	.314
Race	-.12	-.07	.037	-.17	-.09*	.013
Marital	-.17	-.12	.001	.14	.08*	.029

Note. *N* = 712.

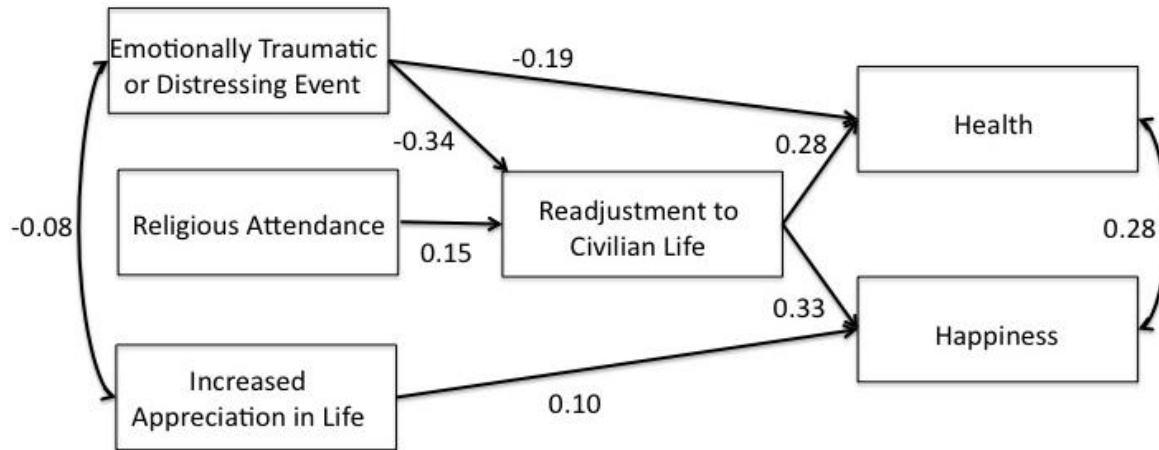


Figure 1. Integrated Model of Health and Happiness in Military Veterans. Values are standardized coefficients. All paths are significant at $p < .05$.

CHAPTER 3

Posttraumatic Stress, Posttraumatic Growth, and Satisfaction with Life in Military Veterans

Military Veterans are more likely than civilians to experience trauma and posttraumatic stress disorder (PTSD). Research suggests, however, that some people who experience trauma, including Veterans, report posttraumatic growth (PTG), or positive personal changes following adversity. This study tested a comprehensive model of PTG, PTSD, and satisfaction with life in a Veteran population, exploring the roles of challenges to core beliefs, types of rumination, sex, and time since event. Data were collected via Amazon's Mechanical Turk, an online crowdsourcing website, from Veterans ($N = 197$) who had experienced a stressful event within the last three years ($M = 16.66$ months, $SD = 12.27$ months). Structural equation modeling was used to test an integrated conceptual model of PTG, PTSD, and satisfaction with life. Results showed that challenge to core beliefs was directly associated with both deliberate and intrusive rumination. Deliberate rumination was positively related to PTG, while intrusive rumination was positively related to symptoms of PTSD. PTG and PTSD, in turn, mediated the relationship between rumination styles and satisfaction with life; PTG was related to higher satisfaction with life; PTSD was negatively related to satisfaction with life. Results failed to show differences on any model variables as a function of time since event or sex. Results indicate that the intentional facilitation of PTG may be a complementary and alternative option to the reduction of PTSD symptoms for improving satisfaction with life. Findings suggest that efforts to facilitate PTG should focus on strategies for promoting deliberate rumination. *Military Psychology*, under review.

Introduction

The past decade has seen an increase in the examination of pathological outcomes stemming from participation in both Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF), including depression, anxiety, and posttraumatic stress disorder (PTSD; Hoge et al., 2004). Percentages of soldiers requiring mental health treatment have been reported to be 20.3% to 42.4% (Milliken et al., 2007). Yet, research also suggests that some people experience subjectively traumatic events and come to perceive positive psychological outcomes from the experience (Kaler et al., 2011; Tedeschi & Calhoun, 1996). In the past three decades, researchers have begun to study such perceptions of positive psychological outcomes that may result from adversity—known as *posttraumatic growth* (PTG)—more systematically (Calhoun & Tedeschi, 1998; Tedeschi & Calhoun, 2004) in both civilian (Cobb, Tedeschi, Calhoun, & Cann, 2006; Danhauer et al., 2013) and military populations (Maguen, Vogt, King, King, & Litz, 2006).

A wealth of empirical evidence supports the presence of PTG in military samples, both active duty (Gallaway, Millikan, & Bell, 2011; Lee, Luxton, Reger, & Gahm, 2010) and Veteran (Feder et al., 2008; Kaler et al., 2011; Maguen et al., 2006; Pietrzak et al., 2010; Solomon & Dekel, 2007; Tedeschi, 2011). Additionally, research is accumulating regarding predictors of PTG in active duty military (Mitchell, Gallaway, Millikan, & Bell, 2013) and Veterans (Hijazi, Keith, & O'Brien, 2015), as well as longitudinal effects of PTG on PTSD (Tsai, Mota, et al., 2016; Tsai, Sippel, Mota, Southwick, & Pietrzak, 2016). A developmental pathway model of PTG has also been tested, in which it was posited that pre-identified risk

factors, PTSD symptoms, and positive and negative psychosocial development were related to PTG (Marotta-Walters et al., 2015). Despite these advances in theory and research, some limitations to our understanding of PTG in military Veterans remain. In particular, there has been limited focus on the roles of core beliefs and styles of rumination vis-à-vis PTG and PTSD, and satisfaction with life, more generally. Additionally, there has been limited consideration of the roles of sex and time since event as potential moderators of PTG. The current study sought to address these knowledge gaps in a military sample.

Challenge to one's core beliefs about the world following a traumatic event can act as the impetus for both distress and growth opportunities. To date, several studies have examined the relationship between challenge to core beliefs and PTG. Results suggest that the extent to which one's core beliefs are challenged is predictive of the amount of growth one reports. Initial investigations with college students found challenge to core beliefs to be positively correlated with PTG, negatively correlated with wellbeing (as measured by the Satisfaction with Life Scale), and unrelated to time since event (Cann et al., 2010). Subsequent studies have produced similar results, with challenge to core beliefs correlating strongly with PTG in college students (Lindstrom, Cann, Calhoun, & Tedeschi, 2013), and in leukemia patients over time (Danhauer et al., 2013). A recent study using structural equation modeling similarly showed cancer-related distress predicting core beliefs examination, followed by intrusive rumination, deliberate rumination, and PTG (Wilson, Morris, & Chambers, 2014).

In addition to core beliefs, rumination appears to play an important role in the psychological outcomes following traumatic experiences. Early work on rumination focused on the negative aspects of this style of coping associated with brooding, worrying, or clinical symptoms of PTSD (Nolen-Hoeksema, McBride, & Larson, 1997). However, empirical evidence suggests that different styles of rumination may be associated with different outcomes following trauma (Treyner, Gonzalez, & Nolen-Hoeksema, 2003). Specifically, research in college students indicates that intrusive forms of rumination may be associated with the development of PTSD, deliberate rumination—that is, cognitive processing of the experience—may be associated with PTG (Cann et al., 2011; Triplett et al., 2012). Intrusive and deliberate rumination are also related conceptually and functionally to experiential avoidance (i.e., an unwillingness to be in contact with distressing thoughts and feelings) and psychological flexibility (i.e., less reliance on psychological flexibility), which have been found to moderate the relationship between distress and PTG in a college sample (Kashdan & Kane, 2011). The associations of specific forms of rumination, PTSD, and PTG have yet to be examined in a military sample.

Ultimately, the empirical and clinical relevance of PTG is the potential promotion of overall psychological health and satisfaction with life following exposure to a traumatic event. Indeed, some research supports a positive association between PTG and satisfaction with life (Cann et al., 2010). However, the relationship between PTG and other psychological outcomes (e.g., depression, satisfaction with life, and suicidal ideation) has been mixed, especially with regard to PTSD. Although some conceptualize PTSD and PTG

as mutually exclusive and opposite, the data do not support this conclusion. Indeed, some studies have found PTG to be negatively associated with distress (Frazier, Conlon, & Glaser, 2001; Park, Cohen, & Murch, 1996), others have failed to find significant relationships between PTG and mental health (Cordova, Cunningham, Carlson, & Andrykowski, 2001), and others, still, have found a positive association between distress and PTG (Park & Lechner, 2006). It is unclear what mechanisms account for these inconsistent findings (Cobb et al., 2006), but the findings speak to the potential role of moderators, such as sex and time since event.

Extant research supports the importance of sex with respect to both PTG and PTSD. Specifically, research has demonstrated sex differences in the development of PTSD, such that women report higher levels of PTSD compared to men (Tolin & Foa, 2006). This sex difference has also been found in active-duty military personnel (Hourani, Williams, Bray, & Kandel, 2015). A recent meta-analysis similarly showed that women also tend to report higher levels of PTG than men (Vishnevsky, Cann, Calhoun, Tedeschi, & Demakis, 2010). Moreover, results from one study suggest that women tend to report higher challenge to core beliefs as well; that said, it is a potentially trivial difference given the small effect size (Cann et al., 2010). Thus, differences in PTG and PTSD between men and women may be attributable to sex differences in challenge to core beliefs; however, no studies to date have tested these associations in one model, in military Veterans or otherwise.

