Traumatic Stress and Positive Growth Amidst the COVID-19 Pandemic

By

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Abstract

It is important to understand how people respond to catastrophic events and crises. The Novel Coronavirus (COVID-19) outbreak introduced widespread concern for impacts on mental health and wellbeing during and beyond the pandemic. Traumatic experiences result in numerous outcomes for people, including potential, positive changes in development and functioning. However, extant literature has not examined the relationship between indicators of negative and positive adaptation following trauma, nor has the literature delineated the mechanisms of action that drive these changes in people during chronic, traumatic events. This observational, cross-sectional study included a sample recruited from Amazon Mechanical Turk (MTurk) and the University of Kansas psychology subject pool. Retrospective data were available for 166 participants who completed a one-time, online survey for monetary compensation or course credit. Participants reporting higher levels of externally oriented (e.g., chance, powerful others) and spiritually oriented (e.g., God, higher power) control beliefs experienced more traumatic stress symptoms when thinking about their COVID-19 experiences. Traumatic stress symptoms and rumination were associated with positive growth scores in the expected directions. Interaction terms investigating health-related control beliefs as buffering effects on the relationships between rumination and positive psychological adaptation were non-significant. Results of these analyses are presented with conclusions, limitations, and recommendations for future investigations and clinical support.

Keywords: traumatic stress, positive psychological adaptation, COVID-19, pandemic

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Introduction

The Novel Coronavirus (i.e., COVID-19) outbreak was designated as a pandemic (i.e., global transmission of a new disease) by the World Health Organization (WHO), with the first case reported on December 31, 2019 in Wuhan, Hubei Province, People's Republic of China (World Health Organization [WHO], 2020b). COVID-19 was first considered an epidemic given the rapid increase in documented cases in China, and the number of cases has drastically increased since that time worldwide and within the US. The US President declared COVID-19 a national emergency as of March 1, 2020 (The White House, 2020). As of June 8, 2020, the Centers for Disease Control and Prevention (CDC) reported nearly two million cases and about 110,000 deaths due to COVID-19 related causes (Centers for Disease Control and Prevention [CDC], 2020a), making COVID-19 a traumatic event on a national scale. Exposure to other national, traumatic events, like the 2001 attacks on the US World Trade Center (WTC) and Pentagon, has been associated with increased risk for the development of Post-Traumatic Stress Disorder (PTSD) (e.g., Neria et al., 2011). Although there has been extensive research on the negative mental health consequences following a traumatic event, such as the attacks on the WTC and Pentagon, little is known about people's mental health and wellbeing during an ongoing, traumatic event (e.g., COVID-19 pandemic) that represents chronic threat and uncertainty.

Given the nature of the COVID-19 outbreak, there have been widespread concerns about the impact of COVID-19 for mental health. For example, isolation and limited social connection may be concerning for the development of depressive symptoms during and after the COVID-19 pandemic (Fiorillo & Gorwood, 2020). There is additional concern for "essential" workers, such as healthcare professionals exposed to critical illness and death due to COVID-19. Healthcare

professionals caring for COVID-19 patients may also experience moral injury, a concept that describes "distress that results from actions, or lack of them, which violate someone's moral or ethical code" (as cited in Greenberg et al., 2020). Given these concerns, it is important to understand the way in which people have responded to the COVID-19 pandemic, as well potential predictors of these responses.

Studies of responses to natural and man-made disasters mirror the field of clinical psychology, which has typically focused on psychopathology, the study of mental illness and its associated factors. For instance, previous investigations have examined risk for PTSD after the 2001 attacks on the WTC and Pentagon (Neria et al., 2011; Schlenger et al., 2002), symptoms of depression and PTSD in survivors of Hurricane Katrina (Mcleish & Del Ben, 2008), and prospective relationships between coping, social support, and combat-related PTSD in Israeli soldiers (Solomon et al., 1988). Much of this knowledge comes from studies of groups in the aftermath of traumatic events, such as months or years after man-made and natural disasters (Mcleish & Del Ben, 2008; Neria et al., 2011; Schlenger et al., 2002). However, less is known about people's mental health and wellbeing during global pandemics that represent ongoing threat and uncertainty (i.e., COVID-19).

Martin E. P. Seligman (re)introduced psychologists to "positive psychology" during the late 1990s, a movement which argues for a research emphasis on positive emotions and functioning. Thus, positive psychology compliments, but does not replace, the field's knowledge of mental illness and provides a more complete picture of the human experience throughout life (Seligman et al., 2005). As such, the integration of the trauma and positive psychology literature bases has provided the field further knowledge as to how humans move forward in positive directions after exposure to traumatic circumstances (Helgeson et al., 2006). For example, extant

literature on positive psychology documents studies of adult natural disaster survivors (Tang, 2006), longitudinal assessments following the 2001 terrorist attacks in the US (Butler et al., 2005), and Polish residents after the 1997 flood (Pelphrey, 2004). Much less is known about positive psychology during global, viral outbreaks. As such, the current study aimed to further understand risk for PTSD, the potential for positive psychological adaptation, and the relationship between these variables amidst the COVID-19 pandemic in the US.

Background

Historical records document numerous epidemics and natural disasters on the North American continent dating back to the 17th century. These include smallpox (1633-1634), yellow fever (1793), three waves of cholera (1832-1866), waves of scarlet fever (1858), the influenza (H1N1; 1918) pandemic, and the Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) pandemic (1980s-present) (Healthline, 2020). Moreover, during the 2010s, the US experienced 119 natural disasters that resulted in at least one billion dollars in damage, thousands of deaths, and community disruption for extended periods (NOAA National Centers for Environmental Information, 2020).

Unlike the COVID-19 pandemic (at the time of data collection), at least some of the previous epidemics and pandemics had established treatment regiments, dedicated immunizations (or variolation), or both. Scientific and medical experts have made progress with COVID-19 treatment regimens, though there remains uncertainty as to when and how accessible a vaccination against COVID-19 infection might be available, for example. While there are now clinical trials investigating treatment regimens to slow disease progression and reduce mortality rates (WHO, 2020a), the most recent information suggests efforts to deliver an effective and safe vaccination are a major undertaking for global research institutions without a clear timeline for

availability (WHO, n.d.). While it is clear that the efforts to combat COVID-19 are ongoing, extant literature has documented the various ways in which society has responded to crisis situations, such as disease outbreaks. This literature suggests that responses to a traumatic event depend on a number of factors, including location of the crisis, type of event (e.g., viral outbreak, natural disaster), and assessment methods of crisis responses (Perrin et al., 2009).

It is important to note that extant literature has also documented influential factors for psychological responses to traumatic events, such as mental health outcomes in response to a pandemic. Perrin and colleagues (2019) documented the following factors as related to outcomes: low levels of emotional and social support, lower income and educational attainment, identifying as female or elder age status, residence in a region with high disease prevalence, time spent in isolation from significant others (e.g., family) due to quarantine, having a significant other or acquaintance infected with the virus or spending time in the same location (e.g., home or healthcare campus) as those infected with the virus, and uncertainty about the disease and outbreak. Moreover, individual responses can change over the course of time and in relation to the source of a disease outbreak (Perrin et al., 2009). Despite these findings, not all people exposed to traumatic circumstances experience clinically significant symptoms of or meet criteria for a trauma-related diagnosis. Additionally, it would be important to identify psychological variables that could predict who might be vulnerable to psychological distress. Given that one characteristic of traumatic events is loss of control, it is critical to address this factor as one related to maladaptive, psychological outcomes in various populations. Loss of control has been correlated with indicators of adverse mental health outcomes, such as traumatic stress symptoms, in groups of prisoners (Dekel et al., 2011) and people living with HIV/AIDS (Olapegba, 2005).

Despite advancements in understanding responses to natural disasters, viral outbreaks, and other crisis situations, extant literature is limited in several ways. First, previous research has focused on psychological symptom profiles in the aftermath of the trauma, with assessments often months or years beyond the endpoint of the event(s). Very little research has studied the way in which people adjust to a viral outbreak amidst a pandemic or disaster. Second, extant literature has investigated psychological adjustment after viral outbreaks that have extensive, documented knowledge surrounding treatment, prevention, and mortality. Thus, previous research has not focused on responses to global, viral outbreaks with limited research and curative knowledge. Lastly, while extant literature has documented the impact of perceived loss of control in maladaptive mental health outcomes, it is unclear how health-related beliefs about control impact psychological responses to a pandemic.

Trauma and Positive Psychology

Although extant literature documents cases of maladaptive health and functioning in response to trauma, it has become apparent that people also experience growth as a result of their experiences. In the last few decades, areas of scientific study within psychology have shifted from investigations of negative outcomes to include a focus on adaptive and positive ways of adaptation (Helgeson et al., 2006). Extant research uses multiple terms, often interchangeably, to describe the nature of growth following trauma including *posttraumatic growth, finding benefits* or *benefit finding*, and *thriving*. Moreover, some researchers refer to these positive changes as *adversarial growth* (Linley & Joseph, 2004) and *stress-related growth* (Park et al., 1996). With an aim to begin the use of clear and consistent terminology, the current study chose to use the term *positive psychological adaptation* to refer these perceived, positive changes following trauma. However, much of the literature has focused on and operationalized positive growth by

including a widely used and validated measure – the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). Using the PTGI, there have been reports of perceived changes in one or more of the following domains: 1) increased strength of interpersonal relationships, 2) positive changes in one's own abilities (e.g., personal strength), 3) increased spiritual development, 4) alterations in life goals and re-prioritization (i.e., life appreciation), and 5) a new or altered perspective or philosophy for life (Tedeschi & Calhoun, 1996; Tedeschi & Calhoun, 2004). In sum, investigations of positive psychological adaptation showcase the ways in which people perceive they change across one or more domains as a result of exposure to a traumatic event(s) or circumstance(s) (Tedeschi & Calhoun, 2004).

Positive Psychological Adaptation Across Populations

Despite the early stage of this research, evidence of this construct has been shown in a number of populations, including documented posttraumatic growth (PTG) in adult survivors of natural disasters (Tang, 2006), refugee children in response to the migration process (Measham et al., 2014), and samples of people who participated in longitudinal studies following the terrorist attacks on September 2001 (Butler et al., 2005). Within the medical field, studies have documented positive psychological growth in breast cancer in South African women (Bremer et al., 1997), mothers of children newly diagnosed with cancer (Barrera et al., 2004), and bereaved parents (Polatinsky & Esprey, 2000). However, much less is known about positive psychological adaptation in people exposed to other types of traumatic events, such as natural disasters and global, viral outbreaks.

Construct Specificity

Positive psychological adaptation has been confused with the construct of resilience; however, they are distinct. Resilience refers to a person's 1) perception of the potentially

adversarial event and 2) their subsequent ability to return to their previous level of functioning following the event (Rossman et al., 2017). Drawing from Piaget's theory of cognitive development, resilience maps onto the concept of assimilation in that people, including those exposed to trauma, utilize a preexisting schema (i.e., mental representation of the world) to "bounce back" to their pre-trauma baseline level of functioning (Huitt & Hummel, 2003). In contrast, positive psychological adaptation is proposed to occur when a person not only survives the event, but also reports perceived improvements in their development and functioning, in one or more domains, that surpass their abilities prior to the event (Tedeschi & Calhoun, 2004). Accordingly, it best represents the process of accommodation from Piaget's theory (Huitt & Hummel, 2003), such that people struggle with their new reality, assumptions, and understanding of the world in the aftermath of a traumatic event. As such, people exposed to trauma must "rebuild" their reality and incorporate input from their environment in order to adapt to life after the experience of traumatic conditions and to achieve an improved level of functioning. These processes have also been compared to an earthquake, including the "seismic" nature of trauma and the "rebuilding" needed to adapt amidst the rubble (Calhoun & Tedeschi, 1998). Similarly, confusion may arise around the difference between positive psychological adaptation and coping.

