

**Posttraumatic Growth and Primal World Beliefs among People Who Have Caused
Accidental Death or Serious Injury**

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Master of Applied Positive Psychology Program, University of Pennsylvania

MAPP 800: Capstone Project

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August 1, 2022

Preface

After a night out celebrating my 25th birthday, I woke up in the hospital to learn that Laura, the woman I loved and planned to spend my life with, was dead, and I was responsible for causing the crash that killed her. I called Laura's family, expecting to be forbidden to attend her funeral, and was surprised when her father David instantly forgave me.

After cleaning out the house I previously shared with Laura—I couldn't bear to live there without her—and planning her memorial with David, I plunged into a deep depression. I stopped attending classes in my last semester of law school, and I moved into the basement of my sister's townhouse, an appropriately dreary living space I sardonically referred to as the dungeon. I'd lost everything: Laura, the future we planned together, and the career in law I was working toward. I felt intense shame and grief, suffered through agonizing nightmares, and wished that I had died in the crash instead of Laura. And on top of that, I was facing up to ten years in prison. A year after the crash, despite David's efforts to keep the state from charging me with Laura's death, I pleaded guilty to manslaughter and was sentenced to serve time in jail followed by several years on probation.

I was terrified of being locked up—more specifically, I was terrified of the men I would be locked up with and the pop-culture depictions of violence that primarily influenced my expectations about incarceration—but soon learned that most of the men I was with were normal guys who, like me, had made mistakes. I started helping them with their cases and other legal issues and found satisfaction in using my legal training to assist others.

I lashed out at God but also found myself rekindling a faith I'd lost when my parents divorced in my youth. I thought of the many people in my life I'd previously taken for granted:

how painful it would be to lose them, how precious it was to have them in my life, and how grateful I was for their support and love throughout that painful time. In the solitude of jail, I grappled with the big existential questions of life: what is its meaning, what happens when it ends, and what are the things that are worthy to value in it?

Most of all, while I was often certain that I was despicable and unworthy of ever experiencing happiness again, I was desperate to make sense of my surviving the crash by focusing on building a more meaningful life that Laura would be proud of. She was planning to become a social worker so she could help people with addictions, and while I was incarcerated, I got to know many people who struggled with substance use and the criminal justice and other consequences that often accompany it.

I returned home determined to use my voice and my experience to bring about change in the criminal justice and addiction systems that seemed to make it harder for people to find recovery. Overcoming the many obstacles created by my criminal record and probation, I eventually found work helping other men returning from prison get back on their feet. Then a nonprofit law firm focused on reforming the criminal justice system hired me as an advocate for change at the federal level. In the mornings, I reported to probation in Baltimore, and in the afternoons, I argued over legislation in the halls of Congress and the White House.

Although the pain of losing Laura and knowing my role in her death has never gone away, over time, I made peace with my loss and my role in it, and I learned that while my love for Laura would never die, the heart makes room for new love too. I'd met Maria not too long after the accident. She'd recently lost her father to cancer, and we bonded over our shared grief. Three years after the crash, we welcomed our first child into the world. We've since gotten

married and added two more to our brood. Laura's dad David is the godfather of our daughter and an important part of our life.

Grateful for my second chance, I dedicated myself to helping others rebuild after trauma, addiction, and imprisonment. In my work, I have had the privilege of meeting countless people who have learned to live with the pain of the worst days of their lives while also turning their despair into positive turning points for their future. They inspired my interest in posttraumatic growth, positive changes that often occur alongside the pain and distress of trauma, an interest reflected on the following pages.

Acknowledgements

This capstone is an act of love, not only my own, but that of so many others who selflessly offered support, guidance, and inspiration without which it could not have been completed. While there are too many of them to name in one paper, I'd like to especially express my gratitude to the amazing people listed below.

Maria, my wife, for her love and support from the moment I met her until this day and throughout a year that found me, at times, much less available to her and our children than they are accustomed to. It's not easy having three young children with busy weekend schedules and a husband who's locked in the basement on Zoom for entire weekends at a time.

Finnegan, Charlie, and Penny, my children, for their understanding when I was focused on weekend classes or weekday schoolwork when they would have preferred I'd been available to play, snuggle, or go on adventures and for cheering me on when the workload had me tired.

Laura, my lost love, for the too-brief time we had together and the cherished memories of it that I still carry with me, and for inspiring me to love deeply, seek meaning, find beauty, do more, and take time to appreciate all of it.

Nick Kerry, my advisor, for his generous support of this project, whether helping to put together the study survey, prepare the data for analysis, teach me how to analyze and understand the results, and review voluminous outlines and writing, while providing gentle critiques that improved the end result and equipped me with the skills for future writing in psychology.

Maryann Gray, a fellow PCADI and executive director of Accidental Impacts, for making me a part of a community of PCADIs, for her support and encouragement of my work on this project, for her feedback on the study survey, and for her help finding participants to share their experiences of pain and growth after causing accidental death or serious injury.

Jer Clifton, my professor, for challenging me not only to reflect on my own experience but also to consider objectively what empirical research shows about trauma survivors and posttraumatic growth, for thought-provoking conversations about the subject of this paper, and for inspiring several of the research questions it attempts to answer.

Kimberly Dickman, Devon Still, and KC White, my MAPP cohort, for reminding me, in so many ways, what it means to be a part of a team that feels more like a family, for the friendships we formed, and for the lessons I learned working with and getting to know you over the last year.

Kym Baum, my cohort's AI Coach for our service-learning project, for her encouragement, practical wisdom, even keel, sense of humor, and generous willingness to devote so much time teaching us to research, plan, and write effectively for this field.

Jan Stanley, my journal reader, for reading my oft-rambling stream-of-consciousness journal submissions and cheering me on through my efforts to take all the things I was learning in MAPP and put them together into something that made sense while exploring my interest in doing all the things that a MAPPster has the opportunity to do.

My MAPP 17 Classmates, for bringing your authentic selves to onsite weekends, in-person gatherings, and WhatsApp chats, for being a place where I belong, for sharing joy, sorrow, frustration, excitement, and curiosity, and for making long hours on Zoom fly by. I was always left wanting more time with you.

The Penn MAPP faculty and staff, for creating a community and learning experience that was intellectually engaging, challenging, oh so thoughtful, meaningful, valuable, breathtakingly well-executed, and, frankly, life-changing. You have the special sauce.

Abstract

Background. Posttraumatic growth (PTG)—positive changes that people may experience in the aftermath of highly distressing experiences—has been observed in survivors of a variety of events but has not been previously studied among people who have caused accidental death or injury (PCADIs). In addition, questions remain about the role, in PTG, of changes in the assumptive world and the relationships between PTG and distress, personality, and social support. **Methods.** Participants ($N = 528$), included PCADIs ($n = 44$) and a non-trauma comparison group ($n = 484$), who completed the Primals Inventory and measures of personality, anxiety, and depression. PCADIs ($n = 43$) also completed measures of PTG, PTG behavioral changes, social support and life satisfaction. **Results.** Modest levels of PTG commensurate with survivors of other relevant forms of distress were observed. Results demonstrated significant differences between primal world beliefs *Good, Safe, Enticing, Just, Regenerative, Funny, and Improvable* in PCADIs and non-trauma survivors as well as significant positive relationships between PTG and the primals *Good, Safe, Alive, Just, Regenerative, Funny, and Improvable* and between PTG and reported behavior changes related to PTG, but no significant relationships were found between PTG and distress, PTG and social support, or PTG and personality traits *Extraversion, Openness to Experience, Conscientiousness, or Agreeableness* (though a significant negative relationship was observed between PTG and *Neuroticism*). **Conclusions.** PCADIs may experience PTG that both influences and is influenced by primal world beliefs, but the hypothesized relationships between PTG and distress, personality, and social support were not observed. Additional studies with larger PCADI populations may find these relationships exist at a statistically significant level. And future research should aim to develop interventions addressing the distress and growth potential of this population.

Keywords: trauma, posttraumatic growth, primal world beliefs, personality, social support, moral injury

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Posttraumatic Growth and Primal World Beliefs Among People Who Have Caused Accidental Death or Serious Injury

Traumatic experiences like exposure to violence, life threatening danger, or the sudden loss of a loved one, paradoxically, have been shown to sometimes lead to personal growth resulting in well-being that exceeds the trauma survivor's pre-trauma status (Tedeschi & Calhoun, 2004). Posttraumatic growth (PTG)—the term used to describe positive changes that result from traumatic experiences—may lead to increased appreciation of life, a perception of new possibilities for one's future, warmer and more intimate relationships, greater beliefs in personal strength, and spiritual growth (Tedeschi & Calhoun, 1996). Though PTG has been observed in a wide range of populations experiencing varying forms of highly distressing experiences, to the author's knowledge, no study has ever examined PTG among people who have caused the accidental deaths or serious injuries of others (PCADIs). To remedy this gap in the PTG research, the present study examines PTG among PCADIs as well as their primal world beliefs about the world (primals; Clifton et al., 2019), Big Five personality traits (L. R. Goldberg, 1991), experiences of social support, and the continued presence of distress and well-being in their lives.

In the following sections, this paper will present an overview of PTG and the history of scholarship pertaining to the role of trauma, suffering, and adversity in human flourishing and personal growth. It will describe the dimensions of growth identified in PTG theory and several of the populations in which empirical studies have measured growth. It will examine the theorized process and mechanisms of PTG as well as some of the individual traits that have been associated with experiences of PTG. Finally, this paper will conclude with a presentation of the study and its results as well as a discussion of the findings and future directions for research on

PTG, primals, and PCADIs. Following the conclusion of the main text of the paper, Appendix A will provide a brief overview of PTG's place in the field of positive psychology.

Posttraumatic Growth

The relationship between suffering and well-being is quite complex, and the two sometimes go hand in hand. PTG is the “experience of positive change that occurs as a result of the struggle with highly challenging life crises” (Tedeschi & Calhoun, 2004, p. 1). According to PTG theory, following a traumatic event that forces an individual to grapple with significant challenges to their core beliefs about the world, they may experience positive changes including greater appreciation of life, the identification of new possibilities for their future, warmer and more intimate relationships, increased perceptions of personal strength, and deepening spirituality (Tedeschi & Calhoun, 2004). PTG is not the absence of posttraumatic stress. High levels of distress are common among individuals reporting PTG and may be necessary for growth to occur (Tedeschi & Calhoun, 2004). Trauma survivors typically do not view themselves as engaging in a quest to find benefits from their pain. Rather, they are simply trying to survive or decide if surviving is even worth it. They are often surprised that growth has occurred because it was not their goal (Tedeschi & Calhoun, 2004). However, research has shown that reports of growth after trauma are more common than reports of psychiatric disorder (Tedeschi & Calhoun, 2004).

In fact, PTG is a common outcome of exposure to trauma. PTG has been observed among parents with critically or terminally ill children or children with acute health crises (Cadell et al., 2014; Colville & Cream, 2009; D'Urso et al., 2017; Hungerbuehler et al., 2011; Kim, 2017; Ogińska-Bulik & Ciechomska, 2016; Picoraro et al., 2014; Rodríguez-Rey & Alonso-Tapia, 2019); people with a wide range of health concerns including coronary health issues (Bluvstein

et al., 2013; Hegarty et al., 2021; Kearns et al., 2019), cancer (Bussell & Naus, 2010; Casellas-Grau et al., 2017; Cormio et al., 2017; Danhauer et al., 2013, 2015; Gori et al., 2021; Jim & Jacobsen, 2008; Marziliano et al., 2020; Paredes & Pereira, 2018; Rider Munday et al., 2019; Zwahlen et al., 2010), stroke (Gangstad et al., 2009), physical disability (L. D. Goldberg et al., 2018), HIV infection (Pięta & Rzeszutek, 2022; Rzeszutek et al., 2019; Rzeszutek & Gruszczyńska, 2018; Sawyer et al., 2010), and chronic illnesses (Tolleson & Zeligman, 2019; Zeligman et al., 2018); survivors of natural (Bernstein & Pfefferbaum, 2018; Cameron et al., 2022; Cryder et al., 2006; N. Nalipay & Mordeno, 2018; Shang et al., 2020) and man-made disasters (Iwasa et al., 2019; Palgi et al., 2020), including earthquakes (Amiri et al., 2021; García & Włodarczyk, 2018; Kesnold Mesidor, 2019; Taku, Cann, et al., 2015; Zhou et al., 2020), fires (Palgi et al., 2020), floods (Boullion et al., 2020; Zeligman et al., 2019), hurricanes (Manove et al., 2019), tornadoes (Weber et al., 2019), and tsunamis (Siqueland et al., 2012); victims of crime, including victims of intimate partner violence (Arandia et al., 2018; Cobb et al., 2006; D'Amore et al., 2021), sexual violence (Burt & Katz, 1987; Sinko et al., 2022) sexual abuse (Ha et al., 2019), and childhood physical or sexual abuse (Schaefer et al., 2018); people in professions where exposure to danger or to the trauma of others is high (Armstrong et al., 2014; Chen et al., 2021; Chopko et al., 2017; Chopko & Schwartz, 2009; Feingold et al., 2022; Hyatt-Burkhart, 2014; Manning-Jones et al., 2015; McLean et al., 2011), and survivors of other distressing events.

Yet it is also true that not every person who experiences trauma will experience PTG, and the degree of growth can vary from person to person. Several individual and environmental factors—sex (Albuquerque et al., 2017; Tedeschi & Calhoun, 1996; Vishnevsky et al., 2010), optimism (Kim, 2017; Prati & Pietrantonio, 2009), certain coping approaches (Prati &

Pietrantonio, 2009), personality (Javed & Dawood, 2016; Tedeschi & Calhoun, 1996), and access to social support (Boullion et al., 2020; Kaler et al., 2011; Prati & Pietrantonio, 2009), among others—have been associated with PTG (though the empirical evidence for these associations is mixed).

History of Scholarship on Growth after Trauma and Adversity

In keeping with the historical trend of psychology's prior focus on distress and disorder observed by Seligman and Csikszentmihalyi (2000), trauma research previously focused nearly exclusively on the negative effects of trauma, including devastating physical and psychological repercussions. In their paper introducing the PTG construct, Tedeschi and Calhoun (1996, p. 455) lamented that there had “been much less attention paid to the possibility of positive impact of negative events.”

The problem was not that it had never occurred to anyone that adversity and suffering might be a source of strength. Indeed, the recognition that highly stressful life events can be positively transformative is thousands of years old. The ancient Greeks, Hebrews, early Christians, and the teachings of Islam, Buddhism, and Hinduism all describe the power of suffering to transform people (Tedeschi & Calhoun, 2004). And many 20th century researchers and practitioners in psychology described ways in which crises could lead people to experience positive transformations (Tedeschi & Calhoun, 2004). Yet, until the 1980s and 90s, scholarly interest in the potential for growth to result from distress and pain was minimal (Tedeschi & Calhoun, 2004).

By the time Tedeschi and Calhoun introduced the PTG construct, theory, and measurement scale in their landmark 1996 article, a body of research was emerging to demonstrate that many people who experienced traumatic events recognized at least some

positive outcomes materializing from their struggle with adversity, tragedy, and pain (Tedeschi & Calhoun, 1996). These included studies identifying positive outcomes in survivors of rape (Burt & Katz, 1987), disaster (Thompson, 1985), and combat (Sledge, Boydstun, & Rabe, 1980), individuals confronting serious health concerns like cancer (Collins, Taylor, & Skokan, 1990), HIV infection (Schwartzberg, 1993), and heart attacks (Affleck, Tennen, & Croog, 1987), individuals bereaved by the loss of a loved one (Calhoun & Tedeschi, 1989-90), and parents with seriously ill children (Affleck, Allen, Tennen, McGrade & Ratzan, 1985; Affleck, Tennen & Gersham, 1985).

Trauma survivors generally perceived benefits that fell into three categories: changes in self-perception, changes in interpersonal relationships, and changes in philosophy of life (Tedeschi & Calhoun, 1996). Among the changes in self-perception identified in these studies, individuals reported emotional growth (Affleck, Allen, Tennen, McGrade & Ratzan, 1985; Affleck, Tennen & Gersham, 1985), feeling that trauma made them a better person (Andreasen & Norris, 1972), and seeing themselves as more experienced (Joseph, Williams & Yule, 1993) stronger, more self-assured (Collin et al., 1990), and more confident in their abilities to deal with difficult situations (Tedeschi & Calhoun, 1996).

People confronted with situations that provoked significant distress also reported improvements in their interpersonal relationships. In one study, 60% of mothers with newborns who received treatment in a neonatal intensive care unit reported some benefits from their experience, including 20% who developed closer familial relationships and expressed deeper appreciation for their child (Affleck et al. 1985). Another study found that about half of participants who had lost a parent in the prior two years reported stronger relationships with others and greater recognition of the importance of their relationships (Malinak, Hoyt, &

Patterson (1979). Researchers found that trauma unleashed a need to discuss the traumatic event and its consequences, which often led to survivors' becoming more open about themselves (Tedeschi & Calhoun, 1996), while their suffering led them to become more sensitive to the needs of others, leading to improved relationships (Collins, et al., 1990).

With respect to changes in philosophy of life, trauma survivors perceived themselves to have greater appreciation of life, a better perspective on life, and an improved spiritual life. For instance, participants in one study of adults bereaved by the death of a parent reported developing a greater appreciation for their own lives (Malinak et al., 1979). And 23% of mothers of newborns with serious illnesses perceived themselves to have better perspectives on life (Affleck et al., 1985). The relationship between trauma and spirituality appeared to be less straight forward. While spirituality and religiosity may decline in the immediate aftermath of trauma (Schwartzberg & Janoff-Bulman, 1991), some studies found that trauma survivors eventually reported experiencing spiritual growth (Andrykowski, 1992).

The Five Domains of Growth in PTG

By the mid-1990s, a growing body of evidence showed that trauma survivors often perceived themselves to have derived benefits from their experience. Still, no measure of these perceived benefits with general applicability to a wide variety of experiences had been developed (Tedeschi & Calhoun, 1996). The introduction of the Stress-Related Growth Scale (SRGS; Park et al., 1996) and Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996) represented the first efforts to develop such measures. Building on Shaefer and Moos' (1992) identification of three categories of positive stress-related outcomes (greater social resources such as improved relationships, increased personal resources reflected in improved self-concept or changes in life philosophy, and improved coping abilities derived from having exercised their use), the 50-item

SRGS was developed to measure positive stress-related outcomes in the areas of coping skills, personal resources, and social resources (Park et al., 1996). In developing the 21-item Posttraumatic Growth Inventory, Tedeschi and Calhoun (1996) identified five factors representing five domains of growth after trauma: increased appreciation of life, awareness of new possibilities for one's life, relating to others more warmly and with more intimacy, growth in personal strength, and positive spiritual change.