Conceptually, time since event is relevant to both research and practice with military Veterans who have experienced traumatic events; specifically, it is necessary to understand

how military Veterans experience growth over time and whether or not there are optimal or critical time points at which growth may occur. However, empirical evidence is mixed on the importance of time since event vis-à-vis growth outcomes. To demonstrate, in studies of growth outcomes in college undergraduates and breast cancer survivors, time since event was not correlated with the amount of growth reported (Bellizzi & Blank, 2006; Brunet, McDonough, Hadd, Crocker, & Sabiston, 2010; Park et al., 1996; Tedeschi & Calhoun, 1996). In contrast, several other studies in breast cancer patients found positive associations between PTG and time (Cordova et al., 2001; Manne, Ostroff, Winkel, Fox, & Grana, 2004; Sears, Stanton, & Danoff-Burg, 2003) and research on core beliefs has shown time since event to be a positive predictor of PTG (Cann et al., 2010). In light of these inconsistent findings, further research is needed to clarify the role of time in the development of PTG. Finally, much of what is known about the relationship between PTG, PTSD, and time comes from research done in the context of cancer patients, and the trauma experienced by military Veterans may be qualitatively different from the distress experienced by those who receive medical diagnoses.

The Present Study

The current empirical literature on models of PTG is plagued by an overreliance on samples of undergraduate students and other populations (e.g., cancer patients), which limits the ecological validity and generalizability of findings to military Veterans. There has also been piecemeal testing of relevant constructs, which has limited our understanding of the psychological mechanisms underlying PTG. To address these limitations, the purpose of this

study is to test a comprehensive model that describes the process through which disruption of core beliefs and rumination can lead to PTG and/or PTSD symptoms, and ultimately, affect satisfaction with life, in military Veterans.

Our conceptual model was developed by integrating existing constructs of interest that have been studied individually in relation to PTG (Cann et al., 2010, 2011). As portrayed in Figure 1, we hypothesized that (a) greater challenge to core beliefs would be associated with higher levels of both intrusive and deliberate rumination; (b) intrusive rumination would be associated with higher levels of PTSD symptoms; (c) deliberate rumination would be associated with higher levels of PTG; (d) PTSD symptoms and PTG would be positively correlated; and (e) PTSD would be associated with lower levels of satisfaction with life, while PTG would be associated with higher levels of satisfaction with life.

Method

Participants and Procedures

Participants were recruited to participate in an online survey, presented as an opportunity to further the theoretical framework of how Veterans experience life following adversity, posted on Amazon's Mechanical Turk (MTurk). MTurk allows investigators to post human intelligence tasks (HITs) to be performed by workers registered on the site. Recent research suggests that MTurk is a viable source of data, with quality comparable to or greater than that of more traditional methods (Bartneck, Duenser, Moltchanova, & Zawieska, 2015; Buhrmester, Kwang, & Gosling, 2011; Casler, Bickel, & Hackett, 2013). To demonstrate, a study examining the use of MTurk in psychology found that MTurk

participants are slightly more demographically diverse than standard internet samples and are significantly more diverse than typical American college samples, participants can be recruited rapidly and inexpensively, and realistic compensation rates do not affect data quality (Buhrmester et al., 2011). Workers were credited \$1.45 for their participation in this survey.

Participation was limited to military Veterans, who reported on the most distressing event (related to their military service or otherwise) experienced within the last three years. This three-year referent period was used to mitigate errors and biases in reporting accuracy that can occur during retrospective recall. A similar timeframe has been used in previous studies of PTG and core beliefs (Cann et al., 2010). To ascertain military Veteran status, potential participants were required to respond to questions that map onto the legal definition of “military Veteran” (see Table 1). Veterans who responded “other” to any of the Veteran status questions were required to specify the length and timing of their service. These responses were checked to ensure that participants met other legal definitions of Veteran.

The survey was open and accessible to participants from 3 February 2015 until 24 February 2015. Both a unique IP address and unique email address were required to access the survey, preventing anyone from accessing the survey multiple times. A total of 255 participants accessed the survey. One participant did not consent and exited the survey, and 39 failed the Veterans check questions and 18 participants left all scales blank, for a final sample of 197 participants.

Measures

The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) is a 21-item instrument for assessing positive outcomes in people who have experienced traumatic events. Five domains or factors are assessed [Relating to Others (seven items), New Possibilities (five items), Personal Strength (four items), Spiritual Change (two items), and Appreciation of Life (three items)] (Tedeschi & Calhoun, 2004), as well as a single higher order factor (Taku, Cann, Calhoun, & Tedeschi, 2008). Responses are measured on a 6-point 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*. An example item is “I changed my priorities about what is important in life.” In the current sample, PTGI scores showed high internal reliability (Cronbach’s $\alpha = .95$).

The PTSD Checklist for DSM-5 (PCL-5; (Weathers et al., 2013), is a 20-item self-report measure assessing the 20 DSM-5 symptoms of PTSD and can be used to screen individuals for PTSD and make a provisional diagnosis. Responses indicate how much participants were bothered by PTSD symptoms in the past month, ranging from 0 = *not at all* to 4 = *extremely*. An example item is “In the past month, how much were you bothered by repeated, disturbing, and unwanted memories of the stressful experience?” PCL-5 total scores showed very high internal reliability in the current sample (Cronbach’s $\alpha = .97$).

The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) consists of five items to assess global life satisfaction. Responses indicate the degree to which participants agree with each statement, ranging from 1 = *strongly disagree* to 7 =

strongly agree. An example item is “In most ways my life is close to my ideal.” SWLS scores showed good internal reliability in the current sample (Cronbach’s $\alpha = .91$).

The Core Beliefs Inventory (CBI; Cann et al., 2010) is a 9-item measure assessing the degree to which one’s assumptive world was challenged by an adverse event. Responses indicate the degree to which participants agree with each statement, ranging from 0 = *not at all* to 5 = *to a very great degree*. An example item is “Because of the event, I seriously examined the degree to which I believe things that happen to people are fair.” Scores on the CBI showed good internal reliability in the current sample (Cronbach’s $\alpha = .91$).

The Event Related Rumination Inventory (ERRI; Cann et al., 2011) was used to assess two types of rumination (two factors): *deliberate* and *intrusive*. Ten items assess the amount of deliberate rumination after an adverse event (e.g. “I thought about whether I could find meaning from my experience”), and 10 items assess the amount of intrusive rumination after an adverse event (e.g., “I thought about the event when I did not mean to”). Responses are measured on a 4-point scale, with values ranging from 0 = *Not at all* to 3 = *Often*. Internal reliability was strong (Cronbach’s α deliberate = .92; Cronbach’s α intrusive = .97) in the current sample.

We additionally measured seven participant characteristics to describe the sample and test potential moderators. The measures included age (in years), sex (where male = 0, female = 1), military branch, military status (Active Duty vs. National Guard/Reserve), rank (Enlisted or Officer) race, and ethnicity. Participants also reported how long ago (in months) the traumatic event happened.

Analytic Strategy

Prior to conducting analyses addressing the study aims, we first examined data missingness. Dummy codes were created that separated the sample into two groups: those with or without any missing data for each of the six main variables of interest (PTGI, CBI, SWL, ERRI-Intrusive, ERRI-Deliberate, and PCL-5). Demographic variables were then compared between groups using ANOVAs. Descriptive statistics were run to describe the overall sample and assess the distributions of all core model variables. Bivariate analyses then were conducted to examine whether predicted relationships existed among these variables as well as time and biological sex. Analyses of variance (ANOVAs) were run to examine possible sex differences in PTG, as well as each PTG factor, and PTSD symptoms, including each symptom cluster. Additionally, phi correlations were used to assess if there were sex differences for multiple PCL-5 cut-off scores (i.e., 30, 43, and 50); these cutoffs were chosen based on recommendations outlined in the literature (Bliese et al., 2008) and reflect varying levels of sensitivity and specificity. Finally, structural equation modeling (SEM) was used to test the proposed model. SEM is preferred over multiple regression for several reasons, most notably (for the purposes of this study) the ability to develop complex path models with direct and indirect effects and test whether latent constructs are related in hypothesized ways (Leong & Austin, 2005). The root mean square error of approximation (RMSEA) was used to determine the model of best fit because it is less sensitive to sample size compared to other fit indices (Fan, Thompson, & Wang, 1999); values less than 0.08 indicate a better fit (Vandenberg & Lance, 2000).

Results

Missing Data

Comparisons between participants with and without data missing on our six measures of interest (i.e., PTGI, CBI, SWL, ERRI-Intrusive, ERRI-Deliberate, and PCL-5) revealed no significant differences between the two groups on any demographic variables, suggesting that the data were missing completely at random (i.e., MCAR). Given the MCAR nature of the data, composite scores based on multi-item scales were pro-rated using the individual's mean on the other items (case-by-case item deletion or ipsative mean imputation; (Schafer & Graham, 2002) to replace missing values to the extent feasible. When internal reliability is greater than .90, this practice does not introduce bias, as all items are highly correlated (Osborne, 2013). A conservative threshold for imputing data on measures or scales missing less than 10% for an individual was used. Because the PTGI is a multi-factor scale, items were imputed by averaging the respondent's score on the factor in question. The changes in variables' mean scores as a result of imputation were minimal and statistically nonsignificant.

Participant Characteristics

The mean age of participants was 36.01 years ($SD = 10.94$, range 21-71). The sample was 69.4% male and 30.6% female, for an overrepresentation of women compared to the national Veteran population (9%; National Center for Veteran Analysis and Statistics, 2014). This is not surprising, given that 70% of MTurk respondents are women (Ipeirotis, 2014). Participants were predominately European-American/Caucasian/White (82.7%, $n = 163$),

while 8.6% ($n = 17$) were African-American/Black, 5.1% ($n = 10$) were biracial/multiracial, and 2% ($n = 4$) were Asian. One participant (0.5%) reported being American Indian/Alaska Native and one participant (0.5%) reported being Native Hawaiian/Pacific Islander. The majority of participants ($n = 171$, 89.5%) were not Hispanic/Latino.