Positive changes have more often been modeled as an outcome, rather than a process within the literature. Coping refers to the set of processes used to adapt in response to trauma, such as benefit finding or sense making (Affleck & Tennen, 1996). Previous studies have highlighted the importance of specific, approach-based coping strategies for disaster survivors, including communal coping (i.e., shared efforts to managing distressing circumstances within a social network) (Afifi et al., 2012), practices or traditions based in religion, spirituality, or culture (Ekanayake et al., 2013), and benefit finding for psychological distress in a sample of

women living with HIV/AIDS (Siegel & Schrimshaw, 2007). In contrast, positive psychological

adaptation is proposed to be an outcome of coping processes (Tedeschi & Calhoun, 2004).

Although some researchers conceptualized growth as a coping mechanism following exposure to

a traumatic event (Affleck & Tennen, 1996), more recently coping has been modeled as

predictive of growth for specific groups of disaster survivors, such people affected by an

earthquake and volcano eruption (Akbar, 2014) or seasonal cyclones (Pooley et al., 2013). In

part, the distinction between positive psychological adaptation and coping may be a function of

differences in theoretical modeling. However, it is important to note that most studies have

utilized correlational analyses, which impacts the ability to determine causal pathways and make

conclusions.

Discriminant Validity

Based upon the conceptualization of positive psychological adaptation, it is important to

address the question of whether it represents an independent construct or merely reflects that the

trauma has ended, or the perceived threat has subsided. The discriminant validity of this

construct is supported by the presence of positive psychological changes in people exposed to

grief and loss as a result of a natural disaster. For example, one study showed that people with

high levels of trauma exposure (e.g., threat to their own and significant others' safety and

livelihood) demonstrated significantly higher levels of stress-related growth across multiple

growth domains in the aftermath of the 1997 flood in Poland (Pelphrey, 2004). It appears that

people with high levels of traumatic exposure may also perceive positive growth despite their

loss(es). These results also mean that survivors of disasters (both natural and human-made) may

experience positive changes in their functioning and beliefs as their surroundings improve (e.g.,

physical damages are repaired) despite their loss(es). However, at this time, additional research is

needed to further support the validity of positive psychological adaptation in populations of disaster survivors and victims of other traumatic events.

Finally, it is necessary to provide a brief discussion on whether or not positive psychological adaptation is a distinct construct or simply the opposite of negative adaptation. Research investigating the concurrent experience of indicators of distress and positive psychological growth has provided support for discriminant validity. Although Tedeschi and Calhoun (2004) proposed that positive growth and distress could be positively related, empirical studies examining the relationship between psychological distress and positive psychological growth is limited, and the quantitative evidence is mixed. For example, one study used a cross-sectional research design to examine the relationship between psychological distress (i.e., depression and posttraumatic stress symptoms) and PTG and found no significant relationship between these variables in breast cancer survivors. Survivors and control participants reported similar mean levels of depressive symptoms, but the breast cancer survivors also reported higher levels of PTG when compared to the healthy controls (Cordova et al., 2001). Similar results were seen in other cross-sectional studies of self-reported traumatic stress symptoms and PTG in people exposed to war in Yugoslavia (Powell et al., 2003) and an internet sample of mothers (Sawyer & Ayers, 2009). However, evidence for an inverse relationship between psychological distress and PTG was documented in samples of sexual assault survivors. In this longitudinal study, at 12 months post-assault, higher numbers of perceived positive changes (e.g., spirituality, relationships) were related to lower, concurrent levels of depression (Frazier et al., 2001). These data seem to indicate that for some people, positive growth and negative adaptation (e.g., symptoms of depression or PTSD) occur contemporaneously, and the data also provide support

for the potentially independent or unrelated nature of these constructs (Tedeschi & Calhoun, 2004).

The Relationship Between Traumatic Stress and Growth in Disaster Survivors

Although there is some research examining the co-occurrence of traumatic stress symptoms and positive psychological adaptation, the breadth of the literature is quite limited and quantitatively mixed. A recent study examined the relationship between clinical outcomes and PTG in a sample of young survivors of an earthquake in Italy and found that respondents with moderate levels of depression also report perceived growth two years after the event (Bianchini et al., 2017). Similarly, in a study of people exposed to terrorism in Israel, higher levels of perceived psychological benefits (e.g., hope, intimacy with friends, family, etc.) were positively related to greater reports of psychological distress, specifically depressive and posttraumatic stress symptoms (Hobfoll et al., 2006). A significant, positive association between traumatic stress symptoms and positive growth, measured by the PTGI (Tedeschi & Calhoun, 1996), was also found in a sample of young adults exposed to chronic, armed conflict in Kashmir (Bhat & Rangaiah, 2016). The co-occurrence of positive growth with distress emphasizes that the experiences of positive psychological adaptation as a result of exposure to traumatic circumstances "does not put an end to distress in trauma survivors" (p. 13, Tedeschi & Calhoun, 2004). For some people, persistent distress may actually facilitate the process and maximize positive changes in the aftermath of the trauma (Tedeschi & Calhoun, 2004).

Other studies investigating the association between psychological distress and positive psychological adaptation in disaster survivors have not found significant associations between these variables. In a cross-sectional study, researchers found psychological distress significantly decreased when participants reported higher levels of positive factors such as resilience,

gratitude and life satisfaction, though the association between traumatic symptoms and PTG was not statistically significant in this sample of police officers after Hurricane Katrina (McCanlies et al., 2014). Given the mixed nature of the findings in various populations, there is not a clear picture of these relationships.

Rather than a linear relationship, it is possible that a curvilinear relationship might best explain the association between traumatic stress symptoms and positive psychological adaption. Although some previous attempts in health populations have found mixed results (Colville & Cream, 2009; Morris & Shakespeare-Finch, 2011), the potential for a curvilinear association between indicators of positive and negative adaptation in disaster-related samples has not been explored within research to date. An investigation of this nature is warranted given support from a recent meta-analysis which documented a moderately-strong, curvilinear relationship between symptoms of traumatic stress and positive growth across numerous samples of people exposed to traumatic events, such as personal illness, military and non-military conflict, natural disasters, sexual assault, and experiences within helping professions (Shakespeare-Finch & Lurie-Beck, 2014). In summary, no studies to date have investigated the cross-sectional relationship between traumatic stress symptoms and positive psychological adaptation during a pandemic, which limits the ability to draw conclusions about discriminant validity, including the potentially independent nature of negative and positive changes during and following trauma, in this population.

Trauma and Positive Psychology: Mechanisms of Action

In addition to the relationship between traumatic stress symptoms and positive psychological adaptation during a pandemic, it would be important to understand the predictors of both negative and positive psychological functioning. In particular, it would be important to

examine the role of control beliefs because they are central to theories of both traumatic stress responses and positive psychological adaptation. The following sections review evidence for the investigation of negative and positive functioning at multiple levels.

Social Cognitive Health Beliefs

Locus of control (LOC) is a construct thought to be related to positive and negative psychological functioning after an acute or chronic, traumatic event. LOC refers to a person's perception of the forces controlling outcomes of events in their life. This is an important factor to consider in trauma research given that one of the defining characteristics of most traumata is loss of control over the situation(s) (e.g., war, terrorism, natural disasters, assault, etc.). Feelings of lack of control and uncertainty have been reflected in research about responses to traumatic events, such as natural disasters and viral outbreaks.

Extant literature explored associations between domains of LOC beliefs and psychological distress in various groups of traumatized individuals. In fact, in a study of respondents from Greece exposed to wildfires, a significant association between externally oriented LOC beliefs and higher levels of psychopathology indicators was found for respondents from damaged areas compared to respondents from non-damaged areas (Mellon et al., 2009). Other investigations have taken a prospective approach. For instance, a group of investigators assessed the association between internal LOC beliefs and PTSD severity two to three years after combat exposure and found that veterans reporting more internally oriented LOC beliefs experienced less severe PTSD symptomology years later (Solomon et al., 1988). In fact, there are a number of studies linking external LOC beliefs – forces, resources, or factors related to the event outside the person's control (e.g., chance/fate, other people) – and higher levels of psychological distress in various groups: people who have experienced spinal cord injuries

(Shadish et al., 1981), people with chronic pain (Crisson & Keefe, 1988), and firefighters (Brown et al., 2002). These results are consistent with the hypothesis that "victims of fate" do not fare as well as those with internally oriented LOC beliefs after trauma (Rotter, 1966). However, much less, if anything, is known about the role of LOC within people exposed to a global, viral outbreak.

Tedeschi and Calhoun's (2004) theoretical model of positive growth, specifically PTG, broadly reflects process level variables as responsible for the outcomes documented in survivors. However, it is also possible that people's experiences of positive psychological adaptation are related to their LOC beliefs pertaining to potential infection during a pandemic. Drawing from Rotter's (1954) social learning theory, people's behavioral responses depend on individual characteristics and the environment. As such, it may be that a global, viral outbreak challenges or alters people's LOC beliefs (Brown et al., 2002; Crisson, & Keefe, 1988; Mellon et al., 2009; Shadish et al., 1981; Solomon et al., 1988).

A domain-specific variant of general LOC, health-related locus of control (HLC) would be most likely to be relevant for people exposed to a pandemic and refers to a person's beliefs about who or what forces determine their health outcome(s). Health-related locus of control has been shown to be multidimensional in nature (MHLC), such that people not only credit outcomes to internal factors, but also other people (e.g., doctors, powerful others) and chance or fate (Wallston et al., 1994; Wallston et al., 1978). MHLC correlates with psychosocial functioning in a number of health-related contexts (Wallston, 2005), such as adherence to type 2 diabetes medical regimens (O'Hea et al., 2005) and adjustment in women with high-risk pregnancies (Eswi & Khalil, 2012). There is limited evidence about how MHLC relates to psychological outcomes in the context of a pandemic. However, Siegel & Schrimshaw (2007) investigated the

influence of perceived control over health status via internal (i.e., self-control) and external (i.e. powerful others, healthcare professionals, chance) LOC beliefs in a sample of women living with HIV/AIDS. In this study, the results suggested that women with stronger perceptions of their health status being a result of chance experienced significantly higher levels of anxiety and marginally significant, increased levels of depressive symptoms. However, perceptions of control over health status due to internal control or powerful others was not significantly related to the level of anxiety or depressive symptoms or positive affect in this sample (Siegel & Schrimshaw, 2007). These significant findings are consistent with multiple hypotheses about poorer outcomes for individuals with externally oriented LOC beliefs exposed to disaster situations (Rotter, 1966), as well as documented relationships in extant literature (Gibbs, 1989).

Although the most commonly used form of the MHLC scale includes three subscales (internal, chance, and others/powerful others) (Wallston et al., 1978), a less well known form of the scale uses a fourth subscale which assesses the perception that God or a higher power determines health outcomes or disease state (Wallston, 2005; Wallston et al., 1999). Research to date, while limited, has emphasized the importance of disaster survivors' and traumatized persons' religious or spiritual worldviews in various groups of people: Beverly Hills Supper Club fire survivors (Green et al., 1985), survivors of the 1978 cycle in Sri Lanka (Patrick & Patrick, 1981), and flood victims (Ollendick & Hoffman, 1982). Belief in a higher power may be especially important for victims and survivors dealing with the uncertainty associated with a disaster or traumatic event (as cited in Gibbs, 1989). Collectively, these data emphasize the importance of understanding how MHLC impacts psychological outcome, which has not been a focus of research to date.