Appreciation of Life

PTG may lead people to experience greater appreciation of life as well as changes in their priorities. *Appreciation of Life* refers to gratitude for and value placed on life in general as well as individual aspects of one's life. Small experiences may take on special significance for the trauma survivor. Importantly, new appreciation is perceived by the individual as a substantial shift. Changes in priorities are also common. Typical changes in priorities include recognizing the value of things they may have previously taken for granted and taking time for the little things in life (Tedeschi & Calhoun, 2004).

New Possibilities

Trauma survivors may also experience cognitions about *New Possibilities* and opportunities in their lives. Some people find that the struggle with trauma leads them to discover a new vocation or purpose (Tedeschi & Calhoun, 2004). For example, they may adopt a survivor's mission, such as motivation to help others experiencing similar trauma or engage in advocacy or educational efforts to raise awareness or prevent future occurrences of the type of trauma they confronted (Herman, 1998).

Relating to Others

Relating to Others refers to people who experience PTG and find that their personal relationships grow warmer and more intimate. Improved relationships may come from recognizing the value in relationships with people who supported the trauma survivor in the aftermath of their crisis (Tedeschi & Calhoun, 2004). The crisis may also help a person develop greater compassion for others who are suffering (Tedeschi & Calhoun, 2004).

Personal Strength

People who have experienced PTG often report a greater sense of *Personal Strength*, including seeing things that were previously a big deal as trivial or not worth worrying about (Tedeschi & Calhoun, 2004). The increased sense of strength may be paradoxically accompanied by a greater sense of vulnerability (Tedeschi & Calhoun, 2004). In other words, people become more likely to recognize that bad things can happen to them while at the same time believing that they have the resources and abilities to cope.

Spiritual Change

Although in the immediate aftermath of their traumatic experience spirituality and religiosity may wane (Schwartzberg & Janoff-Bulman, 1991), many survivors of trauma report positive *Spiritual Change* as a result of their experience. For instance, they may believe that God or a higher power got them through their experience. This may or may not lead to becoming more religious. Whether or not they believe in God or a higher power, trauma survivors may engage to a greater degree with existential questions about life and its meaning (Tedeschi & Calhoun, 2004).

The Process of PTG

Although responses to trauma vary (and not all people who live through acutely distressing events will experience PTG), the development of PTG follows a general pattern in which multiple individual, environmental, and circumstantial factors interact with, influence, and are influenced by the experience of trauma and the ongoing process of change that may result in PTG, and this pattern unfolds over time, though it does appear to taper off over different timeframes for different individuals (Tedeschi & Calhoun, 2004). In other words, some aspects of the traumatic experience and the distress it causes may interact with some aspects of PTG to stimulate or weaken other aspects of distress or growth, and vice versa. For example, one study examined the relationships among aspects of complicated grief—defined as distress and functional impairment that is considerably greater than that experienced by the majority of people after the loss of a loved one—and aspects of PTG (Bellet et al., 2018). The study involving 741 young adults found that PTG and complicated grief co-occurred and both reinforced and weakened each other. Certain elements of complicated grief increased PTG (e.g. the degree to which the death changed the participant's world view), while others decreased PTG (e.g. inability to care about others), and certain elements of PTG decreased complicated grief (e.g. increased ability to handle difficult situations; Bellet et al., 2018).

PTG is both a process and an outcome, and it develops and evolves over time (Tedeschi & Calhoun, 2004). Studies have found positive correlations between time elapsed since a traumatic event and PTG (Barskova & Oesterreich, 2009), though the process does appear to eventually taper off (Tedeschi & Calhoun, 2004). A general outline of the process follows, with the caveat that the dynamic interaction of factors is rarely linear:

First, a major life crisis presents a significant challenge to or shatters an individual's assumptive world—a person's understanding of why and how things happen in the world or their more abstract beliefs about the meaning and purpose of life. Initially, the trauma survivor must cope with high levels of distress, but some cognitive processing also occurs (Tedeschi & Calhoun, 2004). Initial cognitive processing is likely to involve efforts to make sense of what has happened, and through the struggle for comprehensibility, the trauma survivor eventually focuses on questions about the significance and meaning of the experience (Janoff-Bulman, 2004). The degree of cognitive processing is a critical element in the development of PTG, and some degree of psychological distress is required to initiate the process of growth. In fact, Tedeschi and Calhoun (2004) theorized that though PTG may accompany a reduction in distress, distress often endures and may be necessary for sustaining growth outcomes (as discussed later in this paper, the relationship between PTG and distress is not so clear cut). Some individual qualities like extraversion, openness to experience, and optimism make PTG more likely (Tedeschi & Calhoun, 2004). And social support may also play a helpful role in the development of PTG by providing new perspectives for the rebuilding of the assumptive world and offering psychologically safe opportunities for intentional emotional processing through self-disclosure (Tedeschi & Calhoun, 2004).

Traumatic Event or Experience

The initiation of the process of PTG begins with a traumatic event. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) defines a traumatic event—sometimes referred to as a Criterion A event (Hyland et al., 2020; Weathers & Keane, 2007)—as exposure to actual or potential death, severe trauma, or violence by either directly experiencing the event, witnessing the event happen to another person, learning about the event happening to a

close family member or friend, or being repeatedly exposed to extreme events such as in the role of a first responder or victim of child abuse (American Psychiatric Association, 2013).

Agreement on the precise range of experiences that may lead to psychological trauma has been hard to reach (Hyland et al., 2020; Weathers & Keane, 2007), and there is evidence to suggest that many non-Criterion A forms of trauma may lead to posttraumatic stress disorder (Hyland et al., 2020) or PTG (Tedeschi & Calhoun, 2004). In fact, trauma research consistently shows that one's subjective experience of a distressing event is more important to psychological outcomes than the exact nature of the event (Picoraro et al., 2014). For example, within studies of pediatric illness, levels of distress and growth are generally unrelated to the severity of illness or risks associated with treatments (Picoraro et al., 2014).

Within the construct of PTG, Tedeschi and Calhoun (2004) have offered a broader definition of trauma that includes “sets of circumstances that represent significant challenges to the adaptive resources of the individual, and that represent significant challenges to individuals’ ways of understanding the world and their place in it.” As discussed in more detail below, PTG theory holds that in order to lead to PTG, these experiences must present sufficient disruption to the trauma survivor’s assumptive world and unleash the cognitive processes essential for PTG (Tedeschi & Calhoun, 2004).

While PTG has not been studied in PCADIs, it has been observed among survivors of experiences with high relevance to the experiences of PCADIs, including bereaved individuals (Abu-Raiya & Sulleiman, 2021, 2021; Calhoun et al., 2010; Fisher et al., 2020; Levi-Belz, 2019; Şimşek Arslan et al., 2022; Suttle et al., 2022; Waugh et al., 2018); survivors of accidents (Han et al., 2019; Lee et al., 2020; Nishi et al., 2010; Zoellner et al., 2008), and trauma survivors whose experiences may involve moral injury—psychological distress resulting from

discrepancies between one's actions and one's morals (Litz et al., 2009)—including combat veterans (Dekel et al., 2016; Evans et al., 2018; Hijazi et al., 2015; Mark et al., 2018) and intentional wrongdoers (Guse & Hudson, 2014; Mapham & Hefferon, 2012; Seyburn et al., 2020). In the following sections, after a discussion of measurement in PTG research, brief summaries of research into PTG among survivors of traumatic experiences with elements that may be present in the experiences of PCADIs will be presented.

Measuring Posttraumatic Growth with the Posttraumatic Growth Inventory

Many studies measure and report PTG using the Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996). The scale consists of 21 questions measuring overall PTG as well as subscales measuring the five factors of growth within PTG: (*Appreciation of Life, New Possibilities, Relating to Others, Personal Growth, and Spiritual Change*). Each item asks respondents to report the degree to which they experienced a specific change (e.g. “I changed my priorities about what is important in life.”). Item responses range 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”). Total scores range from 0-105 (Tedeschi et al., 2017).

One criticism of the Posttraumatic Growth Inventory is that it does not facilitate the diagnosis of PTG (Wu et al., 2019). By offering only items that identify possible positive changes with a response scale that permits only the reporting of positive outcomes, the Posttraumatic Growth Inventory may skew reports in favor of growth (Boals & Schuler, 2018b). And because all scores besides 0 reflect reports of at least *some* growth, it is difficult to know when a satisfactory threshold has been reached for researchers to confirm that PTG has occurred (Wu et al., 2019). Wu et al. (2019) suggested that a score of 60% of the total possible score on the Posttraumatic Growth Inventory (a score of 63 or above on the full scale with a maximum of

105) or any of its subscales should be considered moderate-to-high PTG. Their meta-analysis of 26 studies reporting Posttraumatic Growth Inventory scores for 10,181 individuals found that a little over half of participants in the included studies experienced moderate-to-high PTG under this definition (Wu et al., 2019). While over half of the total number of participants in the included studies reported moderate-to-high PTG, there was high heterogeneity in the studies' samples. At the low end, only 10% of participants in one study reported moderate-to-high PTG, while at the high end, 77% of participants did so (Wu et al., 2019). Other studies have similarly defined moderate-to-high PTG as consisting of per item mean scores of ≥ 3 (out of 5) for the total number of items in the scale or subscale administered (Pollari et al., 2020). However, many studies find that mean Posttraumatic Growth Inventory scores fall well below this threshold (Fisher et al., 2020; Holtmaat et al., 2017; Mark et al., 2018; Rabe et al., 2006; Seyburn et al., 2020; Taku, Tedeschi, et al., 2015; Zoellner et al., 2011), while few find mean Posttraumatic Growth Inventory substantially higher than this threshold. Additionally, the observation of neurological changes consistent with improvements in psychological wellbeing that have been associated with PTG in a study population with mean Posttraumatic Growth Inventory scores of 37.88 (Rabe et al., 2006), shows that objectively positive changes can be observed among individuals with lower self-reported levels of PTG. This suggests that while there is value in identifying a threshold for the purposes of labeling levels of growth, meaningful positive changes should be acknowledged at lower levels of growth too.

Bereavement

Bereavement has been identified as perhaps the most distressing experience that human beings endure (O'Connor, 2019). The loss of a loved one can trigger substantial psychological distress that can last for months or even years (Carnelley et al., 2006; Rogers et al., 2008).

PCADIs who knew the victims of their accidents show greater levels of distress than those who did not (Gilliam & Chesser, 1991), and even those PCADIs who did not know the victim of their accident may develop a strong sense of connection to and drive to honor the victim as well as a need to acknowledge their own grief over the death (Rassool & Nel, 2012). Yet, while there is strong evidence of the devastating distress caused by bereavement, there is also evidence to suggest that bereavement can be a context for considerable personal growth and development (Calhoun et al., 2010). Recent research has confirmed that bereavement can lead to PTG in adults (Li et al., 2021), young adults (Bluvstein et al., 2013; Taku, Tedeschi, et al., 2015), parents bereaved by the death of a child (Abu-Raiya & Sulleiman, 2021; Suttle et al., 2022; Waugh et al., 2018), children and adolescents bereaved by the death of a parent (Şimşek Arslan et al., 2022), and people bereaved by suicide death (Levi-Belz, 2019) or sudden and violent death (Fisher et al., 2020).

One study examined the relationship between bereavement and the individual PTG domains in college students in Japan who reported the loss of a loved one within the preceding five years as well as that the loss was the most traumatic event they had experienced over that time (Taku, Tedeschi, et al., 2015). Researchers measured PTG using the Japanese translation of the 21-item Posttraumatic Growth Inventory (Taku et al., 2007) which combines appreciation of life and spiritual change into a single factor and a possible range of scores from 0-105. The study found a mean score on the Japanese Posttraumatic Growth Inventory of 41.58, representing 39.6% of the potential maximum score (Taku et al., 2015).

Fisher et al. (2020) examined the relationship between sudden deaths caused by suicide, accident, or combat and PTG as measured by the short form of the Posttraumatic Growth Inventory introduced by Cann et al (2010). Participants in the study were surviving

spouses/partners, adult children, parents, and siblings of military service members who died from suicide, combat, or accident ($N = 1,709$), including 328 participants bereaved by death from suicide, 384 survivors whose loved ones died in accidents, and 997 who lost loved ones in combat deaths (Fisher et al., 2020). The mean score of 25.15 on the short form represented 50.3% of the maximum possible score (Fisher et al., 2020) and demonstrated self-reported PTG below the threshold set by Wu et al. (2019) for moderate-to-high growth.

These findings point to the possibility that PTG may be an outcome of having caused an accidental death or serious injury when accompanied by the experience of bereavement but that scale scores measuring PTG may fall below the threshold for moderate-to-high growth.

Accidents

In addition to potential bereavement associated with having caused an accidental death or serious injury, many PCADIs are themselves survivors of the accidents in which they were involved. Surviving or escaping a close brush with death or injury may lead to posttraumatic growth (Lee et al., 2020; Zoellner et al., 2008). For instance, PTG has been found in survivors of automobile accidents (Nishi et al., 2010; Rabe et al., 2006; Zoellner et al., 2011) and other forms of transportation-related accidents (Han et al., 2019). In one randomized controlled trial comparing Posttraumatic Growth Inventory scores among a sample of motor vehicle accident survivors with PTSD treated with cognitive behavioral therapy and a waitlisted control group, both groups showed similar levels of PTG (Zoellner et al., 2011). Mean Posttraumatic Growth Inventory scores of 42.6 ($SD = 14.37$; 40.6% of maximum score) for the experimental group and 40.68 ($SD = 16.88$; 38.7% of maximum score) for the control group were below the 60% threshold for moderate-to-high growth.

Other studies have found PTG at similar levels. For example, a study of 118 Japanese adults injured in motor vehicle accidents found a mean Japanese Posttraumatic Growth Inventory score of 41.2 ($SD = 22.6$; 39.23% of maximum score; Nishi et al., 2010). And, 82 survivors of severe motor vehicle accidents had a mean Posttraumatic Growth Inventory score of 37.88, representing 36.1% of the maximum PTG score (Rabe et al., 2006). These results suggest that PCADIs may experience PTG as a result of their status as accident survivors, and, in line with the results found among bereaved individuals, they also suggest that growth may fall below the threshold for moderate-to-high growth. However, this is not the case in all studies. When researchers compared PTG among survivors of motor vehicle accidents, sexual abuse, and bereavement, using a version of the Posttraumatic Growth Inventory with a maximum score of 115, motor vehicle accident survivors had a mean Posttraumatic Growth Inventory score of 60.95 ($SD = 25.60$), representing 53.0% of the maximum score and suggesting a slightly higher ceiling for PTG among accident survivors.

Veterans, PTG, and Moral Injury

Military service is a profession that may involve extreme and repeated exposure to threats to one's own safety as well as to the traumatic experiences of others. Several studies have observed PTG among current and former military personnel. One meta-analysis examined 21 quantitative studies measuring PTG among service personnel from 2001-2017, finding 14 studies that utilized the Posttraumatic Growth Inventory and five that used the Posttraumatic Growth Inventory Short Form to measure PTG (Mark et al., 2018). Among the studies using the Posttraumatic Growth Inventory, mean scores ranged from 32.60 ($SD = 14.88$) to 59.07 ($SD = 23.48$), or 31.0-56.2% of the maximum score. Among those using the Posttraumatic Growth Inventory Short Form, mean scores ranged from 17.11 ($SD = 14.88$) to 20.40 ($SD = 11.88$) or

34.2-40.8% of the maximum score. Based on the definition of moderate-to-high growth adopted by Wu et al. (2019) and other studies, these studies largely reflect a modest level of PTG.

The relatively modest levels of PTG experienced by combat veterans may exist because combat exposure can involve the potential for moral injury. Moral injury, the harmful psychological consequences that may result from a person's perception that their actions or inaction have violated their principles or morals (Litz et al., 2009), has symptoms that are similar to those of PTSD, but, rather than a basis in fear, moral injury is based in shame, guilt, and social isolation (Griffin et al., 2019). Experiences of moral injury can lead to feelings of intense anxiety, anger, shame, and guilt, perpetuating in the individual a belief that they are worthless and immoral (Gray et al., 2012). Although most research on moral injury has examined its impact on military veterans, moral injury has been studied in law enforcement personnel, educators, and healthcare providers, among others (Griffin et al., 2019), and researchers have suggested that moral injury may result from the experience of causing accidental death (Gray, 2021; Steinmetz & Gray, 2015).

Given the additional dimensions of distress accompanying moral injury, one might expect that these types of experiences would inhibit PTG, but multiple studies of veterans have found positive correlations between PTG and guilt (Dekel et al., 2016), perceptions of moral wrongdoing (Hijazi et al., 2015), and exposure to potentially morally injurious events involving their own actions (Evans et al., 2018). Perhaps grappling with the moral components of one's role in combat represents the ruminative component some researchers have suggested is necessary for PTG to occur (discussed below). Those not troubled by moral questions may include those who are less likely to engage in deliberate rumination about their experiences. So, while moral injury may result from deliberate rumination on one's conduct, and this deliberate

rumination might be a catalyst for PTG, the distress that accompanies moral injury may create a ceiling for growth below the moderate-to-high threshold.

Moral Injury and Intentional and Unintentional Moral Transgressions

While the majority of research into moral injury has focused on the experiences of combat veterans, researchers have suggested that moral injury may be present in civilian populations who have intentionally or unintentionally harmed others (Steinmetz & Gray, 2015). In the case of veterans, moral injury may result from actions that are otherwise required by their profession, taken for the preservation of their own safety or the safety of others, encouraged by their colleagues and supervisors, and largely accepted by society; however, society's allowance for moral transgressions resulting in interpersonal harm among civilians is likely to be lower (Steinmetz & Gray, 2015). This raises the question of whether PTG can occur in civilians who have engaged in potentially morally injurious behavior that is less likely to be approved or condoned by their community.

Research into the distress and other sequelae of causing traumatic events or engaging in intentional wrongdoing is limited (Steinmetz et al., 2019); however, there is evidence that people who intentionally harm others or commit crimes may experience perpetration-induced traumatic stress—symptoms that occur following the experience of wrongdoing and are similar to posttraumatic stress symptoms (MacNair, 2015)—and, though the research is extremely limited, they may also experience forms of growth indicative of PTG (Guse & Hudson, 2014; Mapham & Hefferon, 2012; Seyburn et al., 2020). In one study, for example, 291 adolescents identified interpersonal wrongdoing they had engaged in—physical or verbal aggression, problems in romantic relationships, interpersonal betrayal, and discrimination—that had shaken their beliefs about themselves, their expectations for the future, and their relationships (Seyburn et al., 2020).