Participants were from all five branches of the military, with the majority being Army Veterans (47.7%, $n = 94$), followed by Air Force (19.3%, $n = 38$), Navy (16.2%, $n = 32$), Marines (12.7%, $n = 25$), and Coast Guard (4.1%, $n = 8$). The majority was Active Duty at time of service (71.9%, $n = 138$), compared to Reserves (19.3%, $n = 37$) and National Guard (8.9%, $n = 17$). Participants represented enlisted ($n = 171$, 86.8%) and officer ($n = 26$, 13.2%) ranks, ranging from E-1 to E-9, W-1 to W-4, and O-1 to O-4. Most ($n = 127$, 64.4%) were between E-3 and E-5 ranks.

All measures were anchored to the event that the participant reported was the most stressful event experienced in the last three years. The most commonly reported event was loss of a loved one (23.4%). Participants also reported on financial hardship (20.3%), job loss (12.2%), career or location change/move (6.6%), change in family responsibility (6.1%), accident or injury (6.1%), divorce (5.6%) and combat (5.6%), with no other category of traumatic event representing more than 5% of the sample. Additionally, participants reported whether or not this event was directly caused by their military service and directly caused by a deployment. Of the entire sample, 25.9% attributed this event to military service and 15.2% attributed it specifically to a deployment.

Descriptive Statistics

The mean score on the PTGI was 45.91 ($SD = 24.68$; Min = 0, Max = 102, Range 0-105), corresponding to participants reporting, on average, *a small to moderate degree* of growth as a result of the adverse event. The mean PCL-5 score was 25.82 ($SD = 20.22$), with a range of 0 to 80, suggesting that participants, on average, were bothered by their symptoms moderately to quite a bit. On the PCL-5, the cutoff score that has been suggested for meeting diagnostic criteria for PTSD is a total score of 38 (Weathers, et al., 2013). Using these guidelines, 32.7% of participants had levels of PTSD symptoms that can be indicative of a diagnosis of PTSD. On the SWLS, participants reported a mean of 21.95 ($SD = 7.60$), with a range of 5 to 35, indicating that this sample, on average, is only *slightly satisfied* with their lives. On the CBI, participants reported a mean score of 22.42 ($SD = 11.02$; Min = 0, Max = 45), corresponding to an average response of *small to moderate degree* of core belief challenge in this sample. In terms of deliberate rumination, participants reported an average of 16.42 ($SD = 7.77$, Min = 0, Max = 30), which reflects that participants *sometimes* engaged in deliberate forms of rumination. On the intrusive rumination factor (Min = 0, Max = 30, $M = 16.81$, $SD = 8.79$), participants reported slightly more levels than deliberate rumination, on average, though it still corresponds most closely to *sometimes* experiencing intrusive thoughts. Participants reported on events that happened an average of 16.66 months ago, ($SD = 12.27$ months).

Bivariate Relationships

Bivariate correlations between the study variables are reported in Table 2. Results demonstrated significant associations, as hypothesized, between PTG, PTSD, SWL, challenge to core beliefs, and intrusive and deliberate rumination. Neither time nor sex was associated with any of these variables ($ps > .05$). Results of one-way ANOVAs similarly failed to identify sex differences in PTG total scores or any of the five PTGI factors, on total PCL-5 scores, PCL-5 cutoffs, or symptom clusters.

Model Testing

Structural equation modeling (SEM) was conducted using SPSS AMOS Version 7.0 (Arbuckle, 2006) in order to test the proposed model for predicting PTG and PTSD among military Veterans. This model included seven variables: core beliefs, time since event, deliberate rumination, intrusive rumination, PTG, PTSD symptoms, and satisfaction with life. Figure 2 shows the SEM describing the standardized beta coefficients for the direct effects. Table 3 shows direct, indirect, and total effects. Results showed that challenge to core beliefs was directly associated with both deliberate and intrusive rumination. Intrusive rumination was then associated with deliberate rumination. Deliberate rumination was directly related to PTG and intrusive rumination was directly related to PTSD symptoms. PTG and PTSD symptoms mediated the relationship between rumination styles and satisfaction with life. PTG and PTSD symptoms were also significantly correlated. Model fit statistics indicated a reasonable fit (RMSEA = .074, 90% CI = .069-.079; CFI = .96; RFI = .94), even though the Chi-square statistic for the model was significant [$\chi^2(770) = 1598.37, p$

< .001], which is expected given the sample size and its sensitivity to even slight differences between observed and predicted covariances (Kline, c2005.).

Discussion

The present study tested a model of the potential pathways from subjective distress to posttraumatic stress and posttraumatic growth (PTG) and, ultimately, satisfaction with life in a sample of military Veterans. Specifically, we examined associations between challenge to core beliefs, rumination styles, time, PTG, PTSD symptoms, and satisfaction with life using structural equation modeling (SEM). There was strong support for this model, with model fit statistics suggesting a good fit as well as all paths showing statistical significance. This study represents an advance over prior research as the first study to test, and provide empirical support for, a comprehensive model of PTG in a military Veteran population. There has been little research to date that has examined a model of PTG that simultaneously includes measures of psychological distress and satisfaction with life and even less work that has examined the psychological mechanisms underlying PTG in military Veterans, specifically. Indeed, a predominance of research on PTG has been conducted in non-Veteran samples, including undergraduate students and cancer patients. In the sections that follow, we discuss the study findings in more detail.

The first construct in the model was challenge to core beliefs. Congruent with previous findings (Cann et al., 2010; Danhauer et al., 2013; Lindstrom et al., 2013), bivariate results showed challenge to core beliefs to be positively related to PTG, as well as both intrusive and deliberate rumination. Also consistent with previous findings (Cann et al.,

2010), challenge to core beliefs was negatively associated with satisfaction with life.

However, results of the SEM revealed that only intrusive and deliberate rumination were directly associated with challenge to core beliefs; all other associations were mediated by one or more variables. These results implicate core beliefs as a possible impetus for PTG and PTSD symptoms, as well as subsequent satisfaction with life. This means that, in bivariate correlations, challenge to core beliefs is negatively related to satisfaction with life, reinforcing the idea that it is not the trauma itself that causes PTG, but rather the cognitive work to deal with the psychological impact of the trauma that can lead to results in perceived positive outcomes. Clinicians and researchers alike should be cognizant of the fact that the extent to which one's fundamental assumptions about life are shattered may or may not coincide with the inherent objective stressfulness of an event. In other words, one person may be exposed to an event that is objectively less stressful (e.g., working supply on a deployment) but is experienced as subjectively more stressful, leading to a challenge to core beliefs and a greater likelihood of PTG. Another individual, in contrast, may be exposed to an event that is objectively more stressful (e.g., handling dead bodies) but is experienced as subjectively less stressful and, thus, does not challenge their core beliefs. This individual, consequently, would be unlikely to report PTG attributable to this event.

The next constructs in the model were the two styles of rumination: intrusive and deliberate. As in previous studies (Cann et al., 2011; Triplett et al., 2012), bivariate analyses revealed that both intrusive and deliberate rumination were associated with higher levels PTG and PTSD symptoms, and negatively related to satisfaction with life. In the SEM,

intrusive rumination was directly associated with deliberate rumination and PTSD symptoms, and deliberate rumination was directly associated with PTG; this pattern of relationships is similar to previous findings (Triplett et al., 2012). Relationships between rumination styles and satisfaction with life were fully mediated by PTG and PTSD. These results support the notion that intrusive rumination may act as a catalyst for individuals to engage in more deliberate types of rumination following trauma (Cann et al., 2011) and that it is this deliberate rumination style, a sort of cognitive work, which leads to experiences of PTG. Findings suggest that treatment strategies that focus on promoting deliberate rumination, such as narrative exposure therapy (Neuner, Schauer, Roth, & Elbert, 2002) or other meaning making strategies (King & Miner, 2000), may have the potential to increase the likelihood of PTG following trauma exposure. Additionally, therapies such as Acceptance and Commitment Therapy (Hayes, Luoma, Bond, Masuda, & Lillis, 2006) or more traditional cognitive behavioral therapy approaches may be helpful in increasing psychological flexibility and decreasing experiential avoidance, in order to make deliberate rumination more feasible. Future research should investigate the effect of such therapies on overall satisfaction with life.

Our findings regarding the association between PTG and PTSD symptoms merit some discussion, particularly given the contrasting associations between each with life satisfaction. Though it may seem counterintuitive for PTG and PTSD to coexist, results from this study and prior research provide empirical evidence that these constructs are not opposite ends of the same spectrum. This fact has important clinical and empirical implications: the

fact that patients or participants present with symptoms of distress does not preclude them from also experiencing growth (Calhoun & Tedeschi, 1999). Additionally, the results of our structural equation model show the strong positive association between PTG and satisfaction with life, as well as the strong negative association between PTSD symptoms and satisfaction with life (see Figure 2). Overall, these findings are congruent with the few studies that have examined a similar model of PTG in other populations, such as undergraduate students and prostate cancer survivors (e.g., Triplett, et al., 2012; Wilson et al., 2014).

Time since event was not associated significantly with PTG in bivariate analyses, consistent with studies similarly failing to find an association (Bellizzi & Blank, 2006; Brunet et al., 2010; Park et al., 1996; Tedeschi & Calhoun, 1996), but was significant in the SEM, consistent with others showing a positive association (Cann et al., 2010; Cordova et al., 2001; Manne et al., 2004; Sears et al., 2003). It is possible that the relationship between PTG and time is non-linear or that the other variables in the model somehow accounted for a clustering effect of various time by PTG relationships. Also, although these results provide evidence of a suppressor effect, the change in the strength of association was small. An understanding of how individuals come to experience PTG over time and whether or not there are critical time points for care are vital for clinicians and researchers.