Cognitive Processes and Positive Psychological Adaptation

In addition to the importance of control beliefs, it would also be imperative to consider process level variables as theoretical mechanisms of action which result in positive changes after trauma. Unfortunately, many of the studies that have examined predictors of positive psychological adaptation do not further the field's theoretical understanding of these processes. Tedeschi and Calhoun (2004) proposed a model of PTG that includes cognitive processing, which suggested that people 1) experience changes in one or more domains of their life as they move forward from the traumatic event(s) and 2) utilize cognitive processes to foster these changes in development and functioning. More specifically, the authors recognized that cognitive processing might involve some type(s) of ruminative (i.e., event-related) thought which might or might not be focused on goal attainment or problem-solving. Although there is a wealth of evidence that rumination (i.e., the focus of the repeated thoughts) is related to cognitive distress and depression, there is also evidence that trauma-related, ruminative thought may serve a different and positive psychological function (Tedeschi & Calhoun, 2004). For instance, there have been a handful of studies, some published about two decades ago, that showed a positive relationship between rumination and positive psychological adaptation in various health and non-health populations (see Calhoun et al., 2000; Tedeschi & Calhoun, 2004). No published studies have attempted to validate this model as a way to further the field's understanding in a sample people exposed to a global pandemic, a vulnerable and under-studied population.

Health Beliefs, Cognitive Processes, and Positive Psychological Adaptation

In order to lay the groundwork for understanding the social cognitive antecedents of traumatic stress symptoms and positive psychological adaptation, the current study focused on a cross-sectional assessment of control beliefs and rumination on traumatic stress symptoms and positive psychological outcomes for a sample of people exposed to an ongoing, global pandemic.

Based on theoretical propositions (Tedeschi & Calhoun, 1996) and the importance of the consideration for health beliefs and cognitive processes, the current study utilized theory-based models including assessment of rumination (see Figure 1 model 1) and MHLC domains (see Figure 1 model 2) to determine the role of these variables in the development of perceived, positive growth in this population.

Summary

Extant literature demonstrates the importance of a number of factors in determining people's responses to traumatic and catastrophic events. Research thus far has mostly focused on natural disasters, including those that have occurred across extended periods of time (e.g., Hurricane Katrina). However, less is known about psychological status during global pandemics with ongoing threat and uncertainty, as well as high levels of media coverage paired with limited knowledge. Moreover, even less is known about positive psychological responses during global, viral outbreaks. As a result, the current, cross-sectional study aimed to further understand risk for PTSD, potential for positive psychological adaptation, and the relationship between these variables in a sample of US community members and undergraduate students amidst the novel coronavirus (COVID-19) pandemic.

This project was also designed to extend the literature in a second way by testing a theoretical model of cognitive process level and health-related, control belief variables as they relate to positive and negative indicators of psychological adjustment. In doing so, the current study aimed to further the field's understanding of traumatic responses to the chronic and stressful nature of the COVID-19 pandemic. As such, the current study examined multiple levels of predictors for both traumatic stress symptoms and positive psychological adaptation. The hypothesized mechanisms of action for both processes were studied based on two, theoretically

based models (see appendix C). Model 1 examined the influence of social cognitive health beliefs (e.g., MHLC) on traumatic stress symptoms and positive psychological adaptation, potentially modifiable process level factors (i.e., rumination) on positive psychological adaptation, and the relationship between traumatic stress symptoms and positive psychological adaptation. Model 2 examined the interactive effects of MHLC domains and rumination on positive psychological adaptation. To the author's knowledge, this is the first scholarly work to address these limitations and questions within this specific domain of positive psychology.

For context, at the start of the data collection period (May 19, 2020), the US had 23,405 new COVID-19 cases per day with a seven-day average of 23,453 cases per day (see Figure 2) (CDC, 2020c) and 1,520 new deaths per day with a seven-day average of 1,362 new deaths per day (The New York Times, 2020a). However, at the end of the data collection period (June 30, 2020), the US had 43,644 new cases per day with a seven-day average of 41,180 new cases per day (see Figure 2) (CDC, 2020c) and 1,300 new deaths per day with a seven-day average of ~520 new deaths per day (The New York Times, 2020a). Finally, during this period, the CDC documented an increase in the number of hotspot counties in the South, Midwest, and West regions and a decrease in the number of hotspot counties in the Northeast region (Oster et al., 2020). A visual representation and timeline of events related to the COVID-19 pandemic and the current study's data collection period is presented in Figure 3.

Aims and Hypotheses

Aim 1

The first aim of the current study was to examine MHLC domains as a correlate and shared predictor of traumatic stress symptoms and positive psychological adaptation. The first aim was also to investigate differences in positive psychological adaptation scores by internal

and external HLC domains. Based on previous research (Rotter, 1966), it was hypothesized that internal HLC scores would be negatively related to traumatic stress symptoms (PCL-5 scores) and external HLC scores would be positively related to traumatic stress symptoms (PCL-5 scores). It was anticipated that spiritual HLC scores would be positively related to traumatic stress symptoms (PCL-5 scores) given prior research that documents significant, positive relationships between spiritual HLC scores and negative affect (Wallston et al., 1999). Based on previous research in medical populations (Zarin et al., 2017), it was hypothesized that participants with higher levels of internal HLC scores would report greater positive psychological adaptation (PTGI scores) compared to people with higher levels of external HLC scores (i.e., chance/fate, powerful others, God/higher power).

Aim 2

The second aim of the current study was to characterize the relationship between traumatic stress symptoms and positive psychological adaptation. A positive association between traumatic stress symptoms (PCL-5 scores) and positive psychological adaptation (PTGI scores) was hypothesized based on the theoretical propositions of Tedeschi and Calhoun (2004) and previous research in related populations (Bhat & Rangaiah, 2016; Bianchini et al., 2017; Hobfoll et al, 2006). As an exploratory aim, the current study tested a curvilinear relationship because it is possible that a curvilinear relationship would best explain the association between traumatic stress symptoms (PCL-5 scores) and positive psychological adaptation (PTGI scores), such that too much or too little distress might inhibit the process of perceived, positive growth.

Aim 3

The third aim of the current study was to test the cognitive processing component of Tedeschi & Calhoun (2004)'s model. Based on previous work, a positive relationship between

rumination (ERRI scores) and positive psychological adaptation (PTGI scores) was anticipated such that participants who endorsed more ruminative thought would also experience higher levels of positive growth. The current study also tested a curvilinear relationship between rumination (ERRI scores) and positive psychological adaptation (PTGI scores) as an exploratory aim given that too much or too little ruminative thought might impact the experience of positive growth.

Aim 4

The fourth and final aim of the current study was to describe the buffering effect of MHLC domains on the relationship between ruminative thought and positive psychological adaptation, specifically related to internal, external, or spiritual HLC scores. At this time, given the dearth of literature in this area, the current study did not make any predictions about the direction of these relationships.

Methods

In order to investigate aims and hypotheses, the current study employed a retrospective, cross-sectional correlational design and was approved by the Institutional Review Board (IRB) at the University of Kansas.

Participant Eligibility

The sample for this study included 150 community members and 16 undergraduate students participating in a larger study designed to study sleep and mental health during the COVID-19 pandemic. Participants were recruited from Amazon Mechanical Turk (MTurk, n= 150) and a subject pool of undergraduate students enrolled in a psychology course at the University of Kansas (n=16). Exclusion criteria included age younger than 18, current or past

diagnosis of a Schizophrenia Spectrum and Other Psychotic Disorder (American Psychiatric

Association, 2013), non-English speaking, and failure of validity items (see Appendix B).

Sample Characteristics

Table 1 and Table 2 present information related to participant demographics, broadly

and specific to the COVID-19 pandemic. The final sample (N=166) was primarily made up of

participants identifying as White/Caucasian, male, heterosexual people with a mean age of ~36

years. More than half of the sample was employed full-time, well-educated, partnered or living

with significant other, and reported an annual, household income of fifty thousand dollars or

more. Twelve percent of the participants endorsed at least one mental health diagnosis (e.g.,

anxiety, depression) and engagement with psychiatric treatment (e.g., counseling; n=20).

Related to the COVID-19 pandemic, about 15% of the sample endorsed chronic health

conditions or risk factors placing them at higher risk for contracting COVID-19 (n=24) (e.g., age,

immune-compromising conditions). Most (60%+) of the sample endorsed one or two impacts of

the COVID-19 pandemic (e.g., loss of job-related income, difficulty with access to resources)

and resided in locations with 5,000+ COVID-19 cases. The location of participants was evenly

distributed throughout the country. At the time of data collection, most regions were relaxing or

planning to relax COVID-19 restrictions or still engaging with "stay-at-home" type restrictions.

The vast majority (86%) of the sample reported themselves and their significant others to be

"healthy" at the time of data collection.

Procedure

Interested and eligible participants were presented with an information statement

outlining all aspects of the study before consenting to the online survey. If eligible participants

were not interested, their participation immediately ended upon clicking the "I do not wish to

participate" button. Participants completed an online survey through Qualtrics, with an estimated completion time of 30 minutes and were compensated with $3 (MTurk) or course credit (undergraduate students).

Measures

Demographic Questionnaire

Participants responded to a number of demographic and COVID-19 related questions: COVID-related health-risks, geographic location (i.e., city, status, zip code), regional restrictions from medical or government entities (e.g., "My current location is under "stay-at-home" or "shelter-in-place" restrictions from local or regional medical/government entities"), current health status (e.g., "I am healthy, "I am sick but do not have COVID-19"), financial status and access to resources (e.g., "I have been fired or lost my job/main source of income"), employment status (i.e., full-time work, part-time work, full- or part-time undergraduate or graduate student), and statewide confirmed number of COVID-19 cases per the CDC tracking website.

Mental Health Screening

Participants completed the self-report Patient Health Questionnaire-2 (PHQ-2; Kroenke et al., 2003) to assess for current symptoms of depression. The PHQ-2 was designed to assess the frequency of depressed mood ("feeling down, depressed, or hopeless") and anhedonia ("little interest or pleasure in doing things") over the previous two weeks, and participants rated each of the two items as 0 ("not at all") to 3 ("nearly every day"). PHQ-2 scores range from 0 to 6. Research has demonstrated evidence for construct and criterion validity (Kroenke et al., 2003), as well as internal consistency ($\alpha=0.83$) (Löwe et al., 2005). The PHQ-2 was consistent with previous reports of good reliability ($\alpha=0.73$).

Participants also completed the self-report Generalized Anxiety Disorder 7-item (GAD-7; Spitzer et al., 2006) scale to assess for symptoms of anxiety. The GAD-7 was designed to assess symptom severity (Spitzer et al., 2006) and includes seven items that participants respond how often they have been bothered by the list of symptoms over the previous two weeks on a scale of 0 ("not at all sure") to 3 ("nearly every day"). Item scores are summed for a total score (0 to 21), and participants also respond to one item that asks them how difficult their symptoms made it to complete work and life responsibilities ("not difficult at all" to "extremely difficult" response options). Extant literature has shown excellent internal consistency coefficients (α=0.89) and validity of the GAD-7 in the general population (Löwe et al., 2005). The GAD-7 was consistent with previous reports of reliability (α=0.90).

Rumination

The Event Related Rumination Inventory (ERRI; Cann et al., 2011) was developed to measure intrusive and deliberate rumination. Cann and colleagues (2011) designed the ERRI in a neutral tone to combat existent preconceived notions about the construct of rumination, which aides in the desirability and applicability of this tool. The ERRI is made up of 20 items which load onto two subscales of 10 items on a scale of 0 ("not at all") to 3 ("often"): intrusive rumination ("e.g., "I could not keep images or thoughts about the event from entering into my mind") and deliberate rumination (e.g., "I thought about whether I could find meaning from my experience") (Cann et al., 2011). Each of the ten items are summed which result in two, separate subscales scores. While research has suggested these two factors are distinct, they are also highly correlated. In the current study, a moderately strong association emerged between the two subscales (r=0.61, p<.001). The proposed study created a composite score from both subscales to reflect an overall rumination score given the proposition that people who experience intrusive

thoughts about the event also have a tendency to engage in deliberate rumination (Cann et al., 2011). Participants were instructed to respond how often they had the listed experiences during the month prior to data collection. Research to date has reported excellent internal consistency coefficients (α=0.88-0.94) and construct validity with other assessments of rumination (Cann et al., 2011). The ERRI demonstrated high reliability (α=0.94) in the current study.