Participants completed a survey including ten items selected from the Posttraumatic Growth Inventory (for a potential PTG score of 0-50) and reported modest levels of PTG ($M = 26.14$, $SD = 11.20$), representing a score of 52.3% of the maximum. And in a qualitative study using interviews of 11 men and three women in South Africa who were previously convicted of serious crimes like bank fraud, robbery or murder and who subsequently completed a program designed to promote desistance from criminal behavior, participants reported improvements in their relationships, new desires to give back, greater emotional intelligence, the development of new and more positive identities, and increased agency, optimism, and self-efficacy about the future (Mapham & Hefferon, 2012). While evidence of PTG among people who have intentionally harmed others or committed intentional crimes may be limited, research examining PTG among PCADIs is non-existent. To the author's knowledge, this represents the first study examining PTG in this population.

PCADIs

Every year, thousands of people accidentally kill other people. This happens most often as the result of car accidents, but it can also occur because of accidents involving firearms, medical mistakes, and mishaps at work, home, or while engaged in recreational activities (Gray, 2021). Gray (2021) defines unintentional killers as individuals who have survived events in which another person was killed, who did not intend harm, but who nonetheless hold themselves responsible for causing the death. The present study extends that definition to include those who meet these criteria when the event resulted in the serious injury of another. Not all PCADIs are blameless in the accidents they caused. While some are, others may have been negligent or engaged in behavior known to cause a high risk to themselves or others (such as drunk driving), or there may be ambiguity and uncertainty about their culpability (Gray, 2021)

Little is known about the psychological experiences of PCADIs. Steinmetz and Gray (2015) suggested that one result of experiences involving accurate appraisals of self-blame for causing accidents (accidental perpetration) resulting in interpersonal harm may be a source of moral injury. Negative evaluation of one's morality may be heightened when the accident is deemed to result from recklessness, when alcohol or drug use or other risky behavior contributed to the accident, or when a physical or mental condition temporarily prevented a person from judging the situation or behaving appropriately (Steinmetz & Gray, 2015). To the author's knowledge, only five studies specifically focused on the psychological experiences of PCADIs have been conducted (Chesser, 1981; Franken & Halliwell, 2021; Gilliam & Chesser, 1991; Nickerson et al., 2011; Rassool & Nel, 2012), and none of these studies directly examined PTG among PCADIs. One of the qualitative studies noted that PCADIs expressed increased gratitude for their family and friends as well as greater appreciation of life (Chesser, 1981) which may correspond to the *Appreciation of Life* and *Relating to Others* domains of PTG. And Rassool and Nel (2012) observed that some PCADIs may search for meaning within a spiritual context (while others may abandon their faith in the aftermath of having caused a fatal accident) which may relate to the *Spiritual Change* domain of PTG. However, the absence of research on PTG among PCADIs leads to the first question addressed in this study:

To what degree, if any, do PCADIs experience PTG? The hypothesis is that PCADIs experience PTG and that measurement of growth will yield mean results that fall below the threshold of moderate-to-high growth but are commensurate with results among studies of bereaved individuals, accident survivors, combat veterans, and intentional wrongdoers (e.g ~30-50% of maximum PTG scores).

Psychological Distress and Cognitive Processing after Trauma

While traumatic experiences may lead to PTG, it is important to remember that these events are highly distressing. Rather than ignore the negative and painful consequences of trauma, PTG theorists have proposed that growth coincides with and may even depend on high levels of distress. In the immediate aftermath of a traumatic event, survivors are likely initially to experience substantial distress. Initial distress often includes intrusive thoughts about the event and efforts to make sense of what has happened. PTG theory holds that these same ruminative processes eventually evolve into efforts to find meaning and significance in their experience, and these efforts lead to growth. Many studies find a significant positive relationship between distress and growth, but the evidence is mixed. Some researchers have suggested that growth may be an illusory phenomenon reflecting trauma survivors' efforts to cope with distress through the fabrication of positive illusions about the benefits of having survived their traumatic experience rather than representing actual growth.

Distress

The potential for trauma to lead to PTG does not mean that trauma is a desirable experience. Trauma survivors often experience substantial distress including negative emotions like anxiety, fear, sadness, depression, and anger, dysfunctional psychological responses like denial or numbness, intrusive and distressing thoughts and memories of the experience, and physical reactions like fatigue, muscle soreness, gastrointestinal issues, and even psychiatric problems (Tedeschi & Calhoun, 2004). People who survive trauma are often grateful for the growth they have experienced as a result of their struggle with the experience, but the trauma itself remains a source of pain and distress. In other words, the trauma is not preferred; growth is

usually an outcome of an experience that they would still rather have avoided (Tedeschi & Calhoun, 2004).

Theorists have suggested that distress may be a necessary ingredient for PTG to occur. In fact, Tedeschi and Calhoun (1996) hypothesized that people with experiences of more severe trauma would report greater benefits than those with less severe trauma because the latter group's beliefs and perceptions about the world would not be challenged to the same degree as beliefs and perceptions of people with more intense experiences of trauma. They found that reports of negative effects arising from traumatic experiences were positively correlated with scores on the Posttraumatic Growth Inventory, which reinforced evidence emerging at the time of their introduction of the PTG construct that more intense trauma might generate greater benefits (Stutts, Calhoun, Tedeschi & Cann, 1994).

Yet, despite early findings in some PTG research showing that people who reported severe trauma reported more benefits than those with less severe or no trauma, evidence regarding levels of distress and their relationship to PTG is mixed. Some early PTG studies found that where relationships between distress and PTG were observed, greater PTG was typically associated with lower levels of distress (Frazier et al., 2001; Park et al., 1996), while other studies found no observable relationship (Cordova et al., 2001; Powell et al., 2003). That trend has continued in more recent PTG research, some of which has found a negative relationship between distress and PTG, with other studies finding no relationship, some finding a positive linear relationship between distress and PTG, and others finding inverted U-shaped curvilinear relationships (Shakespeare-Finch & Armstrong, 2010).

For example, a meta-analysis of 51 studies examining the relationship, in cancer patients and survivors, between posttraumatic stress disorder and posttraumatic stress symptoms on the

one hand and PTG on the other found a very small but significant positive association ($r = .08, p = .005$) between levels of distress and PTG (Marziliano et al., 2020). However, in a separate meta-analysis of 72 articles measuring PTG in cancer patients, 18 of which examined anxiety and depression, 11 of the 18 found no association between distress and PTG, two reported a negative correlation between PTG and anxiety, four found a negative correlation between PTG and depression, and only one found a positive correlation between depressive symptoms and PTG (Casellas-Grau et al., 2017). Those articles that examined posttraumatic stress disorder also showed mixed results with five finding no relationship between posttraumatic stress disorder and PTG and six finding a positive correlation with PTG (Casellas-Grau et al., 2017). Finally, a meta-analysis of 42 studies that measured both PTG and posttraumatic stress disorder symptoms found a significant positive linear correlation between posttraumatic stress disorder and PTG but a stronger significant curvilinear relationship.

Many other individual studies have found positive correlations between distress and PTG.

- A study of Spanish-speaking parents of children treated in the pediatric intensive care unit of a Spanish hospital showed a significant positive correlation between perceived stress and PTG (Rodríguez-Rey & Alonso-Tapia, 2019).
- A study of the relationship between posttraumatic stress symptoms and PTG among 197 ministerial workers present at the 2011 Oslo bombing attack found a significant positive relationship between PTG and impaired work and social adjustment (Blix et al., 2013)
- A longitudinal study that followed for 17 years Israeli soldiers who were prisoners of war during the 1973 Yom Kippur War found a positive correlation between

posttraumatic stress disorder and subsequent PTG (Dekel et al., 2011). Higher posttraumatic stress disorder in 2003 was associated with higher PTG in 2008.

Other studies have found an inverted U-shaped curvilinear relationship between distress and PTG, where lower levels of distress and higher levels of distress were associated with lower PTG while moderate levels of distress were associated with higher levels of PTG:

- In a longitudinal study of 412 bereaved adults, participants completed scales measuring PTG as well as symptoms of posttraumatic stress, depression, anxiety, and grief at baseline and six months later (Eisma et al., 2019). Results showed that the relationship between PTG and distress symptoms was curvilinear with an inverted U-shape at baseline. (However, distress symptoms at baseline did not predict subsequent PTG at six-month follow-up, nor did PTG at baseline predict subsequent distress.)
- In a study of 253 undergraduate college students, participants reported on their most distressing experiences as well as completing the Posttraumatic Growth Inventory and subjective measures of distress related to the event (El-Gabalawy et al., 2021). Subjective measures of distress included questions about the length of their emotional suffering as a result of the event, termed perceived chronicity of distress, and current emotional suffering related to the event, termed current suffering. Results showed a curvilinear inverted U-shaped relationship between PTG and chronicity of suffering as well as between PTG and current suffering.
- A study of 253 Air Force medical personnel who had been recently deployed to Iraq found curvilinear inverted U-shaped relationships between PTG and both combat and healthcare-related distress (McLean et al., 2011)

Still other studies have found that the relationships between distress and PTG may vary depending on the PTG factor. Bereaved students in a Japanese college demonstrated a curvilinear inverted U-shaped relationship between overall PTG and stress responses as well as between stress responses and *Relating to Others* and between stress responses and the factor combining *Spiritual Change* and *Appreciation of Life*. In contrast, the relationships between stress responses on the one hand and *Personal Strength* and *New Possibilities* on the other were linear (Taku, Tedeschi, et al., 2015).

Distress Among PCADIs

With respect to the distressing psychological experiences of PCADIs, Chesser (1981) conducted in-depth interviews with PCADIs. All ten described their accident as among the most stressful experiences of their lives, and this was especially true for those who knew the victims of their accidents. They described substantial emotional distress and rumination about counterfactuals and ways they could have avoided causing the death. Gilliam and Chesser (1991) interviewed 200 PCADIs and found that they became preoccupied with death and religious fixations, developed eating compulsions, and experienced psychosomatic ailments. And an interpretive phenomenological analysis of semi-structured interviews with five PCADIs identified thematic categories among responses: trying to make sense of the accident, struggling to cope, and an altered sense of self (Rassool & Nel, 2012). PCADIs experienced memory loss related to the event, intrusive thoughts and dissociative experiences, feelings of loss, powerlessness, shock, and confusion, stress and uncertainty related to legal proceedings resulting from the accident, struggles with existential questions, difficulty finding social support from people who understood what they were experiencing (though when such support was available, it was cited as a boon to coping), a sense of obligation to honor the victim, difficulty asking for the

help and support they needed, a highly disrupted sense of self, and chronic and intense guilt and shame (Rassool & Nel, 2012).

Indications of high levels of distress in the limited research on PCADIs and empirical results showing that there remains a lack of certainty about the relationship between PTG and levels of distress lead to the next study question:

How will levels of current distress among PCADIs relate to PTG? The hypothesis is that the relationship between current distress and PTG will have a significant, curvilinear, inverted-U-shaped curve.

Self-Reported PTG May Be Illusory

An important caveat in the discussion of PTG is that there remains a robust debate over whether PTG is an illusory or veridical phenomenon (Boals & Schuler, 2018a). While researchers generally agree that posttraumatic growth may occur, many researchers question the validity of self-reported PTG (Boerner et al., 2020). Questions about the authenticity of self-reported posttraumatic growth fall into three categories. First, PTG may represent illusory growth concocted by the unconscious mind of the trauma survivor as a coping mechanism for their distress (McFarland & Alvaro, 2000). Second, measures of PTG like the Posttraumatic Growth Inventory may not be measuring growth that is driven by the experience of trauma (Boals & Schuler, 2018a). And third, PTG that is accompanied by high levels of distress that are substantial enough to impair functioning cannot be veridical (Asmundson et al., 2021). A complicating factor in this debate is the necessity to rely mostly on post-hoc self-reports in PTG research, which make certainty about the veridical nature of PTG claims difficult to achieve. However, measurements of heightened character strengths (Peterson et al., 2008a), neurological

changes (Rabe et al., 2006), and behavior change corroborated by third-parties (Shakespeare-Finch & Barrington, 2012) add credibility to claims of growth.

First, PTG may be illusory because it represents the self-deceptive fabrication of a silver lining of the traumatic experience. While the relationship between levels of distress and PTG remains unclear, researchers generally agree that high levels of distress and perceptions of PTG may cooccur (Shakespeare-Finch & Armstrong, 2010). Rather than catalyzing an attempt to rebuild their assumptive world that ultimately leads to personal growth, some researchers have suggested that this distress leads survivors to attempt to cope by unconsciously fabricating the positive illusion of personal growth (Maercker & Zoellner, 2004). Research has shown that when people are confronted with distressing events or information, they may respond with positive illusions like self-aggrandizement, irrational optimism, and exaggerated perceptions of control (Taylor & Armor, 1996). Trauma survivors may concoct self-aggrandizing personal narratives of growth by underestimating their pre-trauma personal strengths or wellbeing to produce a growth-related silver lining to their experience that helps them cope with their distress (McFarland & Alvaro, 2000).

In support of this theory, participants in one longitudinal study of undergraduate students completed validated measures corresponding to the five domains of growth measured by the Posttraumatic Growth Inventory at baseline and two months later. For example, relationship quality was measured using the nine-item Positive Relationships subscale of Ryff's (1990) Psychological Well Being scale (Frazier et al., 2009). Participants also completed the Posttraumatic Growth Inventory at time 2 and answered questions about traumatic experiences they may have had between times 1 and 2. Among the 122 participants who experienced an intervening traumatic experience, aside from the significant positive relationship between

Posttraumatic Growth Inventory and the measures of religious commitment, there were no significant positive relationships between reported PTG and actual change in PTG-related domains (Frazier et al., 2009). However, an assumption in PTG theory is that growth takes time because it requires intentional rumination (Marshall et al., 2015), so it is not surprising that actual growth may not have occurred over the two-month period in which the study was conducted. And, interestingly, participants in this study did, in fact, experience growth, but the types of growth they experienced did not correlate to the types of growth they reported having experienced. The self reports of growth that was not substantiated by positive changes in domain-based measurements and participants' failures to report growth that was ultimately reflected in the domain-specific measures point to the second argument about illusory posttraumatic growth.

PTG may be illusory when it is measured with scales that fail to accurately measure PTG. Scales may not be measuring the type of growth they aim to measure. Each item on the Posttraumatic Growth Inventory, for example, requires respondents to evaluate their current status on the dimension, recall their pre-trauma status, calculate the degree of change they have experienced, and evaluate the extent to which the change can be ascribed to the trauma. This assumes people can make this complicated evaluation accurately, but research suggests the relationship between perceived change and actual change is rather weak (Jayawickreme & Blackie, 2014). Rather than measuring the actual phenomenon of growth that results from trauma in individual domains, the Posttraumatic Growth Inventory may measure broader beneficial changes to personality or new life narratives (Jayawickreme & Blackie, 2014). Scales also may measure growth that does not result from trauma. Research has found that some study participants will report moderate to high levels of PTG in response to questions about non-

traumatic experiences like watching the worst TV show or movie they have recently seen (Boals & Liu, 2020) or cracking the screen of their cell phone (Boals & Schuler, 2018a).

Third, some researchers have claimed that while PTG often involves high levels of distress, when distress remains so high that it impairs functioning, the trauma survivor's claims of PTG should not be taken at face value. In such cases, PTG should be considered illusory (Asmundson et al., 2021). However, just as positive and negative affect have been shown to be independent phenomena (Wedderhoff et al., 2021), PTG and ongoing distress are the types of opposites identified by Seligman (2019) in which the properties of each are wholly distinct from the other. In fact, posttraumatic depreciation, the experience of negative changes in the domains of PTG, may coincide with, but does not correlate with, PTG, and the two phenomena have been shown to be distinct from one another (Baker et al., 2008; Cann, Calhoun, Tedeschi, & Solomon, 2010). It is possible for PTG and high levels of distress that impair some functioning to coexist.

The nature of trauma—it is too distressing to ethically generate in a lab and too unpredictable to easily conduct longitudinal studies that measure pre- to post-trauma change—means that much of the research on PTG relies on retrospective self-report measurement (Peterson et al., 2008b) and suffers from the inherent difficulty of reliably measuring positive psychological phenomena with such methodologies (Peterson, Park, Pole, D'Andrea, & Seligman, 2008). However, there are reasons to believe that most self-reported growth is real. First, trauma survivors have reported PTG after their distress has ceased and the motivation for illusory benefit-finding has waned (Boals & Schuler, 2018). Second, even when trauma survivors answer character strength questions without reference to their histories of trauma, researchers have measured slightly higher levels of character strengths in trauma survivors than those without histories of trauma, suggesting that PTG may be objectively measurable (Peterson

et al., 2008). That measurable changes may occur is reinforced by the observation of neurological changes consistent with increased psychological wellbeing among trauma survivors reporting PTG (Rabe et al., 2006). Significant others have also corroborated self-reported Posttraumatic Growth Inventory scores of their loved one's growth after trauma (Shakespeare-Finch & Enders, 2008; Weiss, 2002). Finally, and perhaps most importantly, trauma survivors' reports of PTG have been bolstered by their identification of specific positive behavioral changes (using both quantitative and qualitative methods), and their reported behavioral changes have been corroborated by third-party observers (Shakespeare-Finch & Barrington, 2012). This is critical because to truly be meaningful, PTG should reflect not only changes in cognition but also changes in action (Hobfoll et al., 2007).

Shakespeare-Finch and Barrington (2012) conducted a study of 176 participants (88 trauma survivors, defined as individuals experiencing a traumatic event within the preceding five years, and 88 significant others, defined as individuals with a close relationship with the trauma survivor that preceded the traumatic event). Trauma survivors completed the Posttraumatic Growth Inventory along with five questions assessing positive behavioral changes within the PTG domains (e.g. "I now show my family and friends how much I care for them" to measure behavior related to *Relating to Others*). Participants wrote about specific ways in which their behaviors changed as a result of their traumatic experiences. Significant others completed the Posttraumatic Growth Inventory and behavior change questions with reference to the trauma survivor. T-test results showed that trauma survivors and significant others reported total Posttraumatic Growth Inventory scores for the trauma survivor that were not significantly different. Trauma survivors and significant others also agreed on all domains of PTG measured by the Posttraumatic Growth Inventory except for *Appreciation of Life*. Over 90% of significant

others reported observing behavioral changes consistent with PTG in the trauma survivor with whom they had a relationship (Shakespeare-Finch & Barrington, 2012).

The Janus-Face Model of PTG agrees with Tedeschi and Calhoun (2004) that PTG and adjustment to distress are independent phenomena and attempts to reconcile the two sides in this debate by expressly adopting a view of PTG in which some growth is constructive, self-transcendent, and veridical personal development while other reported growth is illusory and self-deceptive coping (Maercker & Zoellner, 2004). While the final resolution of questions about the relationship between and frequency of reports of illusory and veridical PTG is beyond the scope of this paper, the promising use of behavior change questions and quantitative data to validate the veridical nature of growth in self-report responses leads to the next study question:

Is measured PTG corroborated by self-reported behavioral changes identified by PCADIs? The hypothesis is that scale-measured PTG will positively correlate with self-reported behavior changes reflecting PTG.