Lastly, sex was not found to be associated with any model constructs, in contrast with prior research showing differences in men and women in terms of PTG (Vishnevsky et al., 2010) and PTSD (Hourani et al., 2015; Tolin & Foa, 2006), as well as challenge to core beliefs (Cann et al., 2010), but congruent with other studies that have failed to find these

differences in military samples for PTSD (Maguen et al., 2006) and PTG (Gallaway et al., 2011). There are several possible explanations for our null finding. For instance, the mixed findings in military samples may indicate that women who self-select into the military are qualitatively different in some way from their civilian counterparts that reduces the likelihood that they will experience a challenge to core beliefs, PTG, and PTSD. It is also possible that some aspect of being in the military, such as training received or immersion in the military culture, leads men and women to view potentially traumatic events in more similar ways than do their non-Veteran peers. Alternatively, the lack of sex differences in the current study may not reflect anything about the military experience, but rather the people who are willing to respond to questions on MTurk and participate in a study of experiences following adversity. Beyond the scope of the present study, future research could compare men and women Veterans and non-Veterans to explore these differences.

Limitations

There are a few limitations of this study that should be mentioned. This cross-sectional study provides only correlational data and causality cannot be inferred. Further, although demographic characteristics suggest representation from a variety of Veterans, this was a convenience sample and not nationally representative. Likewise, this is one of the first studies to use MTurk with Veterans, and differences between Veterans participating on MTurk and other Veterans have not been examined. Thus, generalizability of the current findings to all military Veterans is unknown and testing the replicability of the current findings using different sampling methods is an important avenue for future research.

Additionally, we relied on self-report data, which may introduce bias or self-report error (Coyne & Tennen, 2010). In order to address the issue of recall, we also limited the referent period for traumatic events to three years, which may not have allowed participants to report on the most traumatic event they have ever experienced. However, self-report of mental health status is a reliable and valid measure, and has shown to be highly associated with other outcomes of interest (Sawatzky, Ratner, Johnson, Kopec, & Zumbo, 2010). Moreover, the perceptions of those dealing with trauma, subjective as it may be, is valuable in both clinical practice and research alike. Nonetheless, future research should also utilize diagnostic instruments, corroboration from friends and family, or medical records to verify these findings. Finally, this model was tested in a sample of military Veterans, but only about one-quarter of the sample attributed the traumatic event on which they reported to their military service. That said, military Veterans experience heightened rates of traumatic events both related and unrelated to their military service (e.g., stressful life events, such as divorce) (Gradus, 2016). As such, investigation of any type of traumatic experience will be relevant to efforts designed to promote the mental health and well-being of military Veterans.

Nonetheless, future studies should test the applicability of the model of PTG established herein to among military Veterans reporting exclusively on military-related adverse events.

Future Directions and Implications

These results have important implications for future research and interventions with military Veterans. First, our results provide empirical support for the conceptualization of PTG that describes a pathway from a traumatic experience through challenge to core beliefs

and deliberate rumination. Second, although many researchers and clinicians focus their efforts on decreasing PTSD, it is also possible to examine intervention opportunities in facilitating increases in PTG to affect satisfaction with life. Third, standardized regression weights show the relative importance or value of PTG and PTSD symptoms in one's evaluation of overall life satisfaction. These results suggest that PTSD symptoms may have a more powerful effect on life satisfaction than PTG, which is consistent with extant literature on negativity bias. Fourth, and of particular importance to this population, is the possibility that a certain level of cognitive functioning might be necessary to apply this model. This may be problematic in a population that has such a high prevalence of traumatic brain injury, which may prohibit a Veteran from engaging in this level of cognitive work (Tanielian & Jaycox, 2008b). Similarly limiting factors may include substance use or any other issue limiting cognitive capacity. Clinicians and researchers should keep in mind the potential for such factors to impede deliberate rumination when applying this model and related interventions to any sample. Finally, this study is among the first to test and provide strong empirical support for a comprehensive theoretical model that describe the co-occurrence of PTSD symptoms and PTG and their association with life satisfaction in military Veterans. Future research should build on the current findings by testing the model in diverse samples and across diverse traumatic events, including the related to military service, specifically.

Table 1
Military Veteran Status by Criteria

	Frequency (<i>n</i>)	Percent (%)	Cumulative Percent (%)
180 or more consecutive days, any part of which occurred during the period beginning September 11, 2001 and ending on a future date prescribed by Presidential proclamation or law as the last date of Operation Iraqi Freedom	141	71.6	71.6
Between August 2, 1990 and January 2, 1992	22	11.2	82.8
180 or more consecutive days, any part of which occurred after January 31, 1955 and before October 15, 1976	13	6.6	89.4
Served in a war, campaign or expedition for which a campaign badge has been authorized on or between April 28, 1952 and July 1, 1955	1	0.5	89.9
Other (please specify)	20	10.2	100.0
Total	197	100.0	

Note. $N = 197$.

Table 2*Bivariate Correlations between Study Variables*

	CBI	SWL	PTSD Symptoms	Intrusive Rumination	Deliberate Rumination	Time	Sex	Age
PTGI	.66***	.16*	.30***	.30***	.56***	.10	-.10	-.08
CBI	--	-.21**	.57***	.58***	.62***	.05	-.02	-.08
SWL		--	-.42***	-.43***	-.21**	.13	-.02	-.10
PTSD Symptoms			--	.68***	.37***	-.14	-.01	-.19*
Intrusive Rumination				--	.62***	-.10	.12	.02
Deliberate Rumination					--	.01	.07	.12
Time						--	.07	.20**
Sex							--	-.07

Notes. * $p < .05$. ** $p < .01$. *** $p < .001$. PTGI = Posttraumatic Growth Inventory. CBI = Core Beliefs Inventory. SWL = Satisfaction with Life.

Table 3

Standardized Effects of Core Belief Challenge, Rumination, Time, PTSD, and Posttraumatic Growth on Rumination, PTSD, Posttraumatic Growth and Life Satisfaction

	Core Belief Challenge			Intrusive Rumination			Deliberate Rumination			Time			PTSD Symptoms		PTG		
	D	ID	T	D	ID	T	D	ID	T	D	ID	T	D	T	D	T	
Intrusive Rumination	.62																
Deliberate Rumination	.50	.21	.71	.34		.34											
PTSD Symptoms	.28	.42	.70	.67		.67											
PTG		.43	.43		.21	.21	.61		.61	.14		.14					
Life Satisfaction		-.33	-.33		-.43	-.43		.32	.32		.07	.07	-.80	-.80	.53	.53	

Notes. $N = 197$. Standardized effects are reported in beta weights. All effects are significant at $p < .001$. D = Direct. ID = Indirect.

T = Total. PTG = Posttraumatic Growth. Age and sex were initially included in the model but there were no significant paths. Full results available upon request.

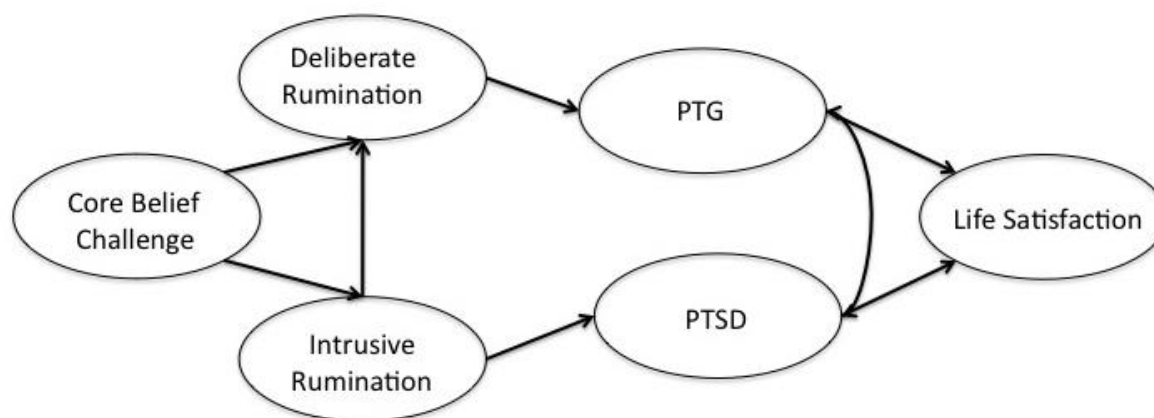


Figure 1. Conceptual model of posttraumatic growth, PTSD, and satisfaction with life in military Veterans.