Locus of Control

Form A of the Multidimensional Health Locus of Control scale (MHLC-A; Wallston et al., 1978) is a 24-item measure designed to assess for attribution of general health beliefs about locus of control across four, 6-item subscales: the person's own behavior (Internal – six items), other people's behavior (Powerful Others – three items), chance (Chance – six items), or God/higher power (GHLC – six items). Each item response is rated on a 6-point, Likert-type scale from 1 ("strongly disagree") to 6 ("strongly agree"), and the subscale items are summed to reflect subscale scores with possible ranges as follows: Internal (6-36), Chance (6-36), Powerful Others (3-18), and GHLC (6-36). For the current study, the following subscale scores were examined: internal, external, which combined the subscales of chance/fate and powerful others, and spiritual (God/higher power). Participants were instructed to think about COVID-19 as the source of sickness: "If I get sick, it is my own behavior which determines how soon I get well again." The MHLC-A, including the six GHLC items, is a well-validated measure and has shown acceptable internal consistency (α=0.60-0.75) (Wallston, 2005). The MHLC-A demonstrated good reliability (α=0.88) in the current study.

Traumatic Stress Symptoms

The PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013) is a widely used, 20-item self-report measure that corresponds to the *DSM-5* symptom criteria for PTSD. Each item

response is rated on a 5-point Likert scale from 0 ("not at all") to 4 ("extremely"). For example, respondents are asked "In the past month, how much have you been bothered by repeated, disturbing, and unwanted memories of the stressful experience?" The PCL-5 has good internal consistency (α=0.96) and is validated in veteran (Bovin et al., 2015) and non-veteran populations (Blevins et al., 2015). In the current study, the PCL-5 demonstrated excellent reliability (α=.97).

Positive Psychological Adaptation

The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) is a 21-item, self-report measure of perceived positive changes across five dimensions (i.e., personal strength, interpersonal relationships, spirituality, appreciation of life, and new opportunities in life) following exposure to a traumatic event or circumstances. Each item response is rated using a 6-point Likert-type scale with values ranging from 0 ("I did not experience this change as a result of my crisis") to 5 ("I experienced this change to a very great degree as a result of my crisis") with higher total scores reflecting higher levels of positive change. Participants were instructed to think about their COVID-19 experiences in the month prior to data collection. Participant responses were summed for a total PTGI score, a common practice in the extant literature (Tedeschi & Calhoun, 1996). Research to date supports good internal consistency (α=0.90; Tedeschi & Calhoun, 1996), and the PTGI demonstrated excellent reliability (α=0.96) in the current study.

Longitudinal Data Follow-up

All participants were asked to respond to one item assessing their interest in future contact from the research study team (yes/no). The majority (93.4%) responded 'yes' to future contact, and they were asked to provide telephone or email contact information for follow-up.

Analytic Approach

A total of 305 people responded to the survey. Invalid survey responses were removed from the dataset: 59 non-US (e.g., India, Brazil), 68 invalid due to failed validity items, one case incorrectly reported demographic information, and 11 reported a history of a psychotic disorder. The final dataset included 166 survey responses with complete data for predictor and outcome variables. Statistical analyses were conducted using the IBM Statistical Package for Social Sciences-26 (SPSS-26) software packages. For all hierarchical, linear regression analyses, covariates were entered in the first step, predictor variables were entered in the second step, and when applicable, interaction terms or standardized predictor variables for non-linear, quadratic analyses were entered in the third step. Significant effects were identified as those with p-values less than 0.05.

Results

Group Differences and Covariate Analyses

Before combining data from students and non-students and between MTurk workers and students, we completed independent samples t-tests to determine whether there were significant differences across groups. As expected, age emerged as statistically significant between students and non-students ($t(164)=3.70, p<.001$) such that non-students ($M=37.98, SD=11.81$) were significantly older than the students ($M=30.57, SD=11.68$). Additionally, we also used an independent samples t-test to determine significant differences between self-identified, MTurk students and the SONA students. There too, age emerged as a statistically significant difference ($t(35.70)=4.84, p<.001$) such that MTurk students (($M=35.00, SD=10.41$) were significantly older than the SONA students ($M=21.44, SD=8.55$). There were no other significant differences between students and non-students, suggesting that we could aggregate data collected from MTurk and SONA. Table 3 includes the results of the student-to-student analyses.

A panel of variables were examined as potential covariates. Education level, anxiety symptoms, and depression symptoms were identified as potential confounds with traumatic stress symptoms. The following variables were identified as potential confounds with positive psychological adaptation: education level, anxiety symptoms, depression symptoms, COVID-19 information seeking, race/ethnicity, and relationship status. Finally, external and spiritual HLC scores were significantly associated; thus, the current study separated these MHLC domains into separate models for hierarchical regression analyses. Variables were correlated in the expected directions, providing evidence of construct validity for the constructs measured in the current study. Due to traumatic stress symptoms being highly correlated with anxiety and depression symptom scores, anxiety and depression symptom scores were removed from the regression equations. Equations were then re-run to address potential suppressor effects in regression modules addressing the study aims. The matrix of correlations is presented in Table 4.

Statistical Power

We used G*Power 3.1. to determine the power needed to detect direct and moderation effects. With a final sample size of 166 and at least 95% chance of detecting small ($f^2=0.05$) direct effects, power analyses suggested we had sufficient power (0.82) to find statistical significance. With a final sample size of 166 and at least 95% chance of detecting medium ($f^2=0.15$) moderation effects, power analyses suggested we had sufficient power (0.99) to find statistical significance.

Trauma and Positive Psychology

Aim 1

The purpose of the first aim was to examine the correlation between MHLC beliefs and traumatic stress symptoms, the correlation between MHLC beliefs and positive psychological

adaptation, and a difference in average positive psychological adaptation scores by higher internal HLC scores compared to external HLC scores.

Traumatic Stress Symptoms. After controlling for relevant covariates, traumatic stress symptoms were found to be related to the external HLC (β=0.26, $p \leq$.001), but not the internal HLC domain (ΔR^2=0.05) ($F(2,159)$=14.21, $p<$.001). The spiritual HLC domain (β=0.14, $p \leq$.05) was also related to traumatic stress symptoms (ΔR^2=0.02) ($F(1,161)$= 9.48, $p<$.05). Full statistical models can be found in Table 5 and Table 6.

Positive Psychological Adaptation. After controlling for relevant covariates, PTGI scores were significantly associated with internal (β=0.19, $p \leq$.05) and external (β=0.41, $p \leq$.05) domains, and they accounted for significant variance in and above first order terms (ΔR^2=0.17) ($F(6,156)$=14.04, $p<$.001). The spiritual HLC domain (β=0.37, $p \leq$.05) was also significantly correlated with PTGI scores and accounted for significant variance in and above first order terms (ΔR^2=0.12) ($F(5,158)$=13.29, $p<$.001). Full statistical models can be found in Table 7 and Table 8.

We computed a dichotomous variable for participants with higher internal HLC than external HLC scores and entered this variable as the grouping factor into an independent samples t-test. A significant group difference in PTGI scores did not emerge ($t(14.12)$=1.02, p=.32), and participants with higher levels of external than internal HLC scores reported higher PTGI scores (M=52.21, SD=24.66) compared to participants with higher internal than external HLC scores (M=42.00, SD=36.54). Moreover, as an exploratory analysis, we tested an interaction term of internal and external HLC scores as a predictor in the hierarchical regression model. There was not a significant interaction between internal and external HLC domains in relation to PTGI scores. Full statistical models can be found in Table 7 and Table 8.

Aim 2

The second aim of the current study was to characterize the relationship between traumatic stress symptoms and positive psychological adaptation. As seen in Table 9, after controlling for relevant covariates, traumatic stress symptoms were related to positive psychological adaptation (β=0.28, *p*<.05) and accounted for significant variance in and above the first step terms (ΔR^2=0.06) (*F*(5,158)=9.98, *p*<.05).

As a planned exploratory analysis, we also investigated whether there was a curvilinear relationship between traumatic stress symptoms and positive psychological adaptation. As can be seen in Table 9, the curvilinear term was significant (β=0.20, *p*<.05) and accounted for significant variance in and above second step terms (ΔR^2=0.03) (*F*(6,157)=9.72, *p*<.05). The scatterplot for this relationship can be found in Figure 4. After examining the scatterplot, it appeared that there were high influence, high leverage cases that could be driving this relationship (n=3). These cases were removed, and analyses were re-run. Even without these influential cases, the curvilinear relationship remained significant which suggested that participants with a moderate level of traumatic stress symptoms experienced the least amount of positive psychological adaptation compared to participants with low or high levels of traumatic stress symptoms. Finally, it is important to note the potential for heteroscedasticity, specifically butterfly distributed residuals (BDR), upon examining the scatterplot (see Figure 4). It is possible the results of these analyses are influenced by unequal variability across traumatic stress symptoms scores.

Trauma and Positive Psychology: Mechanisms of Action

Aim 3

The third aim of the current study was to test the cognitive processing component of Tedeschi and Calhoun's (2004) theoretical model. As seen in Table 10, after controlling for relevant covariates, rumination was correlated with positive psychological adaptation (β=0.33, p<.05) and accounted for a significant amount of variance in and above the first step terms (ΔR^2=0.09) (F(5,158)=11.80, p<.05).

As a planned exploratory analysis, we also investigated whether there was a curvilinear relationship between rumination and positive psychological adaptation. As can be seen in Table 10, the curvilinear term was significant (β=0.14, p<.05) and accounted for a significant amount of variance in and above second step terms (ΔR^2=0.02) (F(6,157)=10.72, p<.05). The scatterplot for this relationship can be found in Figure 55. Again, it appears that there was a high influence, high leverage case that could be driving this relationship (n=1). This case was removed, and analyses were re-run. Even without this influential case, the curvilinear relationship remained significant. This result suggests that participants with a moderate level of ruminative thought experienced the least amount of positive psychological adaptation compared to participants with low or high levels of ruminative thought. Finally, it is important to note the potential for heteroscedasticity, specifically butterfly distributed residuals (BDR), upon examining the scatterplot (see Figure 5). It is possible the results of these analyses are influenced by unequal variability across rumination scores.

Aim 4

The purpose of the fourth aim was to test for the presence of a buffering effect of MHLC domains on the relationship between rumination and positive psychological adaptation. To investigate this aim, a series of regression equations was created after controlling for relevant covariates and significant main effects. There were no significant interactions between

rumination and any of the MHLC domains. Full statistical analyses are presented in Table 11, Table 12, and Table 13.

Discussion

Results Summary

The purpose of this study was to examine multiple levels of predictors for traumatic stress symptoms and positive psychological adaptation in a sample of community members and undergraduate students during the COVID-19 pandemic. Participants reporting higher levels of external HLC (e.g., chance, powerful others, God/higher power) beliefs experienced more traumatic stress symptoms and perceived growth when thinking about their COVID-19 experiences. Traumatic stress symptoms and rumination were associated with positive growth scores in the expected, but perhaps counterintuitive directions. In sum, both external HLC and rumination appeared to be advantageous for people during the COVID-19 pandemic, a global crisis that offered few opportunities for active self-protection at the time of data collection.