Shattered Assumptions, Primal World Beliefs, and PTG

PTG theory holds that for growth to occur after trauma, the traumatic experience must shatter the world assumptions of the survivor to catalyze cognitive processing that ultimately leads to positive change (Tedeschi & Calhoun, 2004). Initial efforts at cognitive processing focus on making sense of what has happened (Janoff-Bulman, 2004) and coping with the consequences of the event (Tedeschi & Calhoun, 2004). Involuntary and often intrusive rumination eventually gives way to purposeful efforts to find significance and meaning in what has happened (Janoff-Bulman, 2004; Tedeschi & Calhoun, 2004). Evidence supporting this process includes research finding correlations between rumination and PTG (Cann, Calhoun, Tedeschi, Kilmer, et al., 2010b; Eze et al., 2020) as well as correlations between PTG and scores on a validated scale that

measures disruption to the assumptive world (Cann, Calhoun, Tedeschi, Kilmer, et al., 2010a; Lindstrom et al., 2011). Additional research has also found measurable differences between the core beliefs of trauma survivors and non-trauma survivors; however, this research has been limited (Clifton, 2020). Measurable differences in primal world beliefs—core assumptions about the nature of the world (Clifton et al., 2019)—among trauma survivors would add support to the theory that changes in the assumptive world provide the mechanism for PTG.

Shattered Assumptions Theory

Trauma is a “psychologically seismic event that can severely shake, threaten, or reduce to rubble many of the schematic structures that have guided understanding, decision making, and meaningfulness” (Tedeschi & Calhoun, 2004, p. 5). A person’s schemas, structural beliefs people have about the attributes of concepts, objects, and relationships in the world, guide their expectations about cause and effect and their understanding of new information (Janoff-Bulman, 2004). One’s most abstract schemas represent their assumptive world, fundamental assumptions they have about the world and their place in it (Janoff-Bulman, 2014). Before their traumatic experience, trauma survivors’ fundamental assumptions about the world, like those of other non-trauma victims, typically included unconscious beliefs in their own invulnerability. People know that bad things happen in the world, but at their core they generally do not expect that those things will happen to them (Janoff-Bulman, 2004). Shattered assumptions theory holds that trauma shatters many of these assumptions about the world (Janoff-Bulman, 1992), violating the core beliefs that previously guided a person’s planning, expectations, actions, and perceptions (Janoff-Bulman, 2014).

Shattered assumptions theory does not propose that trauma shatters all of one’s world assumptions. Rather, the challenges that trauma poses to the assumptive world represent a

combination of threats to some schemas and the destruction of others (Picoraro et al., 2014) and likely leave many schemas intact and unchallenged. The organismic value theory of PTG postulates that people are intrinsically driven to resolve discrepancies between their concept of self and their experiences in the world to achieve their full potential, and posttraumatic growth is a natural process of adapting to new trauma-related information about the self and world (Joseph, 2021). The trauma confronts the survivor with information about the world that is inconsistent with their assumptive world. They can either assimilate the new information into their existing schemas by interpreting it in such a way that it is consistent with preexisting beliefs, or they can accommodate the new information by altering their assumptions about the world (Payne et al., 2007). While people tend to assimilate rather than accommodate new information (Janoff-Bulman, 1992), growth results when assimilation fails, requiring the accommodation of new information through the destruction of pre-trauma assumptions and the composition of new beliefs (Joseph, 2021).

Before the process of growth can begin, initial efforts to cognitively process the event require survivors to grapple with the terror of their own vulnerability (Janoff-Bulman, 2004). Their beliefs about the safety and general benevolence of the world are incompatible with the dangerous reality so vividly illustrated by their experience (Janoff-Bulman, 2004). There are two kinds of rumination: intrusive rumination, involving involuntary recollections or unbidden thoughts about the causes and consequences of the event, which often occurs in the immediate aftermath of the event, and deliberate rumination, which consists of intentional efforts to process the event and its meaning and may also include purposeful efforts to identify benefits of the experience, which generally begins later (Picoraro et al., 2014). Early cognitive processing involves making meaning as comprehensibility and focuses on the question: “How could this

happen?” As trauma survivors engage in this type of event-related rumination, they develop a trauma narrative and begin to understand the trauma as a turning point that divides their personal story into before- and after-trauma periods (McAdams et al., 2001).

PTG theorists believe that initial unconscious efforts to process the trauma by making sense of it and managing the immediate consequences of the experience eventually give way to new forms of intentional cognitive processing that lead to growth (Tedeschi & Calhoun, 2004). Upon identifying the trauma as a turning point, the trauma survivor may begin to make meaning in a second sense: meaning as significance. Cognitive efforts to understand the value of their trauma are often reflected in the trauma survivor’s transition from a belief that life has become meaningless to a belief that life is full of meaning (Janoff-Bulman & McPherson Frantz, 1997). Rebuilding the assumptive world also means developing new schemas that account for the trauma and prepare the person for future potential crises so that the assumptive world will become more resistant to destruction (Tedeschi & Calhoun, 2004).

Interestingly, while PTG represents positive change after trauma, this does not mean that all shattered assumptions are replaced by more positive beliefs about the world. Janoff-Bulman (2004) suggests that PTG lumps together a variety of growth outcomes related to trauma, but that the mechanisms of growth are best understood as three parallel processes that may cooccur and result in growth. The models are strength through suffering, psychological preparedness, and existential reevaluation (Janoff-Bulman, 2004). Only the latter two represent growth that results from shattered assumptions. Strength through suffering, in contrast, represents the idea that psychological challenges make our character stronger just as physical challenges make our bodies stronger. This is best illustrated in the PTG domains of *Personal Strength* and *New Possibilities*. Trauma survivors become more aware of their existing strength and develop new

coping skills that give them resilience for the future (Janoff-Bulman, 2004). This form of growth aligns with Stress-Related Growth theory, which proposes that growth results from, among other things, strengthening of coping mechanisms survivors have employed to ameliorate their distress (Park, 1998).

Psychological preparedness, on the other hand, relates to the reconsideration of challenged and shattered assumptions about a person's safety and personal vulnerability in the world. Trauma prepares the survivor for future potentially distressing events, such that these events cannot affect them as they would have in the past. Psychological preparedness is reflected in a changed assumptive world that takes into account the unavoidable conclusion that the world is more dangerous than the person previously believed and that they are more vulnerable than they realized (Janoff-Bulman, 2004). By incorporating information about the trauma into their assumptive worlds, survivors are likely to arrive at beliefs that acknowledge their vulnerability, such as that the world is less safe or benevolent. While being psychologically prepared may be a form of positive growth, these new beliefs about the world may be decidedly more negative (Janoff-Bulman, 2004).

The third model of growth, and perhaps both the most surprising and the most hopeful, concerns change that occurs as a result of existential reevaluation. These are the changes that result in greater *Appreciation of Life*, *Relating to Others*, and *Spiritual Change*. Along with greater appreciation of life, survivors reorder their priorities, often with a focus on the value of their relationships with other people, with God, and with nature. This reflects the struggle to make meaning as significance from their experience (Janoff-Bulman, 2004). While psychological preparedness may lead to more negative (or, the trauma survivor might say, more

realistic) beliefs about the world, existential reevaluation may lead to a more positive attitude, affect, and philosophical outlook as well as greater meaning in life.

Evidence of Rumination and Shattered Assumptions in PTG

Empirical evidence supports the theorized role of shattered assumptions and rumination in PTG. Scores on the Core Beliefs Inventory—a validated scale for measuring disruption in one’s assumptive world—have been positively correlated with scores on the Posttraumatic Growth Inventory (Cann, Calhoun, Tedeschi, Kilmer, et al., 2010a; Freedle & Kashubeck-West, 2021). Posttraumatic Growth Inventory scores have also been positively correlated with scores for intrusive and deliberate rumination on the Event Related Rumination Inventory, a validated scale for measuring these two types of rumination (Cann et al., 2011; Freedle & Kashubeck-West, 2021). There is also evidence that world assumptions among trauma survivors may differ from those of non-trauma survivors, suggesting that trauma may have altered world assumptions among survivors (Kaler et al., 2011; Mancini et al., 2011; Prager & Solomon, 1995; Valdez & Lilly, 2015). Yet, evidence that trauma survivors’ world assumptions differ from those of non-trauma survivors is limited and inconclusive (Mancini, 2019). More evidence that world beliefs of trauma survivors change after their traumatic experiences or differ from those of non-trauma survivors would add credibility to PTG theory’s assertion that shattered assumptions are the mechanism of PTG.

Studies have found positive correlations between Posttraumatic Growth Inventory scores and scales measuring assumptive world disruption. For example, scores on the Core Beliefs Inventory, a nine-item scale that measures disruption in the assumptive worlds of trauma survivors by asking them to rate the degree to which the event led them to “seriously examine” their world beliefs in various domains, have been positively correlated to Posttraumatic Growth

Inventory scores (Cann, Calhoun, Tedeschi, Kilmer, et al., 2010a; Freedle & Kashubeck-West, 2021). In one study, 181 mostly undergraduate students asked to consider a stressful life event in the previous three years showed a significant correlation between Core Beliefs Inventory and Posttraumatic Growth Inventory scores (Cann, Calhoun, Tedeschi, Kilmer, et al., 2010a). And a longitudinal study of 85 undergraduate students who reported experiencing at least one highly stressful event (death of a friend or family member, divorce, crime victimization, serious medical problem, for instance) within the thirty days before time 1 found a similarly strong correlation between Core Beliefs Inventory scores at time 1 and Posttraumatic Growth Inventory scores at time 2 (Cann, Calhoun, Tedeschi, Kilmer, et al., 2010a). Finally, a study of 476 women with experiences of miscarriage or stillbirth found that Posttraumatic Growth Inventory and Core Beliefs Inventory scores had a significant positive correlation (Freedle & Kashubeck-West, 2021).

Studies have also found significant positive relationships between Posttraumatic Growth Inventory scores and scores on the Event Related Rumination Inventory (Cann et al., 2011; Freedle & Kashubeck-West, 2021). The Event Related Rumination Inventory is a 20-item scale with ten items measuring intrusive rumination (for example, "I thought about the event when I did not mean to") and ten items measuring deliberate rumination (for example, "I forced myself to think about my experience") by asking respondents to rate how often they engaged in the described ruminative behavior (Cann et al., 2011). One study that included 400 students who experienced at least one of several highly stressful events within the preceding 6-8 months, 198 students of whom reported on rumination immediately after the event and 202 of whom reported on recent rumination, found that Event Related Rumination Inventory scores for both intrusive and deliberate rumination immediately after the event and recent intrusive and deliberate

rumination were positively associated with Posttraumatic Growth Inventory scores. Freedle and Kashubeck-West (2021) also found significant correlations between Event Related Rumination Inventory scores for intrusive and deliberate rumination and Posttraumatic Growth Inventory scores of women who experienced miscarriage. A regression model with Core Beliefs Inventory scores as the predictor variable, Posttraumatic Growth Inventory as the outcome variable, and Event Related Rumination Inventory deliberate rumination scores as the mediator predicted 26.7% of variation in PTG, suggesting that the relationship between PTG and core belief challenge was mediated by deliberate rumination (Freedle & Kashubeck-West, 2021).

These studies lend support to the theory that shattered assumptions and rumination lead to PTG. However, they show only that trauma survivors who experience PTG will also report that their world beliefs were challenged and that they ruminated over their experiences. This is important evidence, but it does not show that trauma leads to actual changes in the world beliefs of survivors. Evidence that these beliefs differ from survivors' pre-trauma beliefs or that trauma survivors' beliefs differ from the beliefs of non-trauma survivors would better support the conclusion that schema accommodation after trauma leads to altered assumptive worlds, and there is some evidence to suggest this.

Although studies are limited, there is evidence suggesting that trauma changes the assumptive worlds of survivors leading to changed beliefs about the world (Kaler et al., 2011; Mancini et al., 2011; Prager & Solomon, 1995; Valdez & Lilly, 2015). Sixty-one Israeli Holocaust survivors in one study showed reduced beliefs in the benevolence and meaningfulness of the world when compared to 131 controls (Prager & Solomon, 1995). Changes in scores on the World Assumptions Scale, a 32-item scale measuring eight domains of assumptive world schemas (Janoff-Bulman, 1989), were measured in a longitudinal study of fifty-six

undergraduate psychology students who reported having a traumatic experience between time 1 and time 2 in the study, and researchers found that 26% of the trauma group reported reliable changes in the belief in the benevolence of the world (Kaler et al., 2011). Finally, a longitudinal study of 23 women survivors of intimate partner violence found that world assumptions became more positive among those participants who were not revictimized ($n = 13$) between time 1 and time 2 and that positive world assumption change predicted Posttraumatic Growth Inventory scores among those who showed measurable PTG (Valdez & Lilly, 2015).

Overall, these studies are not sufficient to confirm that trauma leads to real changes in world beliefs. There are few studies measuring these results, and those that exist suffer from methodological problems (Mancini et al., 2011), often use a scale, the World Assumptions Scale, with reliability and validity that has been challenged (Kaler et al., 2011), and show small effect sizes (Clifton, 2020). Additional research using a scale with improved psychometric properties to measure changes in world beliefs in the aftermath of trauma or differences in world beliefs between trauma survivors and non-trauma survivors would better substantiate the theory that trauma shatters world assumptions leading to the accommodative adoption of new high-level beliefs about the world. The relatively new construct of primal world beliefs (primals), twenty-six core cognitions about the overall nature of the world and the environment, and the Primals Inventory that measures them (Clifton et al., 2019) may provide a foundation for developing such evidence.

Primal World Beliefs

Measurement of primal world beliefs among trauma survivors may illuminate the role of beliefs in shaping and being shaped by experiences of trauma. Introduced by Clifton et al. (2019), primals are 26 core beliefs about the world as a whole that people may hold to varying

degrees. In a series of six studies involving nearly 3,000 participants, the Primals Inventory, a 99-item scale measuring primal world beliefs, showed high levels of internal reliability, stability across time, and convergent, divergent, discriminant, and incremental validity (Clifton et al., 2019). The lead author introducing the primals construct (Clifton et al., 2019) has questioned whether primals are shaped by experiences or shape individuals' perceptions of their experiences (Clifton, 2020). The measurement of primals in trauma survivors may lead to a better understanding of the role of changes in the assumptive world after trauma as well as the role of world beliefs in shaping the outcomes of trauma.

Primals relate to a person's overall evaluation of the character of the world (Clifton et al., 2019). These beliefs are simple, generally taking the form "the world is x" where x is some basic quality such as just, safe, or funny (because primals take the form, "the world is x," they may take as their label "x," such that the belief that the world is safe is described as the primal *Safe*). Primals describe what the world is like rather than attempting to explain how or why the world is the way it is. They are goal-relevant in that they relate to how a person may satisfy their needs and desires and shape their interests and values. Primals relate to the character of the world as a whole rather than to a subset of environments or circumstances within the world. They are often unconscious, operating below the level of one's cognitive awareness; yet they also direct one's attention, shape their interpretations of stimuli and information, and influence their actions (Clifton et al., 2019). There is a dialectical quality to primals. While the individual primals are identified by their positively valenced dimensions (e.g. *Good, Safe, Just, Alive, Funny*), lower levels of these beliefs likely indicate the presence of higher levels of their corresponding opposites (e.g. *bad, dangerous, unjust, mechanistic, not funny*; Clifton et al., 2019).

In a series of six studies, the 99-item Primals Inventory (PI-99) demonstrated strong psychometric quality. In studies 1-3, exploratory factor analyses confirmed a hierarchical model of primal world beliefs with *Good* at its apex, *Safe*, *Alive*, and *Enticing* as secondary primals, and 22 tertiary primals, five of which were unrelated to the primary or secondary primals (Clifton et al., 2019). Studies 2 and 5, together, examined the scale for concurrent, convergent, divergent, discriminant, and incremental validity. Study 6 examined stability and reliability over time. And study 4 examined the relationship between affect and PI-99 scores (Clifton et al., 2019). While study 4 showed a relationship between positive affect and the primals *Good* and *Needs Me*, these seemed related to the sequencing of questions in the study and suggested that considering one's primals may influence one's affect. Results in study 6 showing strong test-retest reliability and stability over time (Clifton et al., 2019) suggest primals are not substantially influenced by affect. In addition to showing strong internal reliability, studies showed correlations with Big Five personality traits (L. R. Goldberg, 1991) and VIA character strengths (Niemiec, 2019) that supported convergent and divergent validity, predictive power demonstrating incremental validity, and associations with other measures of world beliefs like the World Assumptions Scale measure of benevolence that showed high concurrent validity (Clifton et al., 2019). The PI-99 has strong psychometrics and improves and expands upon previous efforts to measure world beliefs.

Theories about the relationship between primals and experiences may be said to fall into two categories: interpretive theories and retrospective theories (Clifton, 2020). Interpretive theories propose that primals provide a lens through which individuals interpret and understand their experiences, while retrospective theories propose that, rather than acting as a reliably stable lens through which to examine experiences, an individual's experiences shape and influence

their primals (Clifton, 2020). Clifton (2020) hypothesized that interpretive theories (with some small exceptions) are more accurate but allowed that a significant negative correlation (at a somewhat arbitrary threshold of $r > .2$) between trauma and *Safe* would support, though not dispositively, a conclusion that retrospective theories may explain the relationship between trauma and primals. This would be consistent with Janoff-Bulman's (2004) psychological preparedness model of PTG, and it would also support shattered assumptions theory's contention that trauma alters assumptive worlds. This leads to the next study question:

Are there significant differences between the primals of non-trauma survivors and PCADIs? The hypothesis is that not only will Safe be significantly lower among PCADIs, so will the primals Good, Alive, Enticing, Just, and Regenerative.

It is important to note that retrospective and interpretive theories are not necessarily mutually exclusive. It is quite possible that primals both influence one's interpretations of and reactions to events while also being influenced and shaped by them. While shattered assumptions theory postulates that trauma shatters elements of the assumptive world, it also stipulates that the assumptive world consists of important schemas that shape how people interpret the world and their experiences in it (Janoff-Bulman, 2014). To ignore interpretive theories of the relationship between primals and experiences, in this case trauma, would mean abandoning psychology's decades-long development of a conception of the role of beliefs in influencing behavior (Clifton, 2020). Primals exist on a spectrum, or there would be no need for a scale with six response options. They are normally distributed (Clifton et al., 2019), and it is unlikely that any one individual sees the world as entirely safe or entirely unsafe, for example. Although retrospective theories of primals (Clifton, 2020) as well as the psychological preparedness model of PTG (Janoff-Bulman, 2004) suggest that trauma alters certain primals in a negative direction,

survivors come to the experience of trauma with varying preexisting beliefs about the world (i.e. primals differ among people (Clifton, 2020)), so accommodation of the trauma information will likely leave trauma survivors at varying points along the spectrum with respect to their beliefs. Rather than coming to believe that the world is categorically *unsafe*, for example, they may come to believe that the world is *less safe*. Their original belief in *Safe*, though diminished, may still influence their interpretation of the event in ways that make PTG more likely. That interpretive theories may be accurate even in situations where retrospective theories are also applicable leads to the next study question:

Study Question 5: Which, if any, primals (among Good, Safe, Alive, Enticing, Just, Regenerative, Funny, and Improvable) are associated with PTG in PCADIs? The hypothesis is that all of these primals, except Just, will be significantly and positively correlated with PTG, while Just will be negatively correlated with PTG.