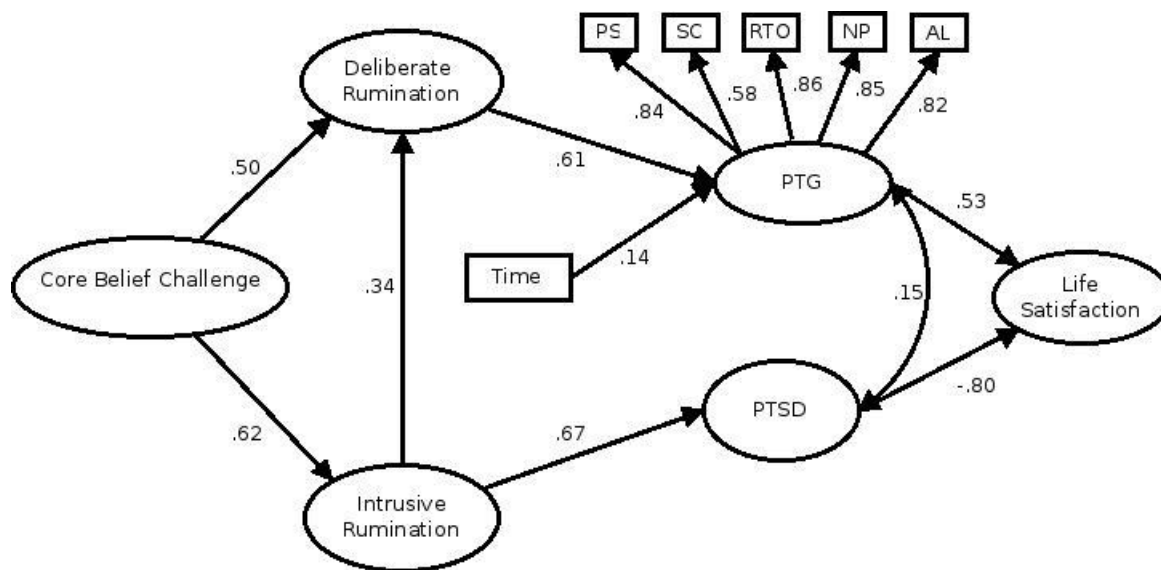


Figure 2. Proposed structural model of posttraumatic growth, PTSD, and satisfaction with life in military Veterans. Standardized beta coefficients shown for each path. All paths are significant at the $p < .001$ level.

CHAPTER 4

Associations between Time since Event and Posttraumatic Growth Among Military Veterans

Despite efforts to understand the antecedents, correlates, and consequences of posttraumatic growth (PTG), the role of time since event vis-à-vis PTG is not well understood. Part of a larger project exploring experiences following emotionally distressing events among military Veterans ($N = 197$) using Amazon's Mechanical Turk (Mturk), the current study sought to clarify associations between time since event and PTG. We used cluster analytic techniques and analyses of variance to: 1) determine the number of clusters, and 2) assess differences in core constructs of PTG and participant characteristics across clusters. Results revealed four significantly different groups (i.e., clusters) characterized by differential associations between PTG and time since event. These groups also differed significantly in challenge to core beliefs, level of PTSD symptoms, intrusive and deliberate rumination, and age. The Immediate Moderate Growth group (Cluster 1) experienced moderate levels of PTG over shorter periods of time, high levels of PTSD symptoms, and was significantly younger in age. The Low Growth group (Cluster 2) was characterized by minimal PTG regardless of time, the least amount of challenge to core beliefs, and low amounts of both intrusive and deliberate rumination. The Long-term Small Growth group (Cluster 3) was primarily characterized by small amounts of PTG over longer periods of time. The High Growth group (Cluster 4) was characterized by high PTG regardless of time, greater challenge to core beliefs, the highest amount of deliberate rumination, and the highest amount of PTSD symptoms. Findings underscore heterogeneity within military Veterans'

experiences of PTG over time.

Military Psychology, 2017

Introduction

The term *posttraumatic growth* (PTG) was coined more than two decades ago to refer to positive personal changes following adversity or trauma (Tedeschi & Calhoun, 1995). Since then, there have been many empirical efforts to better understand PTG and its antecedents, correlates, and consequences. Research has additionally shown that military Veterans are more likely than civilians to experience trauma and posttraumatic stress disorder (PTSD), making PTG a topic of particular interest to military psychologists (Gradus, 2016). Overall, findings of the extant work support PTG following trauma in diverse samples, including military Veterans (Marotta-Walters et al., 2015), and suggest that it is related to both psychological distress and well-being (Kaler et al., 2011; Tedeschi & McNally, 2011; Tsai, Mota, et al., 2016). There has been a growing interest in the military community to examine PTG as a framework for informing prevention and intervention efforts, with the overall goal of improving satisfaction with life among military Veterans (Casey, 2011b; Tedeschi & McNally, 2011).

Several theoretical models of PTG have been proposed and tested, and studies have shown the importance of constructs like challenge to core beliefs and rumination styles (Calhoun & Tedeschi, 2004; Cann et al., 2010, 2011). However, the role of time since event vis-à-vis PTG is not well understood. Some studies have found significant associations between time since the event and PTG. For example, in the seminal article on the Core Beliefs Inventory (Cann et al., 2010), time was found to be a significant predictor of PTG in a sample of 297 undergraduate psychology students, such that longer time since event was

associated with greater growth. Sears, Stanton, and Danoff-Burg (2003) also found that longer time since diagnosis was associated with higher reports of PTG in 58 breast cancer patients. Similar trends have been seen in other samples of cancer patients (Manne et al., 2004).

In contrast, other studies have failed to find an association between time since event and PTG. For instance, in one study of 160 undergraduate students, the amount of growth reported was not related to how recently the event had occurred (Park et al., 1996). However, the lack of significant association in this study may reflect a restricted range, as participants reported on an event within the last year. Another study of 604 undergraduate students similarly found that PTG was not associated with time since event, even though participants reported on events over a longer time frame (up to three years) (Tedeschi & Calhoun, 1996). Two recent studies of breast cancer similarly have failed to show associations between time since event and PTG (Bellizzi & Blank, 2006; Brunet et al., 2010).

The Present Study

Taken together, findings of the prior research suggest that there may be individual differences in the role of time since event in PTG. This is congruent with prior studies examining time since event and negative sequelae of trauma, such as PTSD (Koenen, Stellman, Stellman, & Sommer Jr., 2003). As part of a larger study exploring experiences following emotionally distressing events among military Veterans, the present study sought to clarify associations between time since event and PTG using cluster analytic techniques. The specific aims of this study are: (1) to identify groups of participants (i.e., clusters) that

differ meaningfully with respect to the associations between time since event, and (2) to assess differences between these groups on PTG constructs, including challenge to core beliefs, deliberate and intrusive rumination, PTSD symptoms, satisfaction with life, and demographic characteristics, including sex and age. To our knowledge, this is the first investigation of associations between time since event and PTG among military Veterans.

Methods

Subjects and Recruitment

An online survey was posted on Amazon's Mechanical Turk (MTurk). MTurk allows investigators to post human intelligence tasks (HITs) to be performed by workers registered on the site. Recent research suggests that MTurk is a viable source of data, with quality comparable to or greater than that of more traditional methods (Bartneck et al., 2015; Buhrmester et al., 2011; Casler et al., 2013). Workers were credited \$1.45 for their participation in this survey and participation was limited to military Veterans, who reported on the most distressing event experienced within the last three years. This timeframe was used to mitigate difficulties in retrospective recall. A total of 255 participants accessed the survey. One participant did not consent and exited the survey, 39 failed the Veterans check and 18 participants left all scales blank, for a final sample of 197 participants.

Survey Measures

Posttraumatic Growth Inventory. The Posttraumatic Growth Inventory (PTGI; (Tedeschi & Calhoun, 1996) is a 21-item instrument for assessing positive outcomes following traumatic events. Five domains are assessed [Relating to Others (seven items),

New Possibilities (five items), Personal Strength (four items), Spiritual Change (two items), and Appreciation of Life (three items)] (Calhoun & Tedeschi, 2004), as well as a single higher order factor (Taku, Cann, Calhoun, & Tedeschi, 2008). Responses are measured on a 6-point scale, 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*. In the current sample, PTGI scores showed high internal reliability (PTGI Total $\alpha = .95$; PTGI-RTO $\alpha = .90$; PTGI-NP $\alpha = .85$, PTGI-PS $\alpha = .84$; PTGI-SC $\alpha = .83$; PTGI-AL $\alpha = .75$).

PCL-5. The PTSD Checklist for DSM-5 (PCL-5; (Weathers et al., 2013), is a 20-item self-report measure assessing the 20 DSM-5 symptoms of PTSD and can be used to screen individuals for PTSD and make a provisional diagnosis. Responses indicate how much participants were bothered by PTSD symptoms in the past month, from 0 = *not at all* to 4 = *extremely*. PCL-5 total scores showed very high internal reliability in the current sample ($\alpha = .97$). On the PCL-5, a cutoff score of 38 was used to indicate diagnostic criteria for PTSD (Weathers, et al., 2013).

Satisfaction with Life Scale. The Satisfaction with Life Scale (SWLS; (Diener et al., 1985)\ consists of five items to assess global life satisfaction. Responses indicate the degree to which participants agree with each statement, ranging from 1 = *strongly disagree* to 7 = *strongly agree*. SWLS scores showed good internal reliability in the current sample ($\alpha = .91$).

Core Beliefs Inventory. The Core Beliefs Inventory (CBI; Cann et al., 2010) is a 9-item measure assessing the degree to which one's assumptive world was challenged by an adverse event. Responses indicate the degree to which participants agree with each statement,

ranging from 0 = *not at all* to 5 = *to a very great degree*. CBI scores showed good internal reliability in the current sample ($\alpha = .91$).

Event Related Rumination Inventory. The Event Related Rumination Inventory (ERRI; (Cann et al., 2011) was used to assess two types of rumination (two factors): *deliberate* and *intrusive*. Ten items assess the amount of deliberate rumination after an adverse event, and 10 items assess the amount of intrusive rumination after an adverse event. Responses are measured on a 4-point scale, ranging from 0 = *Not at all* to 3 = *Often*. Internal reliability was strong (α deliberate = .92; α intrusive = .97).

For *time since event*, participants reported how long ago (in months) the traumatic event happened. We additionally measured participant *age* (in years), *sex* (where male = 0, female = 1), military branch, military status (Active Duty, National Guard/Reserve), *rank* (Enlisted, Officer), *race* (0 = White/Caucasian/European American, 1 = other) and *ethnicity* (0 = Non-Hispanic/Latino, 1 = Hispanic/Latino).