Trauma and Positive Psychology

Traumatic Stress Symptoms

The first aim of the current study was to investigate the relationships between MHLC domains and traumatic stress symptoms. Unexpectedly, internal HLC was unrelated to traumatic stress symptoms. Consistent with prior research, high external HLC (e.g., powerful others, chance, God/higher power) was correlated with higher levels of traumatic stress symptoms, meaning people who strongly believed in forces like fate or powerful others and a spiritual higher power reported higher levels of trauma symptoms. Overall, these findings demonstrated that people who believe other forces are in control of their health-related outcomes may

experience more mental health symptoms and outcomes compared to people who believe they are in control of their own outcomes.

These findings are consistent with Rotter's (1966) proposition that "victims of fate" do not fare as well as individuals with a higher perceived sense of internal control. Extant literature has documented poorer outcomes for people identifying with high external LOC orientation, such as believing chance or fate are responsible for health-related outcomes (Morowatisharifabad et al., 2010). Moreover, previous studies have identified that people with high spiritual LOC orientation may be less likely to engage with preventative medical care. In one study, investigators studied engagement with breast cancer care in a sample of African American women and found that women with high scores on the spiritual LOC domain were less likely to follow recommendations for screening, examinations, and clinical mammography procedures compared to women with lower scores on the same domain (Kinney et al., 2002). These studies provide further evidence that strong beliefs in external influences over health-related outcomes could negatively impact overall wellbeing. While many previous studies have focused on LOC beliefs and adherence to medical regimens, much less information is available to determine outcomes for people exposed to global, health crises (e.g., COVID-19 pandemic).

It may be important for researchers to assess aspects within external LOC beliefs. For example, spiritually oriented LOC beliefs have been proposed to include active and passive dimensions. The active dimension means an individual believes that they work together with the higher power (e.g., God) to control their outcomes, while the passive dimension suggests an individual believes only the higher power (e.g., God) is in control of their outcomes. Though not a focus of this study, future research could attempt to further investigate the role of both active

and passion dimensions of spiritually oriented LOC beliefs to further determine the influence on people's outcomes and responses to traumatic circumstances (Holt et al., 2003).

The results from this study are also consistent with previous studies that have shown specific associations between externally oriented LOC beliefs and health-related outcomes, such as a negative relationship between chance/fate LOC and adherence to medical regimens (Morowatisharifabad et al., 2010; O'Hea et al., 2005). Thus, future research should focus on and analyze LOC beliefs across and within internal and external domains because they can independently predict outcomes. For instance, some assessments designed to measure LOC beliefs include internal and external orientations along one continuum providing one total score, such as Rotter's 29-item LOC scale (Zarin et al., 2017). Comparatively, the MHLC-A (Wallston et al., 1978) was designed to include assessment of internal HLC and multiple sub-domains of external HLC beliefs (e.g., fate/chance, powerful others) specific to health-related outcomes. This distinction could be critical in predicting health-related outcomes, both in scholarly investigations and clinical interventions, and would be beneficial for further knowledge related to the association between LOC orientations and trauma-related outcomes. This approach may also be important in determining individual, behavioral outcomes tied to safety precautions during global health crises, resulting in larger scale implications for public health and safety.

The results this study also warrant consideration for how the mental health field conceptualizes trauma-related disorders. Most research on trauma focuses on "post trauma" symptoms and clinical disorders (i.e., Post-traumatic Stress Disorder) (American Psychiatric Association, 2013), implying people experience these symptoms once the traumatic event(s) or circumstances are over. However, during an ongoing pandemic, it is almost impossible to define when the traumatic event is "over." In the current study, about 40% of the participants endorsed

traumatic stress symptoms at or above the clinical cutoff for a probable PTSD diagnosis (PCL-5 total score ≥ 33) at the time of data collection, about two to three months after the US President announced that the COVID-19 pandemic was a national emergency. Although it is not possible to know whether reports of distress were directly related to COVID-19, it may be important to reconsider the way the field conceptualizes and studies responses to trauma, including recovery and non-recovery responses (e.g., PTSD diagnosis). In summary, this finding provides evidence for people's perception of the COVID-19 pandemic as a source of traumatic stress, resulting in increased symptoms and distress. However, there are limitations to this conclusion.

First, the current study collected data during a period for which positive case counts were lower than the first few months of the COVID-19 pandemic (see Figure 2), potentially representing a lower level of perceived threat by the participants. Although the online survey instructions asked participants to think about their experiences in the 30 days prior to data collection, it cannot be assumed that participants reported traumatic stress symptoms with COVID-19 as the primary influence. At the time of data collection, participants may have perceived improvement in their circumstances given the recent decrease in daily, new COVID-19 case counts. This is supported by previous research demonstrating that people with high levels of traumatic exposure still report experiencing positive growth despite perceived improvement in their circumstances (Pelphrey, 2004). This might be especially important for research on trauma-related outcomes during an ongoing pandemic given the COVID-19 data suggests level of threat and exposure can change over time (see Figure 2).

Positive Psychological Adaptation

In stark contrast to other research on LOC, it appears as though external HLC beliefs may have been advantageous and influenced positive psychological outcomes for people during the

COVID-19 pandemic. Although unexpected, a belief that chance and powerful others are in control was congruent with reality, as personal control over public health and pandemic outcomes was quite low, at least early on. Thus, the findings here may reasonably be explained in terms of "goodness of fit." Originally proposed by Thomas and Chess (1997), "goodness of fit" refers to the compatibility of individual traits and the environmental context. During this global, health crisis, particularly at the time of data collection, adaptive responses included limiting social contact, increasing time at home, and following expert recommendations and safety precautions. There are a few other studies that support the importance of "goodness of fit" in response to traumatic exposures. In a sample of cancer patients undergoing chemotherapy, it was found that patients with high external LOC orientation experienced less physiological arousal and negative affect after their procedures and behavioral intervention training (e.g., relaxation techniques) (Burish et al., 1984). Consistent with findings by Burish and colleagues (1984), this study demonstrates the importance of the congruence of belief structures with external circumstances, showing advantage for people with external LOC beliefs who have limited, objective control over their health-related circumstances (e.g., COVID-19 pandemic).

Traumatic Stress Symptoms and Positive Psychological Adaptation

The second aim of the current study was to investigate the relationship between traumatic stress symptoms and positive psychological adaptation. Consistent with Tedeschi and Calhoun's (2004) model, it was hypothesized that traumatic stress symptoms would be positively associated with perceived positive growth, and the results of the current study supported that hypothesis. These data are consistent with other research that has observed a positive association between traumatic stress symptoms and positive psychological adaptation, such as studies of people exposed to war in Yugoslavia (Powell et al., 2003) and online samples of mothers following

childbirth (Sawyer & Ayers, 2009). However, other literature has documented an inverse relationship between depression and PTG, for example, in a sample of sexual assault survivors (Frazer et al., 2001), and some research has not found significant associations between psychological distress and PTG in samples of breast cancer survivors (Cordova et al., 2001). Accordingly, it is not possible to conclude that psychological distress facilitates positive growth in people exposed to traumatic events, which is especially true in this study given the cross-sectional study design. Although this study's linear, positive association between traumatic stress symptoms and positive psychological adaptation supports Tedeschi and Calhoun's (2004) theoretical model and proposed mechanisms of action, longitudinal data could help to specify the full causal path of these relationships, particularly for people enduring chronic trauma with continuous threat. This would be especially important given the unclear picture of these relationships within extant literature.

Despite the significant linear association between traumatic stress symptoms and positive psychological adaptation in the current study, the observed variance accounted for in PTGI scores within the model was low (~17%). Other variables are important in the development of positive growth, such as social support and strategies for managing emotional distress and reactions to the cognitive processes of positive psychological adaptation (Tedeschi & Calhoun, 2004). Outbreak-related factors are also likely contributors to adverse outcomes (Perrin et al., 2009), thus it would be interesting to look at the relationship between traumatic stress symptoms and reports of positive psychological adaptation for groups of participants located in varying US regions. For example, it is possible for the relationship between psychological distress and perceived positive growth to be different based upon geographic differences and pandemic-

specific variables, such as participants in regions with high infections rates or employment within a healthcare facility during the COVID-19 pandemic.

The current study also investigated a non-linear association between traumatic stress symptoms and positive psychological adaptation. Despite finding a significant non-linear (quadratic) regression coefficient, analyses revealed low variance accounted for in PTGI scores, which may be due to several factors including the distribution of traumatic stress symptoms. Approximately 10% (n=17) of the sample did not report traumatic stress symptoms (PCL-5 total score=0). Despite the significant curvilinear effect, visual inspection of the data suggests the best fit for the data appears to be a positive, linear association between reported traumatic stress symptoms and perceived positive psychological adaptation (see Figure 4). As such, future research should continue to focus on and investigate linear and non-linear associations between these variables in groups of people with traumatic exposure.

Trauma and Positive Psychology: Mechanisms of Action

Rumination and Positive Psychological Adaptation

The third aim of the current study was to investigate the relationship between ruminative thought and positive psychological adaptation, and it was anticipated that a positive association would emerge such that participants reporting higher levels of rumination would also report more perceived positive psychological adaptation. The results of the linear regression analysis supported this hypothesis given ERRI scores (Cann et al., 2011) were significantly and positively correlated with PTGI scores (Tedeschi & Calhoun, 1996). Moreover, this result was consistent with previous investigations (see Calhoun et al., 2000; Tedeschi & Calhoun, 2004) and a theoretical model that would suggest that exposure to the COVID-19 pandemic motivated a level of cognitive struggle related to assumptions about the world (e.g., "the world is a safe place")

and affected their perceptions of their ability to function across one or more PTGI domains (e.g.,

interpersonal relationships) (Tedeschi & Calhoun, 1996). Although this relationship supports

Tedeschi and Calhoun's proposed model of positive growth, the cross-sectional nature of the

current study means that it is not possible to make assumptions about the direction of this

relationship or exclude potential, third variables. Additionally, this study's results suggest that

ruminative thought can facilitate adaptive outcomes for people exposed to traumatic events. This

is especially true given rumination is an indicator of negative adaptation and sign of certain

mental health diagnoses (e.g., anxiety, depression).

As an exploratory aim, the current study investigated a non-linear relationship between

rumination and positive psychological adaptation, which also resulted a low value for the

variance in PTGI scores within regression analyses. Moreover, it may be detrimental to assess

rumination with the ERRI total score and not utilize the intrusive and deliberate rumination

subscales because they might differently be related to positive psychological adaptation (Cann et

al., 2011; Tedeschi & Calhoun, 2004). This might be true for assessment of positive

psychological adaptation, such as assessing the relationship between rumination and the five

PTGI domains compared to the PTGI total score (Tedeschi & Calhoun, 2004). Finally, Tedeschi

and Calhoun (2004) suggest meaning making and cognitive reappraisal might be important

correlates of perceived positive growth. Despite the significant curvilinear effect, visual

inspection of the data suggests the best fit for the data appears to be a positive, linear association

between ruminative thought and positive psychological adaptation (see Figure 5). This is one of

the first studies to examine both linear and curvilinear associations between these variables,

particularly in this type of population. As such, future research should continue to focus on and

investigate linear and non-linear associations between cognitive processing and positive

psychological adaptation, as well as consider other influential factors in evaluating people's responses to traumatic events

Additional Considerations for Positive Psychological Adaptation

While all five domains of the PTGI (Tedeschi & Calhoun, 1996) have been relevant to potential, perceived changes during the COVID-19 pandemic, the two highest averages across the five PTGI domains were perceived strength in relationships with others and new possibilities in life. Interestingly, the two lowest domain averages were spirituality (lowest) and life appreciation (second lowest). As a result, it may be that the nature of the traumatic exposure investigated in the current study is responsible for the highest perceived growth scores within the two highest domains. For example, according to the CDC recommendations (CDC, 2020b), US residents have been instructed to increase their physical distance from others not residing in their home, decrease in-person interaction with significant others and large groups, and increase their time spent at home. Additionally, these findings may be due to participants' increased time at home to engage with hobbies or reflect on alterations to employment positions as a result of the COVID-19 pandemic (e.g., furlough, termination, etc.). For instance, in an effort to stay safe and follow guidance and precautions from experts, participants may have increased their connections with significant others (e.g., friends, extended family) via technology and felt a sense of support from their social connections.