Individual Factors that May Aid PTG

Several individual factors have been associated with PTG. Sex (women tend to report more PTG; Albuquerque et al., 2017; Tedeschi & Calhoun, 1996; Vishnevsky et al., 2010), optimism (which is often positively associated with PTG; Kim, 2017), and coping strategies including acceptance coping, reappraisal coping, religious coping, and seeking support (Prati & Pietrantonio, 2009) have been positively associated with PTG in many, though by no means all, studies of PTG in which they were measured. Since the introduction of the PTG construct and theory, theorists have predicted and research has confirmed that personality traits and social support have strong relationships with PTG too (Tedeschi & Calhoun, 1996).

Personality Traits

Big Five personality traits are an important factor related to PTG. Big Five personality traits include *Extraversion*, which is related to a number of traits including sociability, propensity for positive emotions, and activity levels, *Openness to Experience*, which includes traits like imagination, appreciation of art and beauty, curiosity, and flexibility, *Agreeableness*, another aspect of the social personality which relates to trust, sympathy, and cooperation, *Conscientiousness*, which relates to one's attention to detail and level of organization (versus disorganization), and *Neuroticism*, which relates to one's tendency to experience distress (Costa & McCrae, 1992). In developing and validating the Posttraumatic Growth Inventory, Tedeschi and Calhoun (1996) found positive correlations between Posttraumatic Growth Inventory and all major dimensions of personality besides *Neuroticism* (especially *Extraversion* and *Openness to Experience*). Additional research they conducted reinforced that *Extraversion* and *Openness to Experience* make PTG more likely (Tedeschi & Calhoun, 2004), and these findings have generally been replicated in other studies, with some exceptions.

For instance, in one study of 90 patients with myocardial infarction, PTG was found to have significant and highly positive correlations with Big Five *Extraversion*, *Agreeableness*, *Conscientiousness*, and *Openness to Experience* and a large significant negative correlation with *Neuroticism* (Javed & Dawood, 2016). Another study of 139 patients who experienced a first-time myocardial infarction within the preceding 3-12 months corroborated some of these correlations, though with lower (and, perhaps, more expected) effect sizes (Garnefski et al., 2008). PTG was significantly and positively correlated with *Extraversion* and *Conscientiousness* and significantly, though more modestly, and negatively, correlated with *Neuroticism*. And when 470 individuals living with HIV completed the Posttraumatic Growth Inventory and NEO Five

Factor Inventory (Costa & McCrae, 1992), a validated measure of Big Five personality traits, results showed that PTG was positively associated with *Extraversion* and negatively associated with *Neuroticism* (Rzeszutek et al., 2019).

However, results of studies measuring the relationship between personality traits and PTG are somewhat mixed. For example, a study of 271 veterans of Operation Iraqi Freedom and Operation Enduring Freedom (the post-9/11 wars in Iraq and Afghanistan, respectively) found significant positive correlations between PTG and all Big Five personality traits (except for *Conscientiousness*), including a significant and surprising positive relationship with *Neuroticism* (Mattson et al., 2018). Absolute values for the effect sizes of all significant relationships with PTG were below $r = .2$ (*Extraversion*: $r = .182, p < .01$; *Agreeableness*: $r = .198, p < .01$; *Neuroticism*: $r = .135, p < .05$) except that the relationship with *Openness to Experience* ($r = .237, p < .01$) was somewhat higher. While *Neuroticism* was positively related with only the PTG *Appreciation of Life* domain ($r = .175, p < .001$), the relationship was large enough to make the overall relationship with PTG positive, and the finding was at odds with other findings showing a negative relationship between PTG and *Neuroticism*. The finding of no significant relationship between PTG and *Conscientiousness* also contradicted other studies. In addition to these small discrepancies, some studies have found no significant relationship at all between personality and PTG. One study of 102 German survivors of motor vehicle accidents, for example, found no significant relationship between openness to emotions or ideas and PTG or any of its five domains (Zoellner et al., 2008). These mixed results lead to the next study question:

Will PTG correlate with Big Five personality traits among PCADIs? The hypothesis is that PTG will have significant positive correlations with all Big Five personality traits except that it will have a significant negative relationship with Neuroticism.

Social Support

Social support, which can be defined as emotional and practical support one receives from others in their environment (Maercker & Müller, 2004), is another important factor in PTG. Tedeschi and Calhoun (2004) theorized that social support would be a significant factor in growth following acute adversity. They suggested that social support would help people find meaning, craft new life narratives, and engage in self-disclosure that promotes relatedness and cognitive processing (Tedeschi & Calhoun, 2004). The relationship between access to social support and PTG has been amply demonstrated in research. In fact, social support is so closely connected to growth that at least one theorist has suggested that, rather than the recomposition of the assumptive world, the social environment that results from trauma is the key mechanism of growth (Mancini, 2019). It is likely that social support would be a significant positive factor in the development of PTG among PCADIs.

PTG theory holds that social support during or after a highly stressful life experience can assist in promoting PTG by facilitating a search for meaning, aiding in the development of a new life narrative, and offering opportunities for self-disclosure that contribute to relatedness and cognitive processing (Tedeschi & Calhoun, 2004). Social support helps the survivor craft a new narrative about their experience and offers perspectives and schemas that can be considered for incorporation in their new assumptive world (Tedeschi & Calhoun, 2004). Mutual support from people with similar experiences may be especially beneficial because the perspectives of similar others often have more credibility with the trauma survivor (Tedeschi & Calhoun, 2004).

Listening to others' narratives about trauma and survival helps facilitate PTG by promoting a search for meaning and consideration of how it might be rebuilt (Neimeyer, 2001). Self-disclosure, telling stories to others about one's trauma and its impact, reveals the emotional aspects of the experience, leading to surprising intimacy that may be relevant to the relationship components of growth (Tedeschi & Calhoun, 2004). Self-disclosure may also facilitate active cognitive processing of the trauma, expediting the path from distress to growth (Tedeschi & Calhoun, 2004).

Research has largely confirmed the positive relationship between PTG and social support. For example, one meta-analysis of 103 studies examining the role of social support, optimism, and coping strategies in promoting PTG found a significant positive correlation between social support and PTG as well as between PTG and coping by seeking social support (Prati & Pietrantonio, 2009). And in a study of 120 survivors of flooding, participants completed both the Posttraumatic Growth Inventory and Multidimensional Scale of Perceived Social Support. PTG was significantly but modestly positively correlated with social support (Boullion et al., 2020). Finally, a study of 327 U.S. National Guard soldiers who were deployed to Iraq found significant relationships between PTG and post-deployment social support (Kaler et al., 2011).

Social support from romantic partners appears to play an especially important role. Sometimes the relationship detected is a straightforward correlation between PTG in one spouse and PTG in the other as in Weiss (2002). That study of breast cancer patients and their spouses found that levels of PTG in wives predicted levels of PTG in their husbands, regardless of degree of marital conflict. Social support, in general, was also associated with greater PTG (Weiss, 2002). In other studies, the relationship was found to be more complex. In one longitudinal study of 61 married couples (48 couples at time 2), partners were identified as either the actor or the

partner (Canevello et al., 2016). The actor's level of PTG at time 1 correlated with their responsiveness to the partner at time 1, and the actor's responsiveness at time 1 correlated to the partner's perception of the actor's responsiveness at time 1. Finally, the partner's perception of the actor's responsiveness at time 1 correlated with the partner's level of PTG at time 1. These relationships were similar, though somewhat larger, at time 2. Interestingly, positive change in the actor's PTG from time 1 to time 2 was correlated with positive change in each of these relationships (Canevello et al., 2016), suggesting that PTG in one partner combined with responsiveness to the other partner can catalyze an upward spiral of growth in both partners (Canevello et al., 2016).

Social support from others who have experienced trauma that is the same or similar to the survivor's experience (sometimes referred to as peer support (Donovan, 2022)) appears to be quite beneficial for trauma survivors (Schildkraut et al., 2021). Similar others are uniquely positioned to validate survivors' emotional reactions to the traumatic experience, show greater interest in the survivor's story and respond thoughtfully to their disclosures, and refrain from attempting to push the survivor toward recovery. They may also offer information and advice for navigating the practical challenges associated with the aftermath of the traumatic experience (Schildkraut et al., 2021). In-depth interviews of survivors of the 1999 Columbine High School shooting revealed, for instance, that 15 out of 16 study participants identified support from similar others as among the most important factors in their ability to recover. In contrast, 14 out of 16 noted that support offered by others without similar experiences was often unhelpful (Schildkraut et al., 2021). Peer social support has been found to be beneficial in other studies. A review of 10 studies examining the relationships between peer support and PTG among first responders (nine quantitative and one qualitative) found that social support facilitated cognitive

processing, increased the use of coping strategies, and promoted PTG (Donovan, 2022).

Survivors may seek and access social support through support groups and come to consider each other like family because they have revealed so much of themselves to each other and shared mutual understanding and acceptance about the challenges and responses to their highly stressful life event (Tedeschi & Calhoun, 2004). Among 55 surviving wives who lost their husbands in the 9/11 attacks on the World Trade Center, for instance, PTG was associated with participation in support groups offered by the FDNY (Richardson, 2016)

The link between social support (as well as the relationship between social relations and wellbeing) has led at least one researcher to conclude that rather than rumination over shattered assumptions, changes in the social environment are the mechanism that causes PTG in the first place. Psychosocial Gains from Adversity theory holds that the primary mechanism of growth is social support and connection after the traumatic event (Mancini, 2019). According to this theory, acute adversity unleashes a drive to connect with others for mutual support and protection, greater cooperation, and more meaningful interpersonal interactions (Mancini, 2019). Social support and connection contribute directly to wellbeing, and trauma produces an improved social environment where connection, and increased well-being, is more likely (Mancini, 2019).

Unfortunately, social support does not always lead to PTG. Sometimes this is because social support is lacking, which appears to stand in the way of PTG. In studies of breast cancer survivors, for instance, the cognitive processing that leads to PTG was inhibited when patients' friends and families did not want to hear about the illness, and the breast cancer survivors experienced less PTG (Cordova et al., 2001). And other times it is because the significant positive relationship between PTG and social support is absent (Linley & Joseph, 2006; Volgin

& Bates, 2016). When 56 death-exposed disaster response workers completed the Posttraumatic Growth Inventory and Crisis Support Scale, a seven-item scale measuring practical and emotional support following a distressing experience (Joseph et al., 1992), results showed no significant relationship between PTG and received social support or satisfaction with social support (Linley & Joseph, 2006). In another study examining PTG and social support in 100 individuals with self-reported histories of trauma, no significant relationship was found between PTG and emotional support or instrumental (practical) support. Although studies largely support a strong relationship between PTG and social support, the presence of studies that find no relationship as well as the novelty of studying PTG among PCADIs leads to the final study question:

Do social support and PTG correlate among PCADIs? The hypothesis is that there will be a significant positive relationship between PTG and social support.

The Present Study

The present study compares the primal world beliefs of PCADIs with the primals of a convenience sample of participants with no reported histories of trauma and the correlations among PTG, primals, distress, Big Five personality traits, and social support in PCADIs.

Specifically, the study aims to answer the following questions:

- Are there significant differences between the primals of non-trauma survivors and PCADIs? The hypothesis is that not only will *Safe* be significantly lower among PCADIs, so will the primals *Good, Alive, Enticing, Just, and Regenerative*.
- To what degree, if any, do PCADIs experience PTG? The hypothesis is that PCADIs experience PTG and that measurement of growth will yield results that fall below the threshold of moderate-to-high growth (60% of the maximum score) but are

commensurate with results among studies of bereaved individuals, accident survivors, combat veterans, and intentional wrongdoers (~30-50% of the maximum score).

- Which, if any, primals (among Good, Safe, Alive, Enticing, Just, Regenerative, Funny, and Improvable) are associated with PTG in PCADIs? The hypothesis is that all of these primals, except Just, will be significantly and positively correlated with PTG, while Just will be negatively correlated with PTG.
- Is measured PTG corroborated by self-reported behavioral changes identified by PCADIs? The hypothesis is that scale-measured PTG will positively correlate with self-reported behavior changes reflecting PTG.
- How will levels of current distress among PCADIs relate to PTG? The hypothesis is that the relationship between current distress and PTG will have a significant, curvilinear, inverted-U shaped curve.
- Will PTG correlate with Big Five personality traits among PCADIs? The hypothesis is that PTG will have significant positive correlations with all Big Five personality traits except that it will have a significant negative relationship with *Neuroticism*.
- Do social support and PTG correlate among PCADIs? The hypothesis is that there will be a significant positive relationship between PTG and social support.

Methods

Measures

Primal World Beliefs

Participants' beliefs about the world were measured using the brief 18-item Primals Inventory (PI-18; Clifton & Yaden, 2021) that uses items from the PI-99 (Clifton et al., 2019) to measure the four highest order primals—*Good* (versus *bad*), *Safe* (versus *dangerous*), Enticing

(versus *dull*), and *Alive* (versus *mechanistic*)—and subscales of the PI-99 that measure the beliefs that the world is *Funny* (versus not *funny*), *Improvable* (versus *too hard to improve*), *Just* (versus *unjust*), and *Regenerative* (versus *degenerative*). Items from both inventories ask respondents to indicate the degree to which they agree with general statements about the world such as “Most things and situations are harmless and totally safe.” Responses to each item range from 0 (Strongly Disagree) to 5 (Strongly Agree). Mean responses for all items measuring each primal are used to arrive at a score of 0-5 for each primal. The scale had acceptable internal consistency in the study ($\alpha = .721$)

Posttraumatic Growth

PCADIs’ PTG was measured using the 10-item Short Form of the Posttraumatic Growth Inventory (Cann et al., 2010) which provides a brief assessment of PTG with high correlation to the 21-item Posttraumatic Growth Inventory introduced by Tedeschi and Calhoun (1996). Like the Posttraumatic Growth Inventory, the Posttraumatic Growth Inventory Short Form provides an overall score for measured PTG as well as scores for five PTG factors: *Appreciation of Life*, *New Possibilities*, *Relating to Others*, *Personal Strength*, and *Spiritual Change*. For example, one item asks respondents to report the degree to which the following statement describes their experience after trauma: “I discovered that I’m stronger than I thought.” Each item is scored on a scale of 0-5 where 0 corresponds to “I did not experience this change as a result of the accident” and 5 corresponds to “I experienced this change to a very great degree as a result of my accident.” Total Posttraumatic Growth Inventory Short Form scores range from 0-50, and each factor is measured with two questions for a potential factor score of 0-10. The scale had good internal consistency in this study ($\alpha = .838$)

Posttraumatic Growth Behavior Changes

PCADIs responded to five items from Shakespeare-Finch and Barrington (2012) that asked whether certain statements related to PTG behavioral changes applied to them. Response options included “Yes,” “No,” and “Unsure.” These items were slightly modified by replacing “trauma” with “accident” (e.g, “Since the trauma I have taken up new interests” became “Since the accident, I have taken up new interests.”). “Yes” responses were scored as 1, while “No” responses were scored as 0, and responses of “Not Sure” were excluded from analyses so that a total score of 0-5 for PTG Behavior Change was obtained. While internal consistency of the scale was poor ($\alpha = .500$), each item represents a single-item scale for measuring behavior changes in individual PTG domains and does not provide a range of response options, so this is not surprising.

Posttraumatic Growth Behavior Change Open Responses

PCADIs were also provided with open-ended space to provide optional descriptions of specific PTG-related behavioral changes they identified in themselves following their trauma.

Ten-Item Personality Inventory

Participants’ Big Five personality traits (L. R. Goldberg, 1991) were measured using the Ten-Item Personality Inventory (Gosling et al., 2003). The scale consists of two items for each of the Big Five personality traits for a total of ten items and asks respondents to report the degree to which they perceive certain statements to describe them (e.g. “I see myself as anxious, easily upset.”). Responses range from 1, representing that the respondent sees the statement as Very Inaccurate, to 7, representing that the respondent sees the statement as Very Accurate. In validating this short scale for measuring Big-Five personality traits, Gosling et al. (2003) found that it had high convergence with the 44-item Big Five Inventory for all personality traits,

including *Extraversion* ($r = .87, p < .01$), *Agreeableness* ($r = .70, p < .01$), *Conscientiousness* ($r = .75, p < .01$), *Openness* ($r = .65, p < .01$), and *Emotional Stability* (inverse of *Neuroticism*; $r = .81, p < .01$). In this study, the two items measuring each of the Big Five personality traits correlated well with each other: *Extraversion* ($r = .43, p = .004$), *Agreeableness* ($r = .57, p < .001$), *Conscientiousness* ($r = .62, p < .001$), *Openness* ($r = .55, p < .001$), and *Neuroticism* ($r = .68, p < .001$).

Social Support

Social support in the aftermath of PCADIs' accidents was measured using the 7-item Crisis Support Scale (Joseph, Williams, & Yule, 1992) modified by replacing "disaster" with "accident." This scale asks participants to rate the frequency with which they experienced certain types of social support and their feelings about the support they received. Scores for six of the seven items (such as "Did you have personal contact with other people with a similar experience just after the accident?") range from 1, representing Never, to 7, representing Always. One item, which asks "Did people you expected to be supportive make you feel worse at any time just after the accident?" is reverse scored such that 1 corresponds to Always, and 7 corresponds to Never. Scores for each item are summed providing a total Crisis Support Scale score ranging from 7 to 49. The scale had good internal consistency in this study ($\alpha = .766$)

Mood

Participants were asked to rate their mood on a 100-point Likert scale ("Please rate your current mood on a scale of 0-100, where 0 indicates the worst mood possible, 100 indicates the best mood possible, and 50 indicates neither good nor bad.>").