Statistical Analyses

Prior to conducting analyses addressing the study aims, we first examined data missingness. Dummy codes were created that separated the sample into two groups: those with or without any missing data for each of the six main variables of interest (PTGI, CBI, SWL, ERRI-Intrusive, ERRI-Deliberate, and PCL-5). Demographic variables also were compared between groups using ANOVAs. Descriptive statistics then were computed to describe the overall sample and assess the distributions of all core model variables. To address study aim 1, a hierarchical cluster analysis using Ward's method was performed and

the squared Euclidean Distance was used as the distance measure, following the procedure outlined by Burns and Burns (Burns & Burns, 2008). Measures were standardized into *z*-scores for the analysis. Results of the agglomeration schedule suggested the optimal solution and a *k*-means cluster analysis was run with this specification. To address study aim 2, one-way ANOVAs were conducted to assess differences across groups of participants defined by the clusters. Tukey's HSD post-hoc comparisons were conducted when the main effect was significant.

Results

Missing Data

Comparisons between participants with and without data missing on our six measures of interest (i.e., PTGI, CBI, SWL, ERRI-Intrusive, ERRI-Deliberate, and PCL-5) revealed no significant differences between the two groups on any demographic variables, suggesting that the data were missing completely at random (i.e., MCAR). Given the MCAR nature of the data, composite scores based on multi-item scales were pro-rated using the individual's mean on the other items (Schafer & Graham, 2002) to replace missing values to the extent feasible. When internal reliability is greater than .90, this practice does not introduce bias, as all items are highly correlated (Osborne, 2013). A conservative threshold for imputing data on measures or scales missing less than 10% for an individual was used. Because the PTGI is a multi-factor scale, items were imputed by averaging each participant's score on the factor in question. The changes in variables' mean scores as a result of imputation were minimal and statistically nonsignificant.

Participant Characteristics

Mean participant age was 36.01 ($SD = 10.94$, range = 21-71). The sample was predominantly male (69.4%), but nonetheless overrepresented women compared to the national population of Veterans (9%; National Center for Veteran Analysis and Statistics, 2014). However, this distribution is consistent with the overall distribution of men and women among the population of American MTurkers (Ipeirotis, 2014). Participants were predominately European-American/Caucasian/ White (82.7%, $n = 163$), while 8.6% ($n = 17$) were African-American/Black, 5.1% ($n = 10$) were biracial/multiracial, and 2% ($n = 4$) were Asian. One respondent (0.5%) reported being American Indian/Alaska Native and one respondent (0.5%) reported being Native Hawaiian/Pacific Islander. The majority of respondents ($n = 171$, 89.5%) were not Hispanic/Latino and 10.5% ($n = 20$) reported Hispanic/Latino ethnicity. Respondents were from all five branches of the military, but almost half were Army Veterans (47.7%, $n = 94$). Most were Active Duty at the time of service (71.9%, $n = 138$) and from enlisted ranks (86.8%, $n = 171$).

All measures were anchored to the event that the participant reported was the most stressful event experienced in the last three years. The most commonly reported event in this sample was loss of a loved one (23.4%). Veterans also reported on financial hardship (20.3%), job loss (12.2%), career or location change/move (6.6%), change in family responsibility (6.1%), accident or injury (6.1%), divorce (5.6%) and combat (5.6%), with no other category representing more than 5%. Additionally, participants reported whether or not this event was directly attributable to their military service and/or deployment. Overall,

25.9% attributed the event to their military service and 15.2% to a deployment.

Descriptive Statistics

On average, the mean time since event was 14.89 months, ($SD = 11.34$; Range = 1 - 36). The mean PTGI score was 46.14 ($SD = 24.98$; Range = 0 - 105), corresponding to a *small to moderate degree* of growth as a result of the adverse event. This level of PTG is similar to mean levels reported in some research (e.g., Israeli ex-prisoners of war, (Solomon & Dekel, 2007), but somewhat lower than reported in others (e.g., Vietnam prisoners of war, (Feder et al., 2008). The mean PCL-5 score was 25.82 ($SD = 20.22$; Range = 0 – 80), suggesting that participants were bothered by their symptoms moderately to quite a bit. Approximately one-third of participants (32.7%, $n = 65$) met the cut-off for PTSD. The mean SWLS score was 21.20 ($SD = 7.60$; Range = 5 - 35), indicating that participants were only *slightly satisfied* with their lives. The mean CBI score was 22.42 ($SD = 11.02$; Range = 0 - 45), corresponding to an average response of *small to moderate degree* of core belief challenge. In terms of rumination, the mean ERRI-Deliberate score was 16.42 ($SD = 7.77$, Range = 0 - 30), which indicates that participants *sometimes* engaged in deliberate rumination. The mean ERRI-Intrusive score was slightly higher ($M = 16.81$, $SD = 8.79$, Range = 0 - 30), but still corresponded to *sometimes* experiencing intrusive thoughts.

Aim 1: Cluster Analysis

Results of the agglomeration schedule suggested that four clusters provided the optimal solution, so a k -means cluster analysis was run with $k = 4$. A one-way ANOVA revealed significant differences across clusters on time since event [$F(3, 189) = 49.60$, $p <$

.001] and PTG [$F(3, 189) = 395.80, p < .001$]. Post-hoc comparisons revealed differences on measures of PTG and time for all four clusters (all $ps < .001$) (see Table 1). Cluster 1 demonstrated moderate levels of PTG over shorter periods of time, labeled the *Short-Term Moderate Growth* group. Cluster 2 demonstrated low levels PTG regardless of time, labeled the *Low Growth* group. Cluster 3 demonstrated moderate levels of PTG over longer periods of time, labeled the *Long-Term Moderate Growth* group. Cluster 4 demonstrated high levels of PTG regardless of time, labeled the *High Growth* group (see Figure 1). A chi-square goodness-of-fit test revealed that the distribution of cases across clusters differed significantly from chance ($\chi^2[3] = 10.63, p = .014$).

Aim 2: Group Differences

Groups differed significantly in the level of challenge to core beliefs, $F(3, 184) = 38.18, p < .001$. Post-hoc comparisons revealed that the High Growth group experienced greater challenge to their core beliefs than the Short-Term Moderate Growth group, the Long-Term Moderate Growth group and the Low Growth group. In addition, the Low Growth group experienced significantly less challenge to their core beliefs than the Short-Term Moderate Growth or Long-Term Moderate Growth groups (all $ps < .001$).

Groups also differed significantly in both deliberate [$F(3, 187) = 24.51, p < .001$] and intrusive forms of rumination [$F(3, 186) = 5.38, p < .001$]. Post-hoc comparisons showed that the Low Growth group reported less intrusive rumination than both the Short-Term Moderate Growth group ($p = .017$) and the High Growth group. In terms of deliberate rumination, the Low Growth group reported lower amount than the Short-Term Moderate Growth ($p < .001$),

Long-Term Moderate Growth ($p = .001$), and High Growth groups ($p < .001$). Additionally, the High Growth group experienced more deliberate rumination than the Short-Term Moderate Growth ($p = .009$) and Long-Term Moderate Growth ($p = .001$) groups.

Level of PTSD symptoms differed across groups as well [$F(3, 160) = 7.82, p < .001$]. The High Growth group reported the highest level of PTSD symptoms, significantly more than both the Low Growth group ($p = .004$) and the Long-Term Moderate Growth group ($p = .012$). The Short-Term Moderate Growth group also reported higher levels of PTSD symptoms than the Low Growth ($p = .002$) and the Long-Term Moderate Growth groups ($p = .007$). There were no differences in satisfaction with life ($p = .202$).

Lastly, in terms of demographic characteristics, groups differed significantly with respect to age, $F(3, 189) = 5.36, p < .001$. Post-hoc comparisons revealed that the Short-Term Moderate Growth cluster was significantly younger than the Low Growth ($p = .042$) and Long-Term Moderate Growth groups, ($p < .001$). There were no differences as a function of sex, $p = .322$.

Discussion

The present study explored associations between time and PTG in a sample of military Veterans using cluster analytic techniques. This work is consistent with, and builds upon, prior work examining PTG in Veterans (Marotta-Walters et al., 2015), as well as resilience following loss and trauma more generally (Bonanno, 2004). Results revealed four significantly different groups (i.e., clusters) characterized by differential associations between PTG and time since event. Further analyses showed that these groups differed

significantly on a number of constructs core to PTG, as well as age. Specifically, one group (Cluster 2) was labeled the Low Growth group and was characterized by minimal PTG regardless of time, the least amount of challenge to core beliefs, and low amount of both intrusive and deliberate rumination. Another group (Cluster 3) was called the Long-term Small Growth group and was primarily characterized by small amount of PTG over longer periods of time. Cluster 1 was labeled the Immediate Moderate Growth group and experienced moderate levels of PTG over shorter periods of time, as well as high levels of PTSD symptoms; this group was also significantly younger in age. Lastly, a group (Cluster 4), called the High Growth group, was characterized by a great degree of PTG regardless of time, greater challenge to core beliefs, the highest amount of deliberate rumination, and the highest amount of PTSD symptoms. These results suggest that the relationship between time and PTG is heterogeneous in nature. These findings help explain the prior inconsistent findings regarding time since event and PTG from studies in which researchers have assumed that time since event and PTG demonstrate the same association across participants. Part of a larger study on PTG in military Veterans (Morgan et al., forthcoming), this study provides empirical support for the current model of PTG. Beyond military Veterans, individual differences in the association of time since event and PTG should be examined in other populations.