Furthermore, though not a focus of the current study, Tedeschi and Calhoun proposed social support as another factor in their model predicting positive psychological outcomes (2004). This variable might account for outcomes of perceived growth across various domains, as well as one way people manage the emotional distress associated with their cognitive processing and psychological survival upon exposure to ongoing, traumatic circumstances.

During the COVID-19 pandemic, guidance from experts encouraged physical distance from others in an effort to stay safe and healthy. However, these recommendations present challenges to people's wellbeing. For example, people may experience isolation and loneliness as a result of decreased interactions, which further highlights the importance of creative ways to connect with significant others in order to reduce negative psychological consequences amidst a period of uncertainty and increased stressors.

Limitations and Future Directions

Despite the interesting and important findings, the current study is not without limitations. The most important limitation was the cross-sectional design. We were not able to asses for the influence of the participant's past or concurrent trauma experiences during the COVID-19 pandemic. Although the current study relied on self-report measures to assess for study covariates, predictor variables, and outcome variables, we could not control for the influence of other societal events that occurred during the data collection period (see Figure 3 for COVID-19 and study timeline). For instance, on May 25, 2020, George Floyd died in Minneapolis, Minnesota during an arrest by law enforcement officers. Since Floyd's death, the US has observed numerous protests and instances of civil unrest (The New York Times, 2020b). As such, it would be important for future research to include objective assessment measures, such as a clinical interview, to assess for traumatic stress symptoms or multiple informants to assess for perceived positive, psychological changes upon trauma exposure. Future studies should include longitudinal data collection and complete follow-up assessments of these variables in samples of traumatized people, particularly for which traumatic circumstances are ongoing and represent continuous threat.

The data were also limited by the demographic background of the participants. The sample was fairly homogenous with 60% or more of participants identifying as male, heterosexual, and White/Caucasian with a moderately high level of educational attainment and annual income. Thus, the results and conclusions should be generalized with caution to other groups of people exposed to trauma, particularly for individuals with more diverse racial/ethnic and socioeconomic backgrounds. Also, given increased risk for PTSD in groups with direct exposure and proximity to traumatic circumstances (Neria et al., 2011), future research should examine indicators of and associations between psychological distress and positive psychological adaptation in groups with more direct exposure to the COVID-19 pandemic (e.g., healthcare workers caring for COVID-19 patients).

Conclusions

The current study's findings suggested people who believed that other forces (e.g., medical providers, spiritual powers) were in control of their health-related outcomes experienced more psychological distress and perceived growth as a result of their experience during the COVID-19 pandemic. Surprisingly, rumination was also associated with higher levels of perceived, positive psychological changes. Both external LOC and rumination appeared to be advantageous for people amidst the COVID-19 pandemic. For medical and behavioral healthcare providers, the forces for which people believe control their mental health and wellbeing outcomes may be important information in case conceptualization and treatment planning. This study was one of the first to examine positive growth by LOC orientation during an ongoing pandemic.

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Appendix A

1. What is your age? _____ years

2. How do you describe your gender? (Mark all that apply)

    _____ Female   _____ Cisgender
    _____ Male   _____ Genderqueer
    _____ Transgender   _____ A gender not listed (please specify)
    _____ I prefer not to answer

3. How do you describe your sexual identity? (Mark all that apply)

    _____ Heterosexual/straight   _____ Cisgender
    _____ Homosexual/gay/lesbian   _____ Genderqueer
    _____ Bisexual   _____ Asexual
    _____ I prefer not to answer   _____ A sexuality not listed

4. What is your marital status?

    _____ Married   _____ Divorced
    _____ Widowed   _____ Separated
    _____ Single   _____ Living with partner
    _____ I prefer not to answer

5. With which racial or ethnic group(s) do you identify? (Mark all that apply)

    _____ American Indian or Alaska Native   _____ Asian
    _____ Hispanic or Latinx   _____ Middle Eastern or North African
    _____ White   _____ Black or African American
    _____ Native Hawaiian or Other Pacific Islander
    _____ A race or ethnicity not listed (please specify)
    _____ I prefer not to answer

6. What is your highest level of completed education?

    _____ Less than high school diploma
    _____ High school diploma/GED
    _____ Some college or associate/trade degree
    _____ Bachelor's degree
    _____ Master's degree or higher
    _____ I prefer not to answer

7. What is your current employment status? (Mark all that apply)

    _____ Full-time undergraduate or graduate student
    _____ Part-time undergraduate or graduate student
    _____ Part-time work
    _____ Full-time work
    _____ No employed or retired
    _____ I prefer not to answer

8. What is your annual household income?

_____	Less than $10,000
_____	$10,000-$29,999
_____	$30,000-$49,999
_____	$50,000-$69,999
_____	$70,000-$89,999
_____	$90,000-$99,999
_____	Over $100,000

9. Which the following describes your mental health history? (Mark all that apply)

_____	Diagnosis of anxiety from a medical or mental health provider
_____	Diagnosis of depression from a medical or mental health provider
_____	Diagnosis of Post-Traumatic Stress Disorder (PTSD) from a medical or mental health provider
_____	Diagnosis of a psychotic disorder from a medical or mental health provider
_____	Individual counselling or therapy for anxiety, depression, PTSD, or psychotic disorder
_____	Prescription medication(s) to manage your mood and other symptoms
_____	None of the above
_____	Other mental health history (please specify)
_____	I prefer not to answer

Please answer the following questions as they relate your current situation and the current novel coronavirus pandemic (COVID-19 or 2019-nCoV).

1. Do you have a history of chronic health conditions or other factors that place you at high risk for contracting COVID-19 (e.g., age, currently pregnant)? If yes, please specify.

_____	Yes
_____	No
_____	I prefer not to answer

2. What is current location during the COVID-19 pandemic? Please provide the zip code. Example: 60007 for Chicago, IL

_____	Zip code
_____	I prefer not to answer

3. What are the current medical and/or government restrictions in your location?

_____	I am not currently under any restrictions from local or regional medical/government entities and can travel outside my residence for any reason
_____	My current location is under "stay-at-home," "shelter-in-place, " or "lockdown" restrictions from local or regional medical/government entities such that I can only leave my residence for "essential" reasons (e.g., medical emergencies, grocery store, pharmacy)
_____	In the past month, my current location has relaxed or has announced a plan to relax restrictions for non-essential business (e.g., dine-in restaurants, bars)

_____   I do not know the current restrictions from local or regional medical/government entities in place in my area

_____   I prefer not to answer

4. What is the current health status for you and your close friends and/or family members? (Mark all that apply)

_____   I am healthy

_____   I am sick, but do not have COVID-19 (i.e., tested for COVID-19, negative result)

_____   I am sick/suspect COVID-19 and do not qualify for testing/have not been tested

_____   I have tested positive with COVID-19

_____   A close friend and/or family member of mine has tested positive with COVID-19

_____   A close friend and/or family member of mine has passed away due to COVID-19

_____   I am/have been a caregiver for a close friend and/or family member with COVID-19

_____   I prefer not to answer

5. How has the COVID-19 pandemic impacted you? (Mark all that apply)

_____   I have lost my job-related income (e.g., furlough, reduced hours, laid off)

_____   It has been difficult to get the things I need for myself and/or my family (e.g., food)

_____   I am stressed because I worry that I or my loved ones will catch COVID-19

_____   I spend a large percentage of my time trying to find updates online or on TV about COVID-19

_____   None of the above

_____   I prefer not to answer

6. How many confirmed cases of COVID-19 are currently in your state according to the most recently updated information from the Centers for Disease Control & Prevention (CDC)?

_____   0 to 50

_____   51 to 100

_____   101 to 500

_____   501 to 1000

_____   1001 to 5000

_____   5001 or more

_____   I do not know how many COVID-19 cases there are confirmed in my state

_____   I prefer not to answer

Longitudinal Follow-Up Question

1. Are you interested in being contacted in the future for follow-up or participation in future research studies? If, please provide your phone number and email address. __Yes __ No __ I prefer not to answer

Appendix B

V1. Do you intend to take this survey to the best of your ability?

○ Yes (1)

○ No (2)

○ Unsure (3)

V2. Select "Strongly Agree"

○ Strongly Agree (1)

○ Agree (2)

○ Disagree (3)

○ Strongly Disagree (4)

V3. Select "Strongly Agree"

○ Strongly Agree (1)

○ Agree (2)

○ Disagree (3)

○ Strongly Disagree (4)

V4. Select "Strongly Agree"

○ Strongly Agree (1)

○ Agree (2)

○ Disagree (3)

○ Strongly Disagree (4)

V5. Do you take this survey to the best of your ability reading every question?

○ Yes (1)

○ No (2)

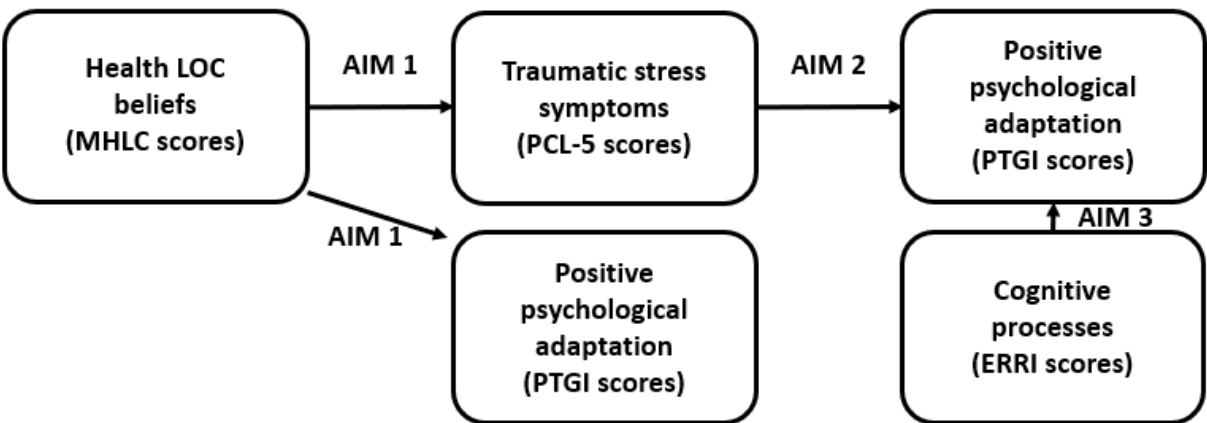○ Unsure (3)

Appendix C

Figure 1

Theoretically-based Predictors of Negative and Positive Psychological Functioning
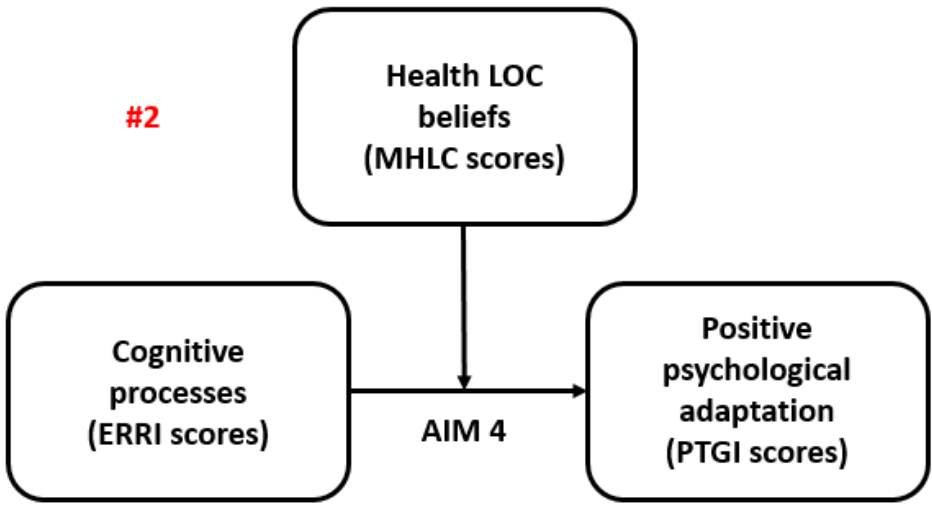
58