Depression and Anxiety

Participants' depression and anxiety was measured using the 8-item emotional distress composite created as part of the PROMIS-29 physical and mental health summary scores (PROMIS-29 Composite; Hays et al., 2018, 2021; Pilkonis et al., 2011). The scale includes four items measuring the frequency with which respondents experienced certain emotions and cognitions related to anxiety (e.g. "In the past 7 days, my worries overwhelmed me") and four items measuring depression (e.g. "In the past 7 days, I felt hopeless"). Responses range from 1, representing "Never," to 5, representing "Always," so that the total composite score can range from 8-40 and scores on subscales for anxiety and depression range from 4-20. The scale had very high internal consistency in this study ($\alpha = .956$)

Meaning in Life

Participants' *Meaning in Life* was measured using the 4-item PROMIS Meaning and Purpose Short Form (PROMIS MPSF; Salsman et al., 2020), which asks respondents to report the degree to which they agree with statements about the meaning they perceive in their lives (e.g. "I experience deep fulfillment in my life"). Responses range from 1 ("Not at all") to 5 ("Very much") so that total scores for *Meaning in Life* can range from 4-20. The scale had very high internal consistency in this study ($\alpha = .926$).

Satisfaction with Life

PCADIs completed the Satisfaction with Life scale (SWL; Diener et al., 1985) a five-item scale measuring one's overall contentment with their life. The scale asks respondents to indicate the degree of their agreement with certain statements about their life (e.g. "If I could live my life over, I would change almost nothing"). Item responses range from 1 ("Strongly

disagree”) to 7 (“Strongly agree”), and possible total scores range from 5-35. The scale had very high internal consistency in this study ($\alpha = .916$).

Participants

Eligible participants were individuals 18 years of age or older, residing in the United States or U.S. Territories, and able to read and understand English and voluntarily consent to participate in the study.

Participants in the study ($N = 528$) included a sample of PCADIs ($n = 44$) and a convenience comparison sample of individuals with no reported histories of trauma ($n = 484$). Among the 43 PCADIs who provided demographic information (one participant provided no demographic data), 28 were female (65.1%), 12 were male (27.9%), and three indicated a preference not to share their sex (7.0%). PCADI sample participants ranged in age from 24 to 74 years with a mean age of 44.2 years ($SD = 13.5$). The convenience comparison sample was demographically similar to the PCADI sample and included 360 females (75.9%), 109 males (23.0%), and 5 intersex individuals (1.1%) ranging in age from 20 to 88 years old with a mean age of 48.2 ($SD = 17.2$).

Procedure

Participants in the PCADI sample were recruited using email, social media, and website communication through Accidental Impacts, an organization that offers support to PCADIs (Accidental Impacts, n.d.). The organization offers mutual support opportunities through monthly online fellowship meetings, expressive writing to help PCADIs cope with trauma, and one-on-one peer support where pairs of PCADIs can support and assist each other (Accidental Impacts, n.d.). The organization posted on its Facebook page and website an invitation to participate in the study and sent an email invitation to 150 of its most active members (Maryann

Gray, personal communication, April 2, 2022) and subsequently included the invitation in an email to its entire network. According to the organization's founder and president Maryann Gray, herself a PCADI, the email list consists of approximately 750 individuals, the substantial majority of whom are PCADIs.

PCADIs completed a 107-item online survey that included questions about their experience causing an accidental death or injury and its consequences. Recognizing that participation in the study could elicit painful memories or emotions, the survey did not require participants to complete every item. In addition to questions about demographics and details of participants' accidents, the 107-item survey included each of the scales described above. Of 63 participants who provided consent to participate in the study, 19 did not complete enough items to be included in the study and were excluded from subsequent analyses. Of the remaining 44 participants, one completed only the items pertaining to demographics, details of the accident, and primals, and this participant was excluded from analyses related to the other scales. Forty-three participants in the PCADI sample completed the entire survey, including the Posttraumatic Growth Inventory Short Form, PTG Behavior Change Questions, Ten-Item Personality Inventory, Crisis Support Scale, and scales measuring depression, anxiety, *Meaning in Life*, and *Satisfaction with Life*.

Participants in the convenience comparison group completed the scales measuring primals (except that their survey did not include subscales for *Funny* or *Improvable*), personality, depression, anxiety, and *Meaning in Life*.

Results

PCADI Participant Characteristics

In addition to the demographic characteristics described above, survey results showed that the PCADI sample was overwhelmingly white. Forty participants (93.0%) identified as non-Hispanic white, one participant (2.3%) identified as Black, one (2.3%) identified as Spanish, Hispanic, or Latino, and one (2.3%) identified as Middle Eastern. Twenty-one participants (48.8%) reported that their political orientation was slightly to very liberal, while 15 (34.9%) reported they were in the middle politically, and six (14.0%) reported being slightly conservative to conservative. Four (9.3%) participants identified as Catholic, five (11.6%) as Evangelical Protestant, three (7.0%) as Mainline Protestant, and three (7.0%) as other Christian. Two participants (4.7%) identified as Jewish, one (2.3%) as Hindu, and one (2.3%) as other religion. Thirteen (30.2%) reported being spiritual but not religious, while seven (16.3%) reported being agnostic, and four (9.3%) reported being atheist.

Characteristics of PCADIs' Accidents

Participants reported on details about the accidents in which they were involved. Nineteen participants (44.2%) reported that their accident occurred within the five years preceding the study, including twelve participants (27.9%) whose accidents occurred within one year of the study. Six participants (14.0%) reported that their accidents occurred between 6-10 years before the study, and eight (18.6%) reported that their accidents occurred between 11-20 years prior. Thirteen participants' (30.2%) accidents occurred more than 20 years prior to the study. The vast majority of reported accidents (88.4%) were automobile accidents, while firearms accident, failure to protect or rescue someone, and accident resulting from safety hazard

were reported by one participant (2.3%) each. Two participants (4.3%) indicated involvement in “other type of accident.”

In terms of the causes of accidents, 25.6% of participants indicated that they perceived themselves to be completely at fault for the accident, while 44.2% perceived themselves to be partially at fault, 14.0% reported that the accident was nobody’s fault, and 16.3% reported that the accident was somebody else’s fault. Asked about the involvement of drugs or alcohol in their accident, 14.0% reported that they were under the influence at the time of the accident, 81.4% reported that they were not, and 4.7% were not sure.

Outcomes of the accidents varied. Over half of participants (58.1%) reported that someone they did not know died as a result of the accident, while someone the participant did know died as a result of 30.2% of the accidents. A total of five participants indicated that their accident resulted in serious injury rather than death, including 2.3% who injured someone they knew and 9.3% who injured someone they did not know. About a third of participants (34.9%) reported that they were currently facing or previously faced criminal charges as a result of the accident, and 41.9% reported that they faced civil liability or a lawsuit as a result of the accident.

Primals of PCADIs and Non-Trauma Survivors

Minimum, maximum, and mean scores (and standard deviations) for the primal world beliefs that the world is *Good, Safe, Enticing, Alive, Just* and *Regenerative* were calculated for each group. Linear regression analyses were conducted to determine if having caused accidental death or serious injury predicted differences in primal world beliefs. Regression analyses were then repeated controlling for age, sex, and family income of participants.

As shown in Table 1, primal world beliefs that the world is *Good, Safe, Enticing, Just, Regenerative*, and *Alive* differed between the experimental and control group. Though effect

sizes were small, having caused accidental death or serious injury was a statistically significant predictor of lower beliefs that the world is *Good*, *Safe*, *Enticing*, *Just*, and *Regenerative*.

However, there was no significant relationship between having caused accidental death or serious injury and the belief that the world is *Alive*.

Controlling for sex, age, and family income, having caused accidental death or serious injury remained a statistically significant predictor of lower beliefs that the world is *Good* ($\beta = -.138, p = .001$), *Safe* ($\beta = -.178, p < .001$), *Enticing* ($\beta = -.095, p = .029$), *Just* ($\beta = -.165, p < .001$), and *Regenerative* ($\beta = -.102, p = .022$). These results confirm the hypothesis of statistically significant negative changes in primals associated with having caused accidental death of serious injury for all dependent variables except for the primal *Alive*.

Table 1. Mean Scores for Primal World Beliefs and Between Group Differences

	PCADIs (<i>n</i> =44) <i>M</i> (<i>SD</i>)	Comparison (<i>n</i> = 484) <i>M</i> (<i>SD</i>)	β	<i>p</i>
<i>Good</i>	2.75 (.75)	3.28 (.60)	-.23	<.001
<i>Safe</i>	2.17 (.94)	2.93 (.76)	-.26	<.001
<i>Enticing</i>	3.40 (.77)	3.83 (.65)	-.18	<.001
<i>Just</i>	1.81 (.93)	2.53 (.91)	-.21	<.001
<i>Regenerative</i>	2.60 (.99)	3.14 (.77)	-.18	<.001
<i>Alive</i>	2.15 (1.31)	2.44 (1.15)	-.07	.113

Note: *n* = sample size; *M* = mean; *SD* = standard deviation

Additional Analyses Comparing PCADIs with Non-Trauma Survivors

Additional linear regression analyses were conducted to determine if having caused accidental death or serious injury predicted differences in personality, emotional distress, or *Meaning in Life*. Table 2 shows results for these analyses. Regressions were subsequently conducted to control for sex, age, and family income.

Table 2. *Personality, Distress, and Meaning in Life and Between Group Differences*

	PCADIs (n=44) M (SD)	Comparison (n = 484) M (SD)	β	p
<i>Extraversion</i>	3.08 (1.40)	3.83 (1.67)	-.13	.004
<i>Openness</i>	4.91 (1.65)	5.22 (1.13)	-.07	.092
<i>Agreeableness</i>	5.09 (1.11)	5.17 (1.16)	-.02	.650
<i>Conscientiousness</i>	5.10 (1.47)	5.67 (1.19)	-.13	.003
<i>Neuroticism</i>	4.39 (1.69)	2.90 (1.36)	.29	<.001
Depression	3.23 (1.01)	1.89 (.84)	.40	<.001
Anxiety	2.95 (1.08)	1.71 (.82)	.38	<.001
Composite	6.19 (2.01)	3.59 (1.58)	.41	<.001
<i>Meaning in Life</i>	2.89 (1.07)	3.63 (1.02)	-.20	<.001

Note: n = sample size; M = mean; SD = standard deviation; Composite = Composite Distress Score; Bolded items are statistically significant results ($p < .05$)

Personality. As shown in Table 2, having caused accidental death or injury was a statistically significant predictor of lower *Extraversion* and *Conscientiousness* as well as higher *Neuroticism*. Having caused accidental death or injury was not a significant predictor of Big Five personality traits *Agreeableness* or *Openness*.

Controlling for sex, age, and family income, the relationship between having caused accidental death or serious injury and *Conscientiousness* was not significant, while it remained a statistically significant predictor of *Extraversion* ($\beta = -.11, p = .014$) and *Neuroticism* ($\beta = .20, p < .001$).

Emotional Distress. Having caused accidental death or serious injury was a significant predictor of higher levels of anxiety, depression, and composite scores for distress.

Controlling for sex, age, and family income, having caused accidental death or serious injury remained a significant predictor of depression ($\beta = -.33, p < .001$), anxiety ($\beta = .31, p < .001$), and composite distress scores ($\beta = .33, p < .001$)

Meaning in Life. Having caused accidental death or serious injury was a significant predictor of lower *Meaning in Life*. It remained a significant predictor of lower *Meaning in Life* when controlling for sex, age, and family income ($\beta = -.14, p = .002$).

Descriptive Statistics and Correlations in PCADI Sample

Minimum, maximum, and mean scores (and standard deviations) were calculated for all scales completed by the PCADI sample. See Table 3 for descriptive statistics of all variables besides PTG Behavior Change items which were not included in the table because responses of “Not Sure” on PTG Behavior Change were excluded from the analyses and therefore changed the sample size with respect to analyses involving those variables.

In addition, Pearson Correlations were run to examine relationships between PTG and PTG domain scores and primals, depression and anxiety, personality traits, and social support.

Table 5 shows the results of these analyses.

Table 3. *Descriptive Statistics for PCADI Variables*

<i>n</i> = 43	Min	Max	M (SD)
PTGI-SF	0.00	44.00	19.95 (11.35)
<i>Appreciation of Life</i>	0.00	10.00	5.07 (3.17)
<i>New Possibilities</i>	0.00	10.00	4.02 (3.15)
<i>Relating to Others</i>	0.00	8.00	3.28 (2.81)
<i>Personal Strength</i>	0.00	10.00	4.51 (3.58)
<i>Spiritual Change</i>	0.00	10.00	3.07 (2.98)
<i>Good</i>	0.80	4.47	2.75 (0.76)
<i>Safe</i>	0.00	4.33	2.18 (.95)
<i>Enticing</i>	1.71	4.86	3.38 (0.76)
<i>Alive</i>	0.00	5.00	2.19 (1.29)
<i>Just</i>	0.00	3.40	1.78 (0.90)
<i>Regenerative</i>	0.00	5.00	2.61 (1.00)

<i>Funny</i>	0.75	4.25	2.50 (0.94)
<i>Improvable</i>	0.80	3.80	2.59 (0.75)
<i>Depression</i>	1.25	5.00	3.21 (1.01)
<i>Anxiety</i>	1.00	5.00	2.94 (1.09)
<i>Extraversion</i>	1.00	6.00	3.08 (1.41)
<i>Openness</i>	1.00	7.00	4.86 (1.63)
<i>Agreeableness</i>	3.00	7.00	5.12 (1.11)
<i>Conscientiousness</i>	2.00	7.00	5.19 (1.38)
<i>Neuroticism</i>	1.00	7.00	4.33 (1.66)
CSS	9.00	41.00	25.63 (8.19)
SWL	5.00	34.00	17.47 (7.40)
MIL	1.00	5.00	2.90 (1.08)

Note: n = sample size; Min = minimum recorded score; Max= maximum recorded score; M= mean; SD= standard deviation; PTGI-SF = Posttraumatic Growth Inventory-Short Form scores; CSS= Crisis Support Scale scores; SWL = Satisfaction with Life; MIL = Meaning in Life

PTG Among PCADIs

As shown in Table 4, mean scores for the Posttraumatic Growth Inventory Short Form and individual PTG factors (*Appreciation of Life, New Possibilities, Relating to Others, Personal Strength, and Spiritual Change*) within the Posttraumatic Growth Inventory Short Form were converted to percentages of the maximum score for comparison to PTG scale scores among survivors of other categories of trauma.

Table 4. Mean PTG Scores and Percentage of Maximum Score

<i>N = 43</i>	<i>M (SD)</i>	<i>% of Maximum Score</i>
PTGI-SF	19.95 (11.35)	39.9%
<i>Appreciation of Life</i>	5.07 (3.17)	50.7%
<i>New Possibilities</i>	4.02 (3.15)	40.2%
<i>Relating to Others</i>	3.28 (2.81)	32.8%
<i>Personal Strength</i>	4.51 (3.58)	45.1%
<i>Spiritual Change</i>	3.07 (2.98)	30.7%

Note: N = sample size; M= mean; SD= standard deviation; PTGI-SF = Posttraumatic Growth Inventory-Short Form scores

Results showing a mean score of 19.95 ($SD = 11.35$; 39.9% of the maximum score) on the Posttraumatic Growth Inventory Short Form among the sample of PCADIs confirmed the

hypothesis that PCADIs would demonstrate levels of PTG that were below the threshold set by Wu et al. (2019) for moderate-to-high PTG (60% of the total maximum score) but were commensurate with that found in studies of bereaved individuals, accident survivors, and individuals whose trauma may be linked to moral injury (~30-50% of the maximum score). This was also true of all PTG domains.

PTG and Primals

As shown in Table 5, Pearson Correlations examining relationships between the primals *Good, Safe, Enticing, Alive, Just, Regenerative, Funny, and Improvable* and Posttraumatic Growth Inventory Short Form scores and scores for individual PTG factors measured by the Posttraumatic Growth Inventory Short Form found significant relationships between PTG and three of the four highest order primals. PTG was significantly and positively correlated with *Good, Safe, and Alive* but not with *Enticing*. Analyses also showed significant positive correlations between PTG and the primals *Just, Regenerative, Funny, and Improvable*. These findings are in general accord with the hypothesis except that, contrary to the hypothesis, *Just* was positively correlated with PTG, and *Enticing* was not significantly related to PTG.

Correlations Between Primals and Posttraumatic Growth Inventory Short Form Factor Scores. As shown in Table 5, in addition to their positive correlations with overall PTG, the relationship between PTG and primals was reinforced by several significant positive correlations between primals and domains of PTG. *Appreciation of Life* was related to *Alive, Just, Funny, and Improvable*. *New Possibilities* was related to *Good, Alive, Just, Regenerative, and Improvable*. *Personal Strength* was related to *Good, Safe, Alive, Just, Regenerative, Funny, and Improvable*. And *Spiritual Change* had a very strong relationship with *Alive*. Relating to *Others* was not related to any primals.

Table 5. *Correlations of PTG and its Domains with Study Variables*

n = 43	PTG	AL	NP	RO	PS	SC
<i>Good</i>	.36*	.25	.31*	.08	.42**	.19
<i>Safe</i>	.33*	.21	.23	.26	.36*	.11
<i>Enticing</i>	.11	.07	.19	-.15	.25	.00
<i>Alive</i>	.54***	.39*	.35*	.04	.47**	.69***
<i>Just</i>	.39**	.33*	.33*	.27	.33*	.13
<i>Regenerative</i>	.33*	.29	.36*	-.11	.40**	.19
<i>Funny</i>	.38*	.33*	.26	.26	.37*	.10
<i>Improvable</i>	.51***	.46**	.45**	.19	.46**	.24
Depression	-.12	-.07	-.25	.03	-.18	.08
Anxiety	-.25	-.19	-.31*	.05	-.30*	-.11
<i>Extraversion</i>	.26	.20	.17	.14	.15	.29
<i>Openness</i>	.27	.18	.22	.13	.34*	.08
<i>Agreeableness</i>	.26	.21	.09	.26	.37*	-.02
<i>Conscientiousness</i>	.16	.14	.13	.11	.11	.06
<i>Neuroticism</i>	-.43**	-.40**	-.44**	-.14	-.45**	-.08
CSS	.15	.19	-.01	.33*	.03	.05
SWL	.37*	.26	.26	.10	.35*	.33*
MIL	.54**	.38*	.45**	.09	.56**	.42**

Note: n = sample size; PTG = Posttraumatic Growth Inventory-Short Form scores; AL = Appreciation of Life; NP = New Possibilities; RO = Relating to Others; PS = Personal Strength; SC = Spiritual Change; CSS= Crisis Support Scale scores; SWL = Satisfaction with Life; MIL = Meaning in Life; * = $p < .05$; ** = $p < .01$; *** = $p < .001$ (two-tailed)

Correlations Between Primals and PTG Behavior Change. No significant correlations were found between total PTG Behavior Change scores and primals. However, significant positive correlations were found between *Funny* and positive responses to the PTG Behavior Change item measuring *Appreciation of Life* ($r(36) = .341, p = .042$) as well as between *Alive* and the PTG Behavior Change item measuring *Spiritual Change* ($r(36) = .451, p = .003$).