Limitations

There are a few aspects of the study design that limit conclusions. First, the study was cross-sectional in nature and thus, causality cannot be inferred. Second, our convenience

sample of military Veterans recruited using MTurk may not generalize to other Veterans, although we found considerable diversity in participants' sociodemographic characteristics. Future research is needed to replicate these findings using different recruitment methods and samples. Third, we relied on self-report data, which may introduce bias or self-report error (Coyne & Tennen, 2010). That said, research demonstrates that self-reported mental health is a reliable and valid measure that is highly associated with related constructs (Sawatzky et al., 2010). Moreover, the perceptions of those dealing with trauma, subjective as it may be, is valuable in both clinical practice and research. Nonetheless, future research should draw data from multiple sources, including clinical diagnoses, friends and family, or official records.

Conclusions and Implications

These limitations notwithstanding, this study advances our understanding of associations between time since event and PTG among military Veterans. Specifically, we found considerable heterogeneity within military Veterans' experiences of PTG over time. These findings have implications for research and practice. Specifically, researchers and practitioners should not assume a singular effect of time since event on PTG, but rather seek to identify subgroups of individuals who may differ with respect to the timeframe and trajectory of PTG. Findings also suggest that PTG should be assessed at multiple time points in research and practice, as it may require some amount of time to pass for individuals to report growth. Additionally, beyond PTG, findings suggest that comprehensive assessments of related constructs, including rumination and symptoms of PTSD, should increase our understanding of an individual's experience of PTG, if any, and point to targets for

intervention. Finally, findings provide further empirical evidence that military Veterans can experience growth following exposure to psychologically distressing or traumatic events and that efforts to promote PTG in this population are warranted.

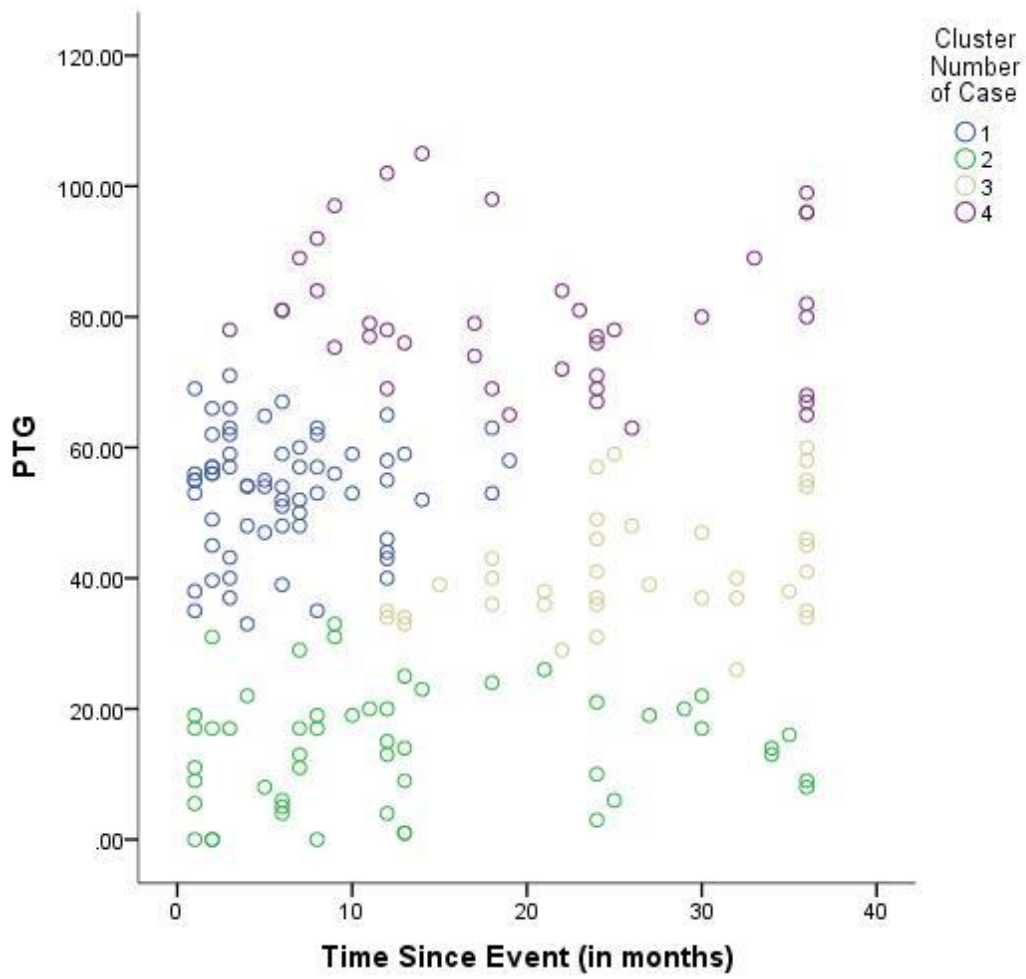


Figure 1. Cluster group membership by PTG and time since event.

Table 1

Comparison of constructs across clusters

Cluster	% (n)	Grouping	PTG M (SD)	Time [months] M (SD)	Challenge to Core Beliefs M (SD)	Intrusive Rumination M (SD)	Deliberate Rumination M (SD)	PTSD Symptoms M (SD)	Age M (SD)
1	33.7% (65)	Short-Term Moderate Growth	53.35 (8.92)	6.15 (4.52)	24.06 (8.40)	17.55 (7.70)	17.82 (6.69)	32.22 (19.00)	32.20 (8.43)
2	26.9% (52)	Low Growth	14.11 (8.81)	13.25 (10.90)	13.17 (10.45)	12.76 (9.57)	10.55 (7.00)	17.77 (17.88)	37.44 (10.87)
3	18.7% (36)	Long-Term Moderate Growth	41.47 (8.80)	26.22 (8.03)	21.23 (8.32)	16.30 (8.65)	15.96 (5.57)	18.39 (17.07)	40.56 (12.41)
4	20.7% (40)	High Growth	80.21 (11.08)	20.48 (10.52)	32.82 (7.14)	19.68 (8.54)	22.07 (6.75)	32.88 (22.18)	36.53 (11.59)

Note. N = 197.

CHAPTER 5

Integrative Review

The United States has now been at war for more than a decade and there has been a subsequent increase in pathological outcomes stemming from participation in both Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) for service members and Veterans, including major depression, generalized anxiety disorder, and post-traumatic stress disorder (PTSD (Charles W. Hoge et al., 2004). PTSD in the military has been associated with psychiatric comorbidity, suicide, physical health and mortality, substance abuse, homelessness, and risk of violence (Tanielian & Jaycox, 2008a). Although the predominant focus has been on the negative sequelae of trauma, over the past two decades, evidence has accumulated suggesting that some people who also report a phenomenon referred to as *posttraumatic growth* (PTG; Tedeschi & Calhoun, 1996)—defined as “positive personal changes that result from the struggle to deal with trauma and its psychological consequences” (Tedeschi & McNally, 2011, p. 19). The studies included in this dissertation provide empirical support for the conceptualization and operationalization of posttraumatic growth and identified it as a possible point of intervention. In the sections that follow, I summarize the findings of each study, in turn. I then discuss the implications for research and practice, providing several directions for future research.

Summary of Findings

In my first study (Chapter 2), I found that there are both shared and unique pathways to health and happiness. Religious attendance increased ease of readjustment to civilian life,

thereby increasing overall well-being. Experiencing an emotionally traumatic or distressing event during military service decreased ease of readjustment to civilian life, and subsequently led to reductions in well-being. Experiencing an emotionally traumatic or distressing event also was directly negatively associated with health, but not happiness. In contrast, increased appreciation of life was directly positively associated with happiness, but not health. Overall, readjustment to civilian life following military service was the strongest predictor of both health and happiness. My findings support the conceptualization of health and happiness as related but distinct components of well-being and indicate that ease of readjustment to civilian life is a critical contributor to the health and happiness of Veterans. Consequently, reentry may be the optimal time for implementing strategies designed to promote Veteran well-being.

In my second study (Chapter 3), I tested a comprehensive model of PTG, PTSD, and satisfaction with life in a Veteran population. I specifically explored the roles of challenge to core beliefs, rumination styles, sex, and time since event. I found that challenge to core beliefs was directly associated with both styles of rumination (deliberate and intrusive). Additionally, deliberate rumination was positively related to PTG, while intrusive rumination was positively related to PTSD symptoms. The relationship between rumination styles and satisfaction with life was fully mediated by PTG and PTSD, with PTG having positive direct effects on satisfaction with life, while PTSD was found to have negative direct effects on SWL. These results suggest that facilitating PTG may be a complementary and alternative approach to decreasing PTSD symptoms in order to improve overall well-being, and efforts

to foster PTG should likely focus on strategies that promote deliberate styles of rumination (Morgan, 2015a). This goal is in line with a critical need for complementary and alternative therapies in the Veterans Affairs (Libby et al., 2012). Additionally, preliminary evidence from some interventions, such as expressive writing interventions, have been related to increases in PTG (Slavin-Spenny, Cohen, Oberleitner, & Lumley, 2011; Smyth, Hockemeyer, & Tulloch, 2008; Stockton, Joseph, & Hunt, 2014), although results have been mixed (Gebler & Maercker, 2007).

In the third manuscript (Chapter 4), I examined the specific role of time since event in relation to PTG. I found significant heterogeneity in time vis-à-vis PTG across four different groups or clusters of participants. These groups also differed on many other PTG constructs, such as challenge to core beliefs, rumination styles, level of PTSD symptoms, and age. These results have implications for both researchers and clinicians, and suggest that we should be measuring PTG at multiple time points and take into account the dynamic nature of this phenomenon. Taken together, this body of work suggests that we may be able to foster posttraumatic growth in military Veterans.