Figure 2

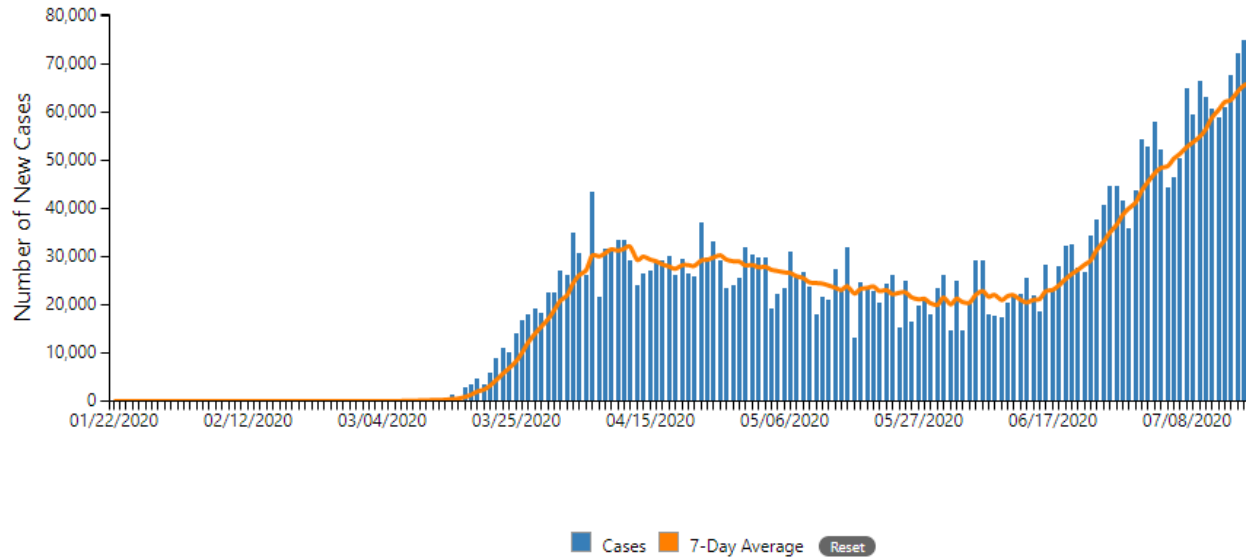*COVID-19 New Cases by Day: Visual Distribution Through July 2020*

Figure 3
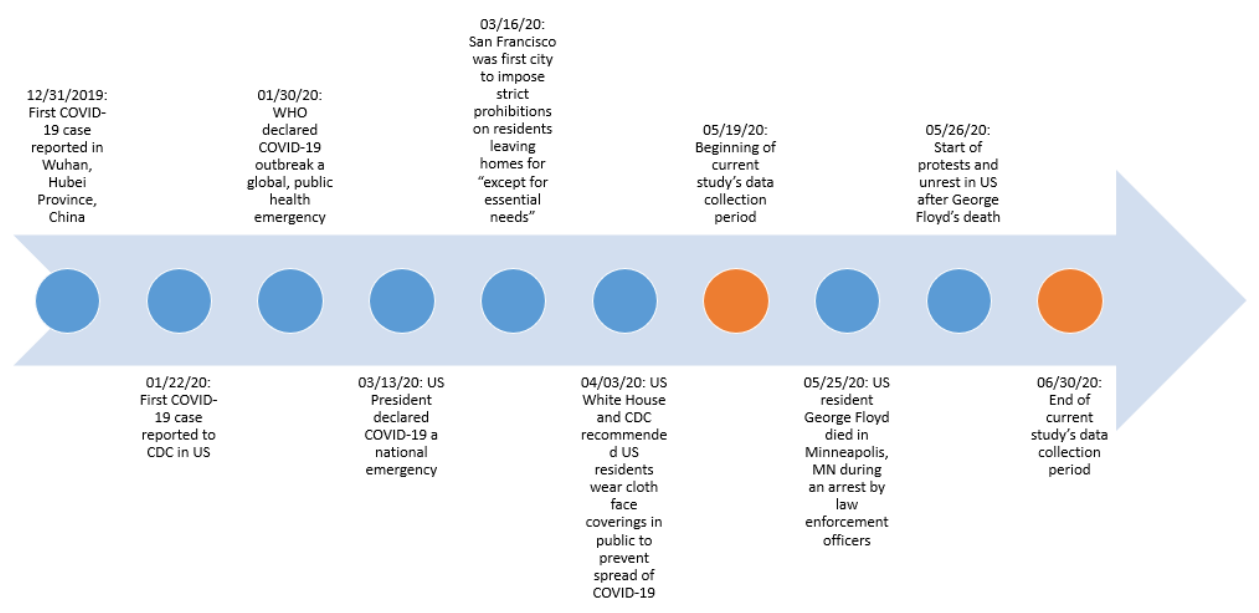
COVID-19 Pandemic and Current Study Timeline

Figure 4
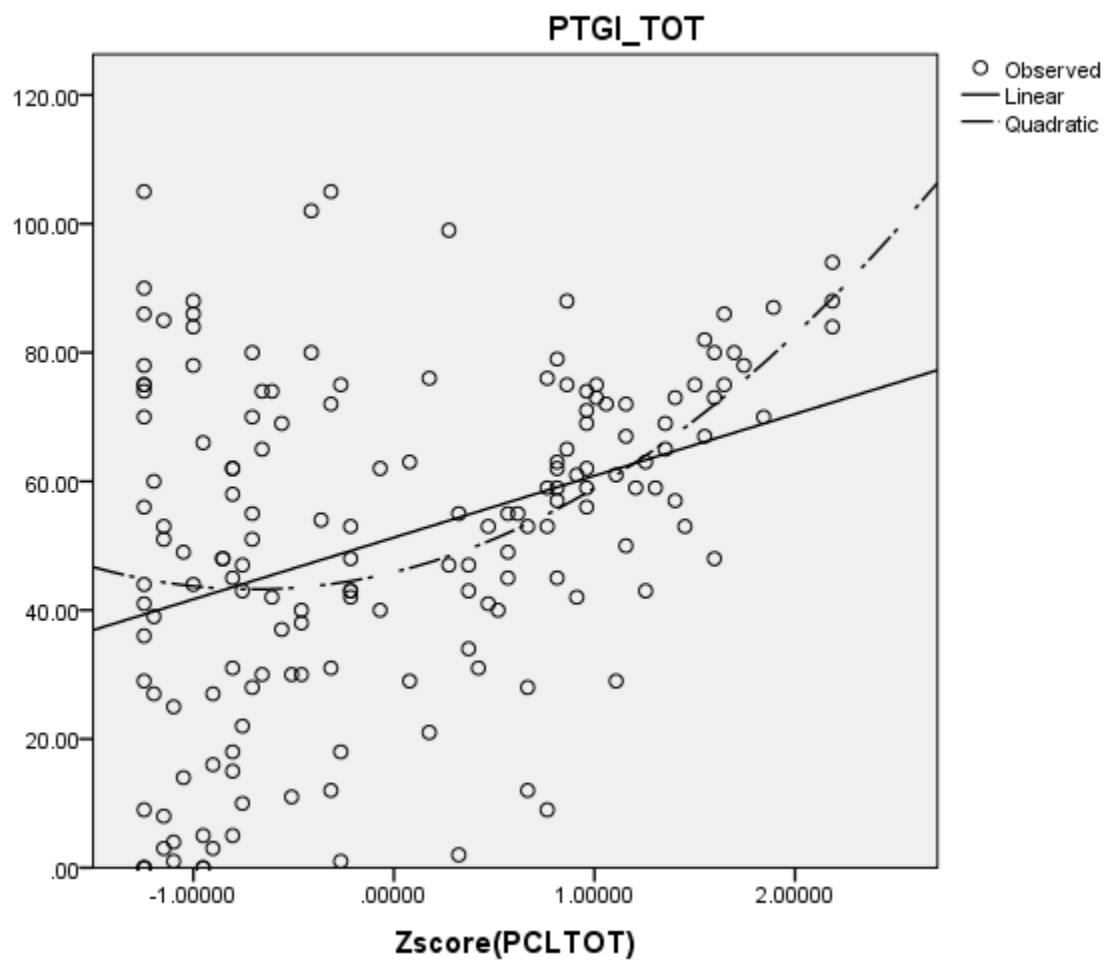
Aim 2: Distribution of Data and Regression Model Lines
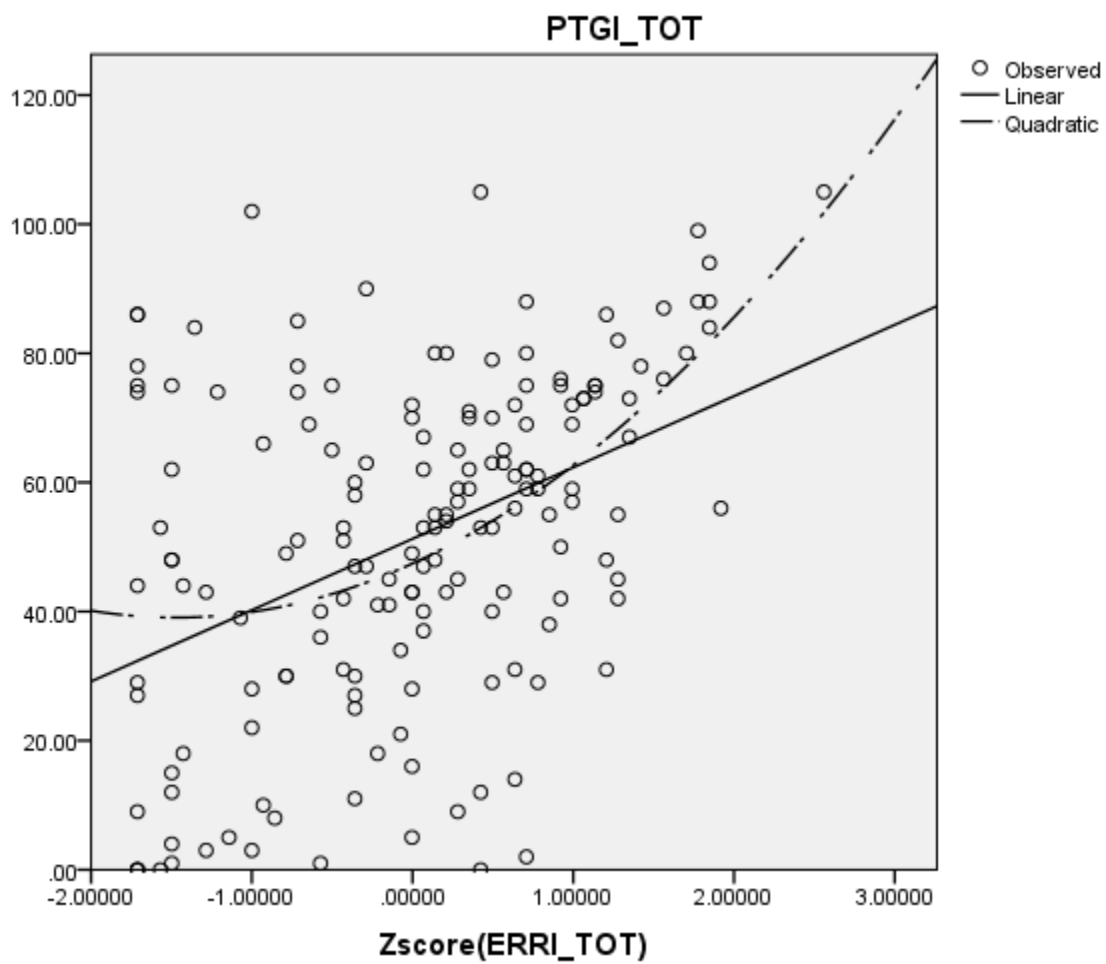
Figure 5