PTG and Distress

Pearson Correlations and linear and quadratic curve estimates were run examining the relationships between PTG scores and depression and anxiety composite scores and separate scores for depression and anxiety. No significant linear or quadratic relationship was found between PTG and composite scores or scores for anxiety or depression. This represents a null

finding with respect to the hypothesis that the relationship between PTG and distress would be an inverted U-shaped curvilinear relationship.

However, while neither total distress scores nor scores for depression correlated significantly with overall PTG or with any PTG domains, anxiety had a significant negative relationship with the PTG domains of *New Possibilities* and *Personal Strength*.

Neither depression nor anxiety significantly correlated with overall PTG Behavior Change. However, depression correlated negatively with the PTG Behavior Change item measuring *Personal Strength* ($r(36) = -.334, p = .040$).

PTG and PTG Behavior Change

Pearson Correlations were run to measure the relationship between overall PTG Behavior Change scores and Posttraumatic Growth Inventory Short Form scores as well as the relationships between individual PTG Behavior Change items and Posttraumatic Growth Inventory Short Form subscales for PTG domains. As shown in Table 6, Posttraumatic Growth Inventory Short Form scores and scores on its domain subscales showed strong correlations with scores on the PTG Behavior Change scale as well as with PTG Behavior Change items related to individual domains. The significant correlation between overall PTG and PTG Behavior Change ($r = .478, p = .001$) confirmed the hypothesis that self-reported PTG would have a significant positive relationship with PTG Behavior Change responses.

Table 6. *Correlations of PTG and its Domains with PTG Behavior Change*

PTG Behavior Change	PTG	AL	NP	RO	PS	SC
Total (<i>n</i> = 43)	.48**	.45**	.47**	.15	.31*	.33*
AL Behavior (<i>n</i> = 36)	.41*	.48**	.29	.17	.40*	.15
NP Behavior (<i>n</i> = 39)	.06	.10	.38*	-.29	.06	-.05
RO Behavior (<i>n</i> = 37)	.30	.37*	.26	.39*	.13	-.06

PS Behavior (<i>n</i> = 38)	.39*	.30	.45**	.26	.17	.23
SC Behavior (<i>n</i> = 41)	.35*	.17	.21	.07	.11	.74***

*Note: n = sample size; PTG = Posttraumatic Growth Inventory-Short Form scores; AL = Appreciation of Life; NP = New Possibilities; RO = Relating to Others; PS = Personal Strength; SC = Spiritual Change; * = $p < .05$; ** = $p < .01$; *** = $p < .001$ (two-tailed)*
Bolded items are relationships between PTG domains and their corresponding PTG Behavior Change item.

PTG Behavior Change Open Responses

In addition to the quantitative analysis of the relationship between Posttraumatic Growth Inventory Short Form scores and PTG Behavior Change scale responses, optional written responses to an open-ended behavior change item asking participants to “Please share any specific examples of the changes to which you responded “yes” above” (*n* = 26) were explored for the identification of emergent themes in behavioral and cognitive changes indicative of growth. All 26 responses are available in Appendix B.

Of the 26 responses, four indicated that they could not ascribe their growth to their accident, and two of these specifically mentioned that the accident was so long ago that it was difficult to correlate decades of growth to a single event. A fifth response identified some changes that were the result of time and other changes that they identified as results of their accident. Two responses indicated only negative changes since the accident, including lost faith and discomfort around people, while a third indicated depreciation in spirituality and growth in *Relating to Others* and *Appreciation of Life*. Nineteen responses described a wide range of positive changes in each of the domains of PTG.

In the area of *Appreciation of Life*, many responses indicated a new appreciation for “the little things” and “the moments” as well as changes in priorities and a recognition of the value and vulnerability of life. One response exemplified this aspect of *Appreciation of Life*: “Got my priorities straight, realized how delicate life is and how quickly and suddenly it can end.”

Another respondent explained that “I know more than most people how quickly death can come and how ugly it can be. I can’t afford to only experience joy in momentous occasions. I try to make myself love the little things too just in case my life turns out to not last as long as I would hope.” And another respondent described how they “get lost in the present moment since the future is uncertain and difficult. I will allow myself the opportunity to get lost when I would have hurried myself along faster pre accident.”

Representing *New Possibilities*, several respondents found new careers or vocations related to their experience. For example, one respondent stated that, as a result of the accident, “I changed career paths after my accident and started graduate school.” Another who graduated from college shortly after their accident reported that “I originally intended to go to a research-focused graduate program for counseling, but ended up going to a much more relational program, and this change was directly influenced by my accident.” Others engaged in new interests and activities. For example, one respondent shared that they “found yoga after the accident,” while another explained that they developed an interest in “psychology and philosophy” (the latter of which may cross over into the *Spiritual Change* domain). Another respondent observed that “I moved into my own house and out of a shared house with my ex boyfriend, I am now interested in DIY projects and have gotten more invested in reading.” As one respondent described it, “[b]eing acutely aware of how quickly life can change, or be taken away, makes pursuing your interests and curiosities a no-brainer.”

Relating to Others was a common theme expressed in responses. Many respondents indicated a new level of appreciation for the role that social support from their family and friends played in the aftermath of their accidents. For example, one respondent indicated that “I appreciate that my family was there for support,” and another shared that they “[v]erbally

expressed gratitude to friends and family more.” Spending more time with loved ones was also important, as one respondent described that “I definitely spend even more time with them and I am constantly reminding them how much they mean to me and how grateful I am for their assistance and support throughout this endeavor.” Respondents also described a heightened emotional response to the value of their relationships. For example, one response described how “when I see people I love now I cry with sheer emotion of love whereas I didn’t before.”

Many respondents recognized new levels of *Personal Strength*. Some acknowledged that their newfound personal strength was accompanied by increased perceptions of vulnerability in the world (in line with Janoff-Bulman’s (2004) conception of both strength through suffering and psychological preparedness). For example, one response stated that their experience made them “fearful, lonely, afraid yet resilient and protective for myself.”

Spiritual Change was more complicated for this group. Some responses indicated intense grappling with spiritual questions (e.g. “My spirituality has turned into multiple existential crisis’ one after the other, and I have currently settled on being agnostic with accepting that as humans we will never [have] a scientific answer as to how everything works”). Other respondents indicated spiritual depreciation. For example, one respondent stated that “I completely lost my faith after the accident.” A few responses indicated positive *Spiritual Change*, including one respondent who simply shared that “I have become more religious” and another who was able to find meaning in their experience by contemplating God’s role in their life and the accident and the *New Possibilities* the accident created for them: “I realized that God put this in my life for a reason . . . I realize that this needed to happen to me and that how God made me, I can do something with this accident to make the world a better place.” The mixed responses with respect to *Spiritual Change* correspond to mean findings on the Posttraumatic Growth Inventory

Short Form in this study in which *Spiritual Change* received the lowest mean score of any of the domains.

Overall, responses to open ended questions about specific changes PCADIs have made in their lives as a result of their accidents support the conclusion that PTG in these respondents is a veridical phenomenon.

PTG and Personality

Pearson Correlations were run to examine relationships between Big Five personality traits and Posttraumatic Growth Inventory Short Form scores, scores for individual PTG factors measured by the Posttraumatic Growth Inventory Short Form, and PTG Behavior Change scores and factors measured by the PTG Behavior Change items. Table 5 provides results of these analyses with respect to the Posttraumatic Growth Inventory Short Form and Big Five personality traits. No significant relationships were found between overall PTG and *Extraversion, Openness, Agreeableness, or Conscientiousness*. This represents a null finding with respect to the hypothesis that PTG would have a significant positive correlation with these personality traits. *Neuroticism* was negatively correlated with overall PTG as well as with *Appreciation of Life, New Possibilities, and Personal Strength*. This is in accord with the hypothesis of a significant negative relationship between *Neuroticism* and PTG. *Personal Strength* was also positively correlated with *Agreeableness* and *Openness to Experience*.

The analysis found no relationship between any of the Big Five personality traits and overall PTG Behavior Change scores. However, the PTG Behavior Change item for *Relating to Others* was positively correlated with Big Five traits *Extraversion* ($r(35) = .450, p = .005$) and *Openness* ($r(35) = .351, p = .033$). And the PTG Behavior Change item for *Appreciation of Life*

was positively correlated with *Openness* ($r(34) = .419, p = .011$) and *Conscientiousness* ($r(34) = .479, p = .003$).

PTG and Social Support

Pearson Correlations were run to measure relationships between Crisis Support Scale scores, Posttraumatic Growth Inventory Short Form scores, scores for individual factors measured by the Posttraumatic Growth Inventory Short Form, and scores for PTG Behavior Change. No significant relationship was found between Crisis Support Scale scores and overall PTG. This represents a null finding with respect to the hypothesis that social support would have a significant positive relationship with PTG. However, there was a significant positive correlation between the PTG factor *Relating to Others* and Crisis Support Scale scores.

Additional Analyses of Relationships Among Variables in the PCADI Group

PTG and Meaning in Life. As shown in Table 5, *Meaning in Life* positively correlated with overall PTG, *Appreciation of Life*, *New Possibilities*, *Personal Strength*, and *Spiritual Change*. Of the PTG domains measured by the Posttraumatic Growth Inventory Short Form, only *Relating to Others* had no significant relationship with *Meaning in Life*.

Meaning in Life also positively correlated with overall PTG Behavior Change ($r(41) = .368, p = .015$) as well as with the PTG Behavior Change item measuring *Spiritual Change* ($r(39) = .347, p = .026$).

PTG and Satisfaction with Life. *Satisfaction with Life* correlated positively with overall PTG, *Personal Strength*, and *Spiritual Change*. *Satisfaction with Life* did not correlate with overall PTG Behavior Change.

Primals and Social Support. No significant relationship was found between beliefs that the world is *Good, Safe, Enticing, Alive, Just, Regenerative, Funny, or Improvable*, on the one hand, and received social support among PCADIs.

Discussion

Although very few studies have examined the psychological experiences of PCADIs, the limited research on this population suggests that they experience high levels of distress. Nonetheless, results from this study demonstrate that PCADIs may report PTG levels that are commensurate with people who have experienced other relevant traumas, including bereavement, accident survival, and involvement in traumatic events that include potentially morally injurious elements. In addition, there are significant differences between the primals of PCADIs and individuals with no reported histories of trauma, and significant correlations between PTG and primals among PCADIs. However, the study did not find predicted relationships between PTG and social support, PTG and levels of distress, and PTG and most personality traits. Yet, within these null findings, interesting results demonstrated relationships between these variables and certain domains of PTG.

Although research is limited, available evidence suggests that causing unintentional death or serious injury may lead to substantial psychological distress. Many PCADIs may view the experience as the most stressful event of their lives (Chesser, 1981). Causing unintentional harm may lead to moral injury (Steinmetz & Gray, 2015) preoccupations with death, the development of eating disorders and psychosomatic ailments (Gilliam & Chesser, 1991), psychological disorders including PTSD, mood disorders, substance use disorders, and anxiety disorders (Connorton et al., 2011; Nickerson et al., 2011), memory loss related to the event, intrusive rumination, confusion, shock, stress, uncertainty, feelings of loss and powerlessness, and intense

guilt and shame (Rassool & Nel, 2012). Given the high degree of distress associated with having accidentally killed or seriously injured another, one might reasonably be shocked to learn that 40 out of 43 PCADIs reported at least some benefit from their traumatic experience.

Yet these results reveal more than that. They show that on average, PCADIs experience PTG at levels in line with those measured in survivors of many other forms of trauma and acute distress. While Wu et al. (2019) identified a threshold for moderate-to-high PTG at 60% of total possible scale scores, the literature review identified several studies examining PTG among bereaved individuals, survivors of accidents, especially automobile accidents, and trauma survivors whose experiences included potentially morally injurious elements, such as combat veterans and people who intentionally engaged in wrongdoing. These populations were thought to be highly relevant to the experiences of PCADIs, and their levels of PTG in the identified studies ranged from about 30% to about 50% of maximum scale scores. The results in this study found mean Posttraumatic Growth Inventory Short Form scores that fell firmly in that range, at 19.95 out of a possible 50 or 39.9% of the total maximum score, though there was a great deal of heterogeneity in the results.

In addition to finding levels of PTG similar to those of other relevant populations, this study of PACDIs found evidence to support the shattered assumptions theory and, therefore, its inclusion as a theorized mechanism of growth in PTG. Results showed that primal world beliefs of PCADIs, including the beliefs that the world is *Good*, *Safe*, *Enticing*, *Just*, and *Regenerative*, were significantly different from those of people with no histories of trauma. Only the primal *Alive* did not significantly vary between the populations. Importantly, mean primals were uniformly more negative among the PCADI group, supporting Janoff-Bulman's (2004) theory

that PTG related to psychological preparedness would leave the trauma survivor with perceptions of a more dangerous and less benign world.

These results also support the accuracy of retrospective theories of the relationship of between experiences and primals, at least with respect to experiences likely to cause extreme levels of distress, such as the trauma of having caused an accidental death or serious injury. Previous research into the role of shattered assumptions and rumination often asked respondents to report that their beliefs were challenged or that they unintentionally or deliberately ruminated on their experience and its meaning. Few studies examined the world beliefs of trauma survivors to determine if they actually differed from those of non-trauma survivors. Those studies that did often had methodological problems and other limitations. Clifton (2020) questioned whether there was enough evidence to support a conclusion that world beliefs were heavily influenced by events (retrospective theories of primals), suggesting that study results finding a relationship between trauma and *Safe* with a medium effect size ($r > .3$) would be *clearly consistent* (though certainly not dispositively so) with retrospective theories, while small effect sizes ($.295 > r > .20$) would be *weakly consistent* with retrospective theories, and $r < .195$ would be inconsistent with retrospective theories (and consistent with interpretive theories that primals influence perceptions of experiences rather than being shaped by them). As regression coefficients (β) are roughly comparable with Pearson Correlation coefficients (r), results showing that having experienced the trauma of causing accidental death or serious injury was a significant predictor of lower *Safe* beliefs ($\beta = -.26$) appear to satisfy Clifton's test for the applicability of retrospective theories to the relationship between trauma and primals among PCADIs.

However, while the differences between primals of PCADIs and non-trauma survivors support retrospective theories of the relationship between trauma and primals, correlations

between primals and PTG support interpretive theories. Results showed that the primals *Good*, *Safe*, *Alive*, *Just*, *Regenerative*, *Funny*, and *Improvable* all had significant positive correlations with PTG; only *Enticing* was not significantly related to PTG. Interestingly, *Alive*, the only primal that did not differ significantly between the PCADI and non-trauma groups, also had the strongest relationship to PTG, suggesting the possibility that it is the primal that is both least influenced by the experience of trauma (or at least the specific trauma of PCADIs) and most conducive to the development of PTG. It bears acknowledgment, here, that comparisons between the primals of PCADI and non-trauma samples and correlations between variables within the PCADI group cannot show causation (Clifton, 2020). However, the alignment between theory and findings supports the strong possibility of a causal relationship between trauma experiences and primals on the one hand and primals and PTG on the other.

Results did not support three of the hypotheses in the study. First, analyses found null results with respect to the hypothesized significant relationship between all but one of the Big Five personality traits and PTG. The exception, *Neuroticism*, had a significant negative relationship with PTG, as hypothesized. Second, the hypothesized significant curvilinear relationship between distress and PTG did not materialize in the results. In fact, neither a linear nor a quadratic relationship was found, and, to the extent there was a relationship, the negative linear relationship between distress and PTG had greater significance than the curvilinear relationship. Various studies have found relationships between distress and PTG ranging from negative, to positive, to curvilinear, to simply non-significant, and this study was unable to provide new evidence for the nature of that relationship. Finally, and most surprisingly given broad, though not complete, agreement in the literature on the relationship between social support and PTG, no significant relationship between these variables was found.

Limitations

Perhaps the greatest limitation in the study was the sample size. Despite hopes of recruiting 100 or more PCADI participants, only 63 participants gave consent for participation, and attrition on the survey meant that only 43 of them completed the entire survey. A study with a larger sample size may have found significant relationships among the variables relevant to unconfirmed hypotheses. For example, results showed positive relationships between PTG and social support, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness*, but, though all relationships were consistent with hypotheses and existing theory, none of them achieved statistical significance. A larger sample size would also permit the disaggregation of PCADIs into multiple groups so that, for example, one might compare outcomes among PCADIs whose accidents resulted in the death of someone they knew to outcomes of PCADIs whose accidents resulted in the death of a stranger.

With respect to demonstrating the veridical nature of self-reported PTG among the sample, this study was limited in that the sample did not include PCADIs' significant others who could corroborate their claims of behavior change as in Shakespeare-Finch and Barrington (2012). Corroboration from significant others would provide greater support for the conclusion that self-reported PTG reflected veridical growth in this sample.

Another important limitation of the study was its reliance on a sample of PCADIs who sought support and connection through a support group. On the one hand, this may indicate that they experienced a higher level of distress, prompting their efforts to connect with similar others, and on the other hand, it may indicate that they have engaged in support-seeking coping that may have more effectively managed their distress than other potential coping approaches. In either case (or both cases), the population may be substantially different from other PCADIs.

Also, with respect to their involvement with Accidental Impacts, the study asked about social support that participants received only in the immediate aftermath of their accidents. Given research findings showing the positive relationship between peer support and recovery from trauma (and PTG) and the PCADI sample's relationship with Accidental Impacts as well as evidence that PTG develops over time, it would have been valuable to measure current social support as part of the analysis of the relationship between social support and PTG.

Yet, asking participants to reflect on their states and perceptions at multiple time points from a single vantage point (at the time of their taking the survey) would require a lot from participants. A longitudinal study examining changes in these variables, especially changes from a time point before to a time point after the traumatic experience would present stronger evidence for many of these relationships.

Future Directions

Future research should build on the findings in this study by examining primals, PTG, and correlates of PTG among PCADIs with greater specificity—for example, several significant relationships emerged between individual primals and individual domains of PTG, and these could be examined in more depth—and with larger sample sizes and methods taking a longitudinal approach. To the extent that studies examine behavior changes to determine the extent to which self-reported PTG represents a veridical phenomenon (in PCADIs and other populations), when possible, they should seek corroboration from trauma survivors' significant others who can report their own observations of positive (or negative) changes in the survivor.

As moral injury is a relatively new construct (and a pathological response to distress caused by violations of one's moral code that has not yet been recognized by the American Psychiatric Society for inclusion in the *Diagnostic and Statistical Manual of Mental Disorders*),

and because little of the research into moral injury has examined its relationship with PTG, additional research should identify the factors that can support not only healing in those suffering from moral injury but also positive growth that may accompany it.

The same is true in the case of primals. Additional research should aim to resolve the question of when, why, and to what extent retrospective theories of the relationship between primals and experience versus interpretive theories apply. And examination of additional primals and their relationships with PTG and specific domains of PTG would help develop a more complete picture of the relationships between specific beliefs and trauma outcomes. Combining these areas of study would be worthwhile. For example, research examining the relationships among guilt, shame, moral injury, PTG, and primals could lead to some interesting and useful findings.