Implications

En masse, the findings from these studies have several implications for clinicians and researchers alike. Results in Chapter 2 suggest that reentry and readjustment to civilian life may be a critical turning point in military service members' developmental pathways and is likely a crucial time for intervention. Chapter 3 findings highlight the process model of PTG through critical constructs such as core belief challenge and rumination styles, and shows that

the intentional facilitation of PTG may be a complementary and alternative option to decreasing PTSD symptoms as a viable treatment protocol. Additionally, PTSD symptoms may be a stronger predictor of overall well-being than PTG, and therefore more gains in PTG may be necessary to mitigate or forestall the impact of PTSD on satisfaction with life. Due to the importance of rumination styles in the reporting of PTG, a certain level of cognitive functioning may be necessary to engage in this cognitive work. In Chapter 4, results suggest that there is extensive heterogeneity of the PTG experience over time and that researchers and practitioners should not assume a singular effect of time since event on PTG. Therefore, clinicians and researchers should identify subgroups and trajectories of PTG, and assess PTG at multiple time points.

Future Directions

Despite these important advances in knowledge, the current literature is still limited in several important ways. First, it is unclear what amount of time is necessary to see changes in growth and how these trajectories might relate to PTSD (Lancaster, Klein, & Heifner, 2015). Second, little is known about individual factors that may moderate the relationships among trauma exposure, PTG, and PTSD. Third, several structural impediments to optimizing growth may exist that have not been identified. Fourth, the ability and/or mechanisms by which PTG may be fostered are unknown; for the majority of studies, fostering growth has not been the focus of the intervention, rather PTG has been a secondary measured outcome (Smyth et al., 2008). Each of these directions for future research are discussed, in turn, in the sections that follow.

Interdependence of posttraumatic growth and posttraumatic stress disorder.

Longitudinal studies of mental health in military Veterans provide information about changes in mental health and possible predictors of this change. However, overall wellbeing is comprised of several underlying processes, each of which may respond differently over time. In addition to studying how these processes change independently, how the processes change together is also of interest. However, in most research, they continue to be measured in separate samples and with only one construct included at a time. In my dissertation research, I examined both PTSD and posttraumatic growth as processes, not discrete outcomes because PTSD and posttraumatic growth are not mutually exclusive; they can, and often do, coexist. Therefore, both constructs were measured simultaneously over time. My findings support the notion that PTSD and posttraumatic growth are interdependent. The next step is to analyze whether or not (1) initial levels of PTSD are related to levels of PTG at baseline; (2) rates of change in PTSD are related to rates of change in PTG; and (3) levels of PTSD at baseline are related to rates of change in PTG and vice versa. Analysis of longitudinal data using multivariate growth models, for example, may provide a means of addressing these issues.

Role of individual factors. Future work should examine potential individual-level factors that may contribute to, or inhibit, the development of PTG. Because we know that deliberate rumination may play a key role in reporting growth outcomes, we must also consider the types of factors that may limit this higher-level cognitive work. In the military, a particularly salient issue may be the occurrence of comorbid traumatic brain injury or mild traumatic brain injury (Tanielian & Jaycox, 2008b). Among OEF/OIF Veterans, it is

estimated that 19% experienced probable traumatic brain injury during deployment, and traumatic brain injury tends to co-occur with depression and PTSD (Tanielian & Jaycox, 2008a), and the process of PTG may rely on cognitive functioning not possible in this subgroup of military service members. Another concern in populations experiencing high rates of mental health issues may be concurrent substance use. It may be the case that some substances limit the ability of an individual to engage in deliberate rumination or meaning-making. Other individual-level factors may also precipitate higher rates of occurrence of PTG. Such factors may include intelligence, resilience, hardiness, or grit. It may be that optimism or self-efficacy also play key roles. The overarching question is whether or not there are personality traits that make an individual more likely to experience growth following adversity, and whether or not some of these traits are malleable.

Structural issues and impediments to growth. Beyond individual-level factors, other levels of the socio-ecological model should be taken into account as points of intervention. It is possible that factors preventing individuals from reporting growth exist outside of the individual and that supporting exterior structures may enhance growth opportunities as well. For example, the microsystems of military Veterans may be comprised of family and their fellow service members, perhaps from their particular unit. Positive social support from an individual's family may operate to facilitate growth opportunities. Likewise, unit cohesion or a strong cultural narrative may be beneficial for military Veterans in terms of increasing the likelihood and levels of PTG.

More distal from the individual-level factors are factors operating in the exosystem, such as social services and local policies. Conceptually, it is possible that PTG and meaning making require substantial cognitive resources. The cognitive and energetic bandwidth that it takes to spend time processing adverse events and reconstructing a personal narrative may be more than some individuals have at their disposal. For instance, if an individual is struggling to get through their day-to-day activities, are unemployed, or are homeless, this sort of higher-level need may not take priority. In this vein, interventions borrowed from the field of psychiatric reentry, such as supported employment (Bond, Drake, & Becker, 2008) or housing first (Padgett, Gulcur, & Tsemberis, 2006) models may offer similar benefit to military Veterans or other interventions targeted at fostering PTG.

Promotion of growth. The ultimate goal of this program of research would be to develop and test a meaning-making intervention to foster PTG in military Veterans. One possible avenue would be to examine the expressive writing paradigm as a framework for meaning making. In addition to assess the ability to facilitate PTG intentionally, there is a need to examine the underlying mechanisms of change (e.g., content of writing or reported changes in rumination), as well as potential moderators (e.g., type of trauma, sex, time since event, and number of lifetime traumas). Finally, there will be a need to examine the acceptability of such an intervention among service members. The key factor in the PTG model being targeted by an intervention of this type would be the movement from intrusive styles of rumination to deliberate rumination. It is possible that an expressive writing intervention could facilitate PTG through meaning-making and narrative reconstruction

(Aldwin, 2007), using the framework proposed by expressive writing paradigms (Pennebaker, 1997), specifically focusing on perceived benefits (King & Miner, 2000).

Two theories could inform such work: the theory of PTG (the outcome of interest) and the theoretical foundations of expressive writing (the proposed mechanism). The theory of PTG is still being developed, but my dissertation work has suggested that a few constructs are of particular interest, including *challenge to core beliefs* (the subjective evaluation of how traumatic the event was), *intrusive rumination* (unwanted recurring thoughts about the event), *deliberate rumination* (cognitive work to process the meaning of the event), PTG, PTSD, and life satisfaction. The model of PTG developed and tested in my dissertation research suggests that the challenge to core beliefs and subsequent intrusive rumination as major factors contributing to mental health problems (Morgan, 2015a). Additionally, results of my dissertation research suggests that the move from intrusive rumination to deliberate rumination increases perceptions of PTG and possibly alleviates re-experiencing symptoms associated with PTSD (Morgan, 2015a). In order to assist participants in the transition from intrusive to deliberate rumination, expressive writing could be used to facilitate meaning-making and narrative reconstruction (Aldwin, 2007).

Writing about emotional experiences has been associated with both physical and mental health improvements (Pennebaker, 1997). Scientific laboratories have conducted experiments with the writing paradigm under various parameters, with the majority asking participants to write for 3 to 5 consecutive days in writing sessions lasting between 15 and 30 minutes per day on the topic of a past trauma (Pennebaker, 1997). Numerous outcomes have

been measured in these expressive writing experiments, and significant results have been found across all categories, including reductions in physician visit lasting from two months to 1.4 years, physiological improvements in immune functioning and autonomic activity, improvements in behavioral markers such as grade point average or absenteeism from work, and self-reports of physical symptoms, distress, negative affect, and depression (Pennebaker, 1997). There are two proposed models for explaining these effects: (1) inhibition and disclosure, and (2) cognitive changes (Pennebaker, 1997). The first model of inhibition and disclosure essentially proposes that not talking about the trauma is “a form of inhibition: and that this inhibitory work is a chronic stressor” (Pennebaker, 1997, p. 164). There is some empirical support for the deleterious effects of inhibition, but not necessarily for the beneficial effects of disclosure (Pennebaker, 1997). The second model suggests that it is the building of a cohesive narrative by putting the trauma into written form that confers the benefits (Pennebaker, 1997).

More recently, King and Miner (2000) investigated whether or not it was necessary to attempt to experience or re-experience the negative aspects of adversity in order to confer these established health benefits. Participants either wrote about the trauma itself, the perceived benefits of the trauma, or both (King & Miner, 2000). Interestingly, although all three groups had fewer health center visits for illnesses than the control group at three and five months following the intervention, the trauma-only group and the perceived benefits-only groups produced better outcomes than the group that wrote about both (King & Miner, 2000). Additionally, the perceived benefits group rated the expressive writing tasks as less

upsetting, less difficult, and more important than the trauma-only group (King & Miner, 2000). Participants also reported less concern about their anonymity in the perceived benefits-only group (King & Miner, 2000). Thus, although there are many different intervention strategies and modalities, the expressive writing paradigm may offer an option to target what we now know to be critical aspects of the development of PTG. Such interventions must be developed and examined in future research.

Conclusion

Posttraumatic growth (PTG), or perceived positive psychological changes following adversity, is being reported across myriad populations. A more holistic examination of well-being reveals that both PTG and distressing outcomes are occurring simultaneously as a result of the same trauma. PTG may be acting as a sort of buffer against the effects of pathology on well-being and should therefore be incorporated as an additional outcome of interest in trauma-related studies, including in work with military Veterans. Additionally, PTG appears to be malleable, with several individual- and community-level factors contributing to, or inhibiting, the development of PTG. Interventions that target these factors may hold promise in improving the overall well-being of military Veterans as a complementary and alternative option to the traditional treatment of PTSD symptoms.

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