Yet, ultimately, this is all academic without interventions. In the case of PCADIs, Accidental Impacts is one of only two organizations providing support or services to the population (Franken & Halliwell, 2021), and, while valuable and meaningful for participants, these are limited to mutual support meetings, one-on-one peer support, and expressive writing interventions (Accidental Impacts, n.d.). While degrees of culpability vary among this population, many of them are suffering through no fault of their own, and psychology has mostly ignored their plight. Future research should aim to evaluate existing interventions for this population and develop new approaches to relieve their distress as well as support them to experience positive changes in the aftermath of their accidents.

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Appendix A: Positive Psychology and PTG

In his address to the American Psychological Association upon ascending to its presidency, Martin Seligman (1999), the father of positive psychology, lamented psychology's drift away from its original purpose of improving well-being among all people toward a nearly exclusive focus on curing mental illness. While recognizing the importance of reducing human suffering, Seligman called for the establishment of a "positive psychology" to emphasize the most positive qualities of individuals as well as the individual, group, and institutional strengths most conducive to the development of those qualities. The positive psychology he envisioned would advance an empirically-based understanding of the actions and attributes that increase well-being, flourishing, and justice to develop an inviting and comprehensible vision of "what makes life worth living" (Seligman, 1999).

The field of positive psychology officially launched in January, 2000 with the publication of a special edition of *American Psychologist*, the primary journal of the American Psychological Association (Satterfield, 2001). In their introduction to that issue, Seligman and Csikszentmihalyi (2000, p. 5) promised the burgeoning field would "catalyze a change in the focus of psychology from preoccupation only with repairing the worst things in life to also building positive qualities." At the individual level, the new field would seek to understand and explain the types of experiences people find subjectively desirable and the traits of character that contribute to thriving. At the group level, it would examine the interpersonal and civic qualities as well as the qualities of institutions that lead to flourishing and harmonious communities and societies (Seligman & Csikszentmihalyi, 2000). Positive psychology would not be unconcerned with psychological pathologies; rather, the field's founders hoped it would bolster strengths to prevent the development of mental illness in the first place (Seligman & Csikszentmihalyi,

2000). And, importantly, it would retain psychology's reliance on the use of validated empirical methods for uncovering the truth about the human experience and the cultivation of well-being (Seligman & Csikszentmihalyi, 2000).

Positive psychology rapidly developed into a substantial field of psychological inquiry. Within five years, researchers in positive psychology were publishing books, holding dozens of conferences, expanding grant opportunities and collaborations, and launching university and high school courses (Gable & Haidt, 2005). Still, the field has not been immune from criticism. Some have questioned whether the implication of the name "positive psychology" is that the rest of psychology is negative and whether the claimed need for positive psychology implies that the results of psychology's focus on relieving mental illness were unsatisfactory. However, to the contrary, rather than being unsatisfactory, the success of what might more accurately be called "psychology as usual" (as opposed to "negative psychology") in relieving human suffering served to highlight the relative lack of progress on understanding and developing interventions to cultivate the conditions and attributes that make people and communities thrive (Gable & Haidt, 2005).

A second and closely related criticism of positive psychology is that positive psychology is redundant of psychology as usual because the good life is simply the absence of suffering, and psychology as usual already focuses on reducing suffering (Seligman, 2019). Yet, the good life should be construed as more than just the absence of suffering. At best, the relief of suffering may get people to some neutral state, but that is not the same as flourishing (Seligman, 2011). As Seligman, (2019) explained, there are phenomena in our world in which the opposite of a thing is the absence of that thing. Dryness, for example, is just the absence of wetness. But there are other things that have opposites with properties that are wholly distinct from their own

(Seligman, 2019). Not being sad is not the same thing as being joyful or exuberant. Positive psychology's role is to identify and cultivate elements of well-being that have positive properties that are independent of, and therefore not achieved through the elimination of, the negative properties of their opposites. For example, positive affect, the experience of subjectively enjoyable emotional states, varies in individuals independently of negative affect. Both can be high. Both can be low. Or one can be high while the other is low (Wedderhoff et al., 2021). Increasing positive affect cannot be achieved by simply reducing negative affect.

Finally, critics of positive psychology have cautioned that the focus on positive attributes and conditions for human flourishing risks devaluing psychology's efforts to mitigate human suffering and distress and promotes a view of human existence distorted by rose-colored glasses (Gable & Haidt, 2005). However, positive psychology was never intended to deny the reality of human suffering or negate psychology as usual's focus on its alleviation. Rather, it was intended to restore balance between the focus on amelioration of suffering on the one hand and the cultivation of well-being on the other (Gable & Haidt, 2005). Recognizing that the majority of people report feeling happy and being satisfied with their lives (Myers, 2000), not only in the United States but also around the world (Diener & Diener, 1996), even in situations where we might assume they would be unhappy (Biswas-Diener & Diener, 2001), and most are not suffering from mental illness, positive psychology uses the validated tools and methodologies of social science to arrive at empirically sound observations and interventions that benefit the typical, mentally healthy person (Gable & Haidt, 2005).

The Nature of Well-Being

Positive psychology's focus on the traits, behaviors, and qualities that promote optimal functioning and subjective satisfaction with one's life are not new. Indeed, the search for

understanding of the path to human happiness is at least as old as Aristotle (Melchert, 2002). In the last century, the inquiry into the nature of human well-being continued in the work of William James through his focus on “healthy mindedness” (James & Nielsen, 1929) and the humanists’ empirical studies of self-actualization and creativity in healthy people (Moss, 2001). Over the last two decades, positive psychology has renewed, reinvigorated, and expanded the scope of this inquiry to describe the good life, identify the components of human well-being and the individual and environmental factors that influence it, and recommend strategies for cultivating flourishing. If the goal of these inquiries is the cultivation of well-being, a foundational need is to define what well-being means. Researchers and philosophers have proposed several constructs for understanding well-being, including, among others Subjective Well-Being (SWB; Diener et al., 2016), I COPPE (Prilleltensky et al., 2015), and PERMA (Seligman, 2011).

Subjective Well-Being

Ed Diener has suggested that well-being consists of a person’s subjective evaluation of their life. Subjective Well-Being represents a person’s overall appraisal of their life and evaluation of their emotional experiences (Diener et al., 2016). Components of subjective well-being include life satisfaction, (Diener et al., 2016), which can be measured using the Satisfaction with Life Scale (Diener et al., 1985), positive affect, and negative affect (Diener et al., 1985), which can be measured using the Positive and Negative Affect Schedule (Watson et al., 1988). In other words, subjective well-being consists of one’s contentment with the overall course and circumstances of their life and the frequency and intensity of positive and negative emotional experiences. With regard to the affect-related components, individuals with more positive affect and less negative affect have higher subjective well-being. Importantly, as

discussed above, positive affect and negative affect are independent phenomena. People can be high in positive affect and high in negative affect, low in both, or high in one but low in the other (Wedderhoff et al., 2021).

I COPPE

Isaac Prilleltensky and his colleagues have operationalized well-being using the I COPPE model, consisting of overall life satisfaction and interpersonal, community, occupational, psychological, physical, and economic well-being (Prilleltensky et al., 2015). Interpersonal well-being refers to satisfaction with one's close relationships. Community well-being refers to one's overall satisfaction with their community. Occupational satisfaction is one's happiness with their paid or unpaid work. Psychological well-being refers to one's emotional life satisfaction. Physical well-being refers to a person's satisfaction with their physical health and wellness. And economic well-being describes satisfaction with one's financial situation (Prilleltensky et al., 2015). The I COPPE scale is a self-report measurement of overall well-being and well-being within these six domains (Prilleltensky et al., 2015).

PERMA

Finally, building on his Authentic Happiness theory of the good life, consisting of positive emotion, engagement, and meaning (Seligman, 2004), Martin Seligman has operationalized well-being as PERMA, consisting of positive emotion, engagement, positive relationships, meaning, and accomplishment (Seligman, 2011, 2018). According to Seligman, each element contributes to well-being, is pursued for its own sake by many people, and is independent of the other elements. Positive emotions correspond to positive affect in subjective well-being and represent the experience of pleasant feelings. Engagement is synonymous with flow experiences (Seligman, 2011), subjectively enjoyable episodes characterized by effortless

attention to challenging tasks and the absence of emotion and time awareness (Csikszentmihalyi, 1990). Positive relationships represent our connections with others and their inclusion in the PERMA model of well-being recognizes that very little of what makes life worth living is solitary. Meaning in life comes from being a part of and contributing to something bigger than oneself. And finally, accomplishment consists of both episodic achievements and the dedication of one's existence to the pursuit of excellence in some realm of life (Seligman, 2011).

PTG as Positive Psychology

Though the construct predates the founding of the field of positive psychology, PTG has been considered a topic of positive psychological research (Aspinwall & Tedeschi, 2010). Given positive psychology's focus on the positive aspects of the human experience, one might wonder whether the study of PTG makes sense within the field. One might ask whether there are ways to experience growth without experiencing so much pain or how the experiences of people who have experienced such high levels of distress can count as positive.

In fact, growth does not always require the experience of traumatic suffering. Highly positive life events have been shown to contribute to personal growth. In one study, 605 adults completed a self-report measure of growth following positive events. Participants reported growth in spirituality, meaning and purpose, and positive relationships, especially following events perceived as inspiring, meaningful, or revelatory of new possibilities (Roepke, 2013). And a recent meta-analysis of findings from 122 longitudinal studies ($N = 98,436$ participants) reporting 364 effect sizes compared longitudinal evidence of PTG and postecstatic growth and found no significant difference between growth following traumatic or ecstatic events (Mangelsdorf et al., 2019). The meta-analysis certainly had its limitations. There was a dearth of available qualifying studies of positive experiences for many outcome variables. For example,

only one included study measured meaning in life after positive life events, and none measured spirituality (Mangelsdorf et al., 2019). And many studies had methodological problems, for example, controlling only for the specific experiences being studied rather than for all traumatic or ecstatic experiences, that would make it difficult to compare results across studies (Mangelsdorf et al., 2019). The study also found that negative events led to more positive growth in social relationships than positive events (Mangelsdorf et al., 2019). Even considering these limitations, it seems likely that highly positive experiences may lead to growth.

There are also ways to grow from suffering without experiencing the acute distress of trauma. Chosen suffering in pursuit of meaningful goals may be a more desirable source of well-being (Bloom, 2021). Purposeful suffering for the achievement of a goal, for example, can be an important source of meaning and accomplishment in a person's life (Bloom, 2021). While Roepke (2013) and Mangelsdorf et al. (2019) do not claim that the existence of post-ecstatic growth makes PTG unworthy of study, Bloom denies the existence of PTG altogether, stating that "I don't buy any of this" (Bloom, 2021). Yet, Bloom appears to make the case for PTG when he points to the experiences of Holocaust survivor and psychiatrist Viktor Frankl as well as people living in poverty as examples of suffering's relationship with meaning and when he subsequently shares strong evidence that trauma is associated with greater resilience and altruism. Surely neither of these experiences qualifies as a chosen form of suffering.

Bloom (2021) suggests avoiding unchosen suffering in favor of chosen but meaningful forms of suffering. Most people would prefer to avoid unchosen suffering if they could—being unchosen, by definition, suggests this type of suffering is something outside of one's control. Painful and stressful experiences and trauma are part of life, and a complete evaluation of their

effects requires examining not only their harmful consequences but also their benefits. But does that mean that these studies belong in the field of positive psychology?

After all, positive psychology is concerned with helping humans to thrive (Seligman & Csikszentmihalyi, 2000), and the field is perhaps most distinct from psychology as usual when it examines how positive experiences, states, and situations lead to positive outcomes (Pawelski, 2016). Yet, while strengths, virtues, and conditions that contribute to well-being in individuals, groups, and institutions are worthy of study for their own sake, they are also among the things that can prepare people for and buffer against distress and mental disorder (Gable & Haidt, 2005). Conversely, painful experiences like trauma may help people build the strengths and behaviors that contribute to well-being (Wong, 2019).

The reality is that in some circumstances, qualities and experiences that are generally considered to be positive can be counterproductive and those that are generally considered to be negative could be adaptive (Lomas & Ivtzan, 2016). For example, excessive or misplaced optimism can lead to unwise risk taking, while anger at injustice could motivate someone to take action to correct it. When we love someone, we may miss them in their absence or experience intense grief if they die. If we relentlessly pursue accomplishment, we risk damaging our relationships or physical health. We may not understand pleasure as well without the experience of suffering. And indeed, research into posttraumatic growth and related phenomena suggests that for many people, trauma and suffering may be key ingredients that ultimately improve their well-being. The line between the negative and the positive is not always clear, and it is often porous. While ecstatic experiences and experiences of chosen but meaningful suffering may lead to gain without real pain, positive psychology should never ignore the potential for growth after extreme adversity or its contribution to human flourishing.

Appendix B: PTG Behavior Change Open Responses

Below are unedited responses to the optional open-ended PTG Behavior Change prompt: “Please share any specific examples of the changes to which you responded "yes" above.”) at the end of the PTG Behavior Change scale.

- Most of the statements above are true to some degree, but in my case, I don’t relate this to my accident.
- Verbally expressed gratitude to friends and family more. Engage in challenging mental activity of intensive therapy. New interests of safety in everything and every situation and psychology and philosophy. I appreciate the little things more when I can and I’m not experience intense apathy for life in general. My spirituality has turned into multiple existential crisis' one after the other, and I have currently settled on being agnostic with accepting that as humans we will never a scientific answer as to how everything works.
- Since the accident happened 30+ years ago, my entire existence is drastically different than it was as a teenager.
- Got my priorities straight, realized how delicate life is and how quickly and suddenly it can end. Realized that my actions can affect people around me that I don’t even know...
- I changed career paths after my accident and started graduate school
- I know more than most people how quickly death can come and how ugly it can be. I can’t afford to only experience joy in momentous occasions. I try to make myself love the little things too just in case my life turns out to not last as long as I would hope.
- I don't think I do these things more. I have been doing this since I was harassed at work before the accident. And sometimes I have a cycle in my head deciding whether or not it

is my fault or the other drivers, but on paper it is their fault. I have not been religious since I was a small child.

- I slowed down and learned to appreciate the moments. I had already shown love to my friends and family. What changed was how I treated myself. I made my needs a priority for the first time on my life. Reconnected with my spiritual principals.
- I realized it's important to recognize and be grateful for the simplest things in life and never to take anything for granted. I realized that we have no control over what happens in our lives. All we can do is guide our future and the rest is decided for us.
- I completely lost my faith after the accident.
- I appreciate that my family was there for support, even though the victim's family has never located or contacted me.
- I found yoga after the accident & it helped me to heal. I started teaching but was in constant fear someone would find out about the accident. It gave me anxiety every time I would teach & eventually quit bcuz the anxiety was overwhelming
- I am more closed off to others post accident & have a hard time being content or comfortable around others as if they can't relate to who I am post accident.
- I've always showed people I care and love them. I've always been the responsible one people rely on too. I've always appreciated little things in life. An accident involving alcohol and a death, didn't change those things. I have since the accident added more mental challenges as I face legal problems and looming prison sentence. I have become more religious.
- This entire survey, the questions and how I persevered myself now compared to before, show how devastating and life changing this has been. I have many "before and after"

events in my life and only one of those events has completely changed my faith in life and the world. One event that Has made me fearful, lonely, afraid yet resilient and protective for myself.

- Being acutely aware of how quickly life can change, or be taken away, makes pursuing your interests and curiosities a no-brainer. The perspective that comes with a serious accident and death also offers perspective about fear (in that most of the things we fear aren't really all that scary at all).
- I don't know if I 'show' them but I know that when I see people I love now I cry with sheer emotion of love whereas I didn't before. I appreciated the small things in life before regardless & still do again. And I lost my spirituality because of the accident and believe nothing now. I just bought longer believe there is a point to anyone's life. Nothing matters. My accident was within the last 6 months.
- Family - I definitely spend even more time with them and I am constantly reminding them how much they mean to me and how grateful I am for their assistance and support throughout this endeavor. Mental/Physical - I have always been very active in both aspects. The accident has added a whole new layer of what I would call challenging mental or physical activities. It is a lot of work to dress up, show up and be present. That in it and of itself can be difficult at times since the accident. I do not have the physical strength or energy as I did pre accident but I am getting there. New Interests - Yes, I have because I have changed my environment. I moved into my own house and out of a shared house with my ex boyfriend, I am now interested in DIY projects and have gotten more invested in reading. Small Things - I believe that I always took time to stop and smell the roses. But I think now I allow myself to get lost in the present moment since the

future is uncertain and difficult. I will allow myself the opportunity to get lost when I would have hurried myself along faster pre accident. Spirituality - I have always been a spiritual person in some regard but I think since the accident I realized that God put this in my life for a reason. The other people I was with the night of the accident would have lost their children or a parent as a result or my other friend would have lost his green card. So I realize that this needed to happen to me and that how God made me, I can do something with this accident to make the world a better place. I think I am more confident in how God made more so than before.

- I graduated college a couple weeks after my accident. I originally intended to go to a research-focused graduate program for counseling, but ended up going to a much more relational program, and this change was directly influenced by my accident. It has led to work that requires a higher capacity for emotional transparency and vulnerability, rather than the behavioral approach I was previously fond of. Since, I have also gotten back into reading and writing, with a particular love of fantasy and science fiction.

Contemporary/literary fiction feels both too boring and too real.

- I have always showed family and friends that I cared for them but now I show it more verbally. I now do more mental research on how the brain works and what can help me cope with life since the accident. I now appreciate the smaller things in life such as just meeting with friends and family for small social things rather than have to make bigger plans.
- Recording saxophone music, chaplaincy, cherishing my family members

- These questions seem to apply more to those who had an accident in the last 10 years or so. Mine was 42 years ago. Many other events have changed my life since my accident. So it's difficult to apply these statements solely to my accident.
- I now sit on the board of an accidental harm non profit as a result of my accident and I regularly talk to others about this. I also write frequently on this topic.
- I've taken up new interests since the accidents, but I wouldn't then conclude that the accident had anything to do with that. My accident was over 20 years ago, so time might be a larger factor. I appreciate the smaller things in life as a result of the accident, because I've seen how fast a life can be taken, so just waking up each day is something to appreciate; Everything else is just icing on top.
- I started calling my mom more often after the crash, and I returned to church after a decade of not attending. I was never an athlete, but I took up running and completed a half marathon. I slow down to see beauty in my environment whenever possible.
- My husband's care and patience after the accident and through litigation inspired my greatest loyalty and care in return. He helped me find courage and to live again. I also slowed my life down to appreciate little things, passing moments, nature in news ways as an exercise in self care & anxiety reduction.