Aim 3: Distribution of Data and Regression Model Lines

Appendix D

Table 1

Sample Characteristics: General Background Information

	Total (*N*=166)	MTurk (*n*=150)	SONA (*n*=16)
Age (*M*, *SD*)	35.8 (12.2)	37.3 (11.6)**	21.4 (8.5)**
Race/Ethnicity (*n*, %)			
Hispanic or Latinx	7 (4.2)	6 (4.0)	1 (6.3)
White or Caucasian	106 (63.9)	100 (66.7)	6 (37.5)
Black or African American	20 (12.0)	20 (13.3)	0 (0.0)
Multiracial Identity	8 (4.8)	7 (4.7)	1 (6.3)
Other Racial/Ethnic Identity	25 (15.0)	17 (11.4)	8 (50.1)
Gender (*n*, %)			
Female	64 (38.6)	51 (34.0)	13 (81.3)
Male	102 (61.4)	99 (66.0)	3 (18.8)
Other Gender Identity	0 (0.0)	0 (0.0)	
Sexual Identity (*n*, %)			
Heterosexual	143 (86.1)	129 (86.0)	14 (87.5)
Homosexual	2 (1.2)	2 (1.3)	0 (0.0)
Other Sexual Identity	19 (11.4)	17 (11.4)	2 (12.5)
Prefer Not to Answer	2 (1.2)	2 (1.3)	0 (0.0)
Marital Status (*n*, %)			
Married or Living with Partner	95 (57.2)	94 (62.7)	1 (6.3)
Single	55 (33.1)	40 (26.7)	15 (93.8)
Widowed/Separated/ Divorced	14 (8.4)	14 (9.4)	0 (0.0)
Prefer Not to Answer	2 (1.2)	2 (1.3)	0 (0.0)
Completed Education (*n*, %)			
HS Diploma/GED or Less	22 (13.3)	13 (8.7)	9 (56.3)
Some College	45 (27.1)	38 (25.3)	7 (43.8)
Bachelor's Degree	70 (42.2)	70 (46.7)	0 (0.0)
Master's Degree or Higher	29 (17.5)	29 (19.3)	0 (0.0)
Employment Status[a] (*n*, %)			
Full-time	101 (60.8)	100 (66.7)	1 (6.3)
Part-time	19 (11.4)	15 (10.0)	4 (25.0)
Full- or Part-time Student	49 (29.5)	33 (22.0)	16 (100.0)
Not Employed or Retired	17 (10.2)	11 (7.3)	6 (37.5)
Prefer Not to Answer	1 (0.6)	1 (0.7)	0 (0.0)
Household Annual Income			
Less than $10,000	6 (3.6)	6 (4.0)	0 (0.0)
$10,000-$29,999	14 (8.4)	14 (9.3)	0 (0.0)
$30,000-$49,999	35 (21.1)	33 (22.0)	2 (12.5)
$50,000-$69,999	50 (30.1)	46 (30.7)	4 (25.0)
$70,000-$89,999	26 (15.7)	23 (15.3)	3 (18.8)
$90,000-$99,999	12 (7.2)	12 (8.0)	0 (0.0)

| | Over $100,000 | 16 (9.6) | 13 (8.7) | 3 (18.8) |
| | Prefer Not to Answer | 7 (4.2) | 3 (2.0) | 4 (25.0) |

Note. PTSD = Posttraumatic Stress Disorder. [a]Participants could choose more than one response

option. Percentage totals may be $\geq$ 100%. *$p <$ .05. **$p <$ .001.

Table 2

Sample Characteristics: COVID-19 Risk Factors

	Total (*N*=166)	MTurk (*n*=150)	SONA (*n*=16)
Chronic Health Dx (*n*, %)			
Yes	24 (14.5)	23 (15.3)	1 (.3)
No	139 (83.7)	124 (82.7)	15 (93.8)
Prefer Not to Answer	3 (1.8)	3 (2.0)	0 (0.0)
US Region (*n*, %)			
Northeast	27 (16.3)	27 (18.0)	0 (0.0)
Southeast	40 (24.1)	40 (26.7)	0 (0.0)
West	34 (20.5)	33 (22.0)	1 (6.3)
Southwest	23 (13.9)	22 (14.7)	1 (6.3)
Midwest	42 (25.3)	28 (18.7)	14 (87.5)
COVID-19 Restrictions (*n*, %)			
No Restrictions	33 (19.9)	28 (18.7)	5 (31.3)
Relaxed/Plan to Relax Restrictions	68 (41.0)	59 (39.3)	9 (56.3)
Don't Know Restrictions	3 (1.8)	3 (2.0)	0 (0.0)
"Stay at Home" Orders[a]	61 (36.7)	59 (39.3)	2 (12.5)
Prefer Not to Answer	1 (0.6)	1 (0.7)	0 (0.0)
COVID-19 Health History (*n*, %)			
Healthy	143 (86.1)	127 (84.7)	16 (100.0)
Sick, Tested Negative	13 (7.8)	13 (8.7)	0 (0.0)
Sick, Not Tested/Don't Qualify	5 (3.0)	5 (3.3)	0 (0.0)
Sick, Tested Positive	1 (0.6)	1 (0.7)	0 (0.0)
Significant Other Tested Positive	11 (6.6)	11 (7.3)	0 (0.0)
Significant Other Passed Away	4 (2.4)	4 (2.7)	0 (0.0)
Caregiver (COVID-19 Patient)	0 (0.0)	0 (0.0)	0 (0.0)
Prefer Not to Answer	1 (0.6)	1 (0.7)	0 (0.0)
COVID-19 Impacts (*n*, %)			
Loss of Income	54 (32.5)	53 (35.3)	1 (6.3)
Lack of Resources	38 (22.9)	35 (23.3)	3 (18.8)
Stress Due to Infection Worry	69 (41.6)	58 (38.7)	11 (68.8)
COVID-19 Information Seeking	27 (16.3)	25 (16.7)	2 (12.5)
None	38 (22.9)	34 (22.7)	4 (25.0)
Prefer Not to Answer	1 (0.6)	1 (0.7)	0 (0.0)

Note. [a]Orders to "stay at home," "shelter in place," or "lockdown" for "essential" trips in public.

Table 3

Group Difference Analyses: MTurk Students Compared to SONA Students

Measure	MTurk Students (*n*=33)		SONA Students (*n*=16)		*t* (df)
	M	*SD*	*M*	*SD*	
Age	35.00	10.42	21.44	8.55	4.84 (35.70)**
GAD-7 Total	8.03	5.69	6.75	6.83	0.69 (47)
PHQ-2 Total	2.36	1.65	1.69	1.40	1.41 (47)
PCL-5 Total	28.36	22.25	17.69	15.72	1.94 (40.41)
ERRI Total	26.36	12.81	20.94	15.71	1.29 (47)
MHLC-Internal	25.15	4.06	25.13	5.12	0.02 (47)
MHLC-External	42.42	10.33	39.31	8.00	1.06 (47)
MHLC-God/HP	21.61	8.93	16.88	8.64	1.76 (47)
PTGI Total	58.91	24.15	46.19	25.25	1.70 (47)

Note. *p < .05. ** p< .001. HP = Higher Power

Table 4

Correlation Matrix: Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age	-														
2. Gender[a]	.061	-													
3. Education[a]	.139	N/A	-												
4. Ethnicity[a]	.304**	N/A	N/A	-											
5. Income[a]	-.072	N/A	N/A	N/A	-										
6. Relationship Status[a]	.239**	N/A	N/A	N/A	N/A	-									
7. COVID-19 Information Seeking[a]	.020	N/A	N/A	N/A	N/A	N/A	-								
8. GAD-7 Score	-.162*	.136	.305**	-.091	-.148	.020	.187*	-							
9. PHQ-2 Score	-.083	.054	.282**	-.071	-.106	.004	.144	.747**	-						
10. PCL-5 Total	-.143	.142	.408**	-.004	-.112	.130	.152	.799**	.704**	-					
11. ERRI Total	-.137	.096	.346**	-.082	-.047	.126	.148	.683**	.559***	.738***	-				
12. MHLC Internal	.039	.221*	.007	-.079	-.067	.015	.147	.054	-.062	.003	.113	-			
13. MHLC External	-.199*	.131	.344**	-.103	-.036	.196*	.272**	.499***	.444**	.629***	.500***	.059	-		
14. MHLC God	-.105	.019	.218*	-.171*	-.037	.235**	.169*	.351**	.331**	.436**	.323**	.037	.522**	-	
15. PTGI Total	-.050	.028	.295**	-.195*	.002	.246**	.188*	.254**	.234**	.370**	.426**	.240**	.511**	.474**	-

Note. *p < .05. **p < .01.

[a] Variables coded 0 or 1 for correlational analyses. 0=Female, 1=Male; 0=Less than Bachelor's Degree, 1=Bachelor's Degree or more; 0=Non-White, 1=White; 0=Income ≤ $69,999, 1=Income ≥ $70,000; 0=Not married or living with partner, 1=Married or living with partner; 0=Not spending large percentage of time finding COVID-19 updates online or TV, 1=Spending large percentage of time finding COVID-19 updates online or TV.

Table 5

Regression Analysis: Internal HLC and External HLC on Traumatic Stress Symptoms

	b	SE*b*	β	Adjusted R^2
Step 1				
(Constant)	-8.17	3.53		
Education	3.48	1.10	0.16**	
Anxiety Symptoms	2.19	0.24	0.60**	
Depression Symptoms	2.56	0.79	0.21*	.695**
Step 2				
(Constant)	-16.47	5.54		
Education	2.13	0.97	0.10*	
Anxiety Symptoms	1.90	0.23	0.52**	
Depression Symptoms	2.13	0.75	0.18*	
MHLC – Internal	-0.13	0.16	-0.03	
MHLC – External	0.48	0.09	0.26**	.738**

Note. *p < .05. ** p≤ .001.

Table 6

Regression Analysis: Spiritual HLC on Traumatic Stress Symptoms

	b	SE*b*	β	Adjusted R^2
Step 1				
(Constant)	.8.99	3.57		
Education	3.84	1.02	0.18**	
Anxiety Symptoms	2.18	0.24	0.59**	
Depression Symptoms	2.47	0.81	0.20*	.686**
Step 2				
(Constant)	-12.54	3.67		
Education	3.47	1.00	0.16**	
Anxiety Symptoms	2.07	0.24	0.56**	
Depression Symptoms	2.24	0.79	0.19*	
MHLC – God/Higher Power	0.31	0.10	0.14*	.701*

Note. *p < .05. ** p≤ .001.

Table 7

Regression Analyses: Internal HLC and External HLC on PTGI Total Score

	b	SEb	β	Adjusted R^2
Step 1				
(Constant)	29.11	7.87		
Education	6.66	2.19	0.24*	
Race/Ethnicity	-12.03	4.08	-0.22*	
Relationship Status	8.14	4.12	0.16*	
COVID-19 Information Seeking	9.57	5.09	0.14	.156**
Step 2				
(Constant)	43.42	7.48		
Education	2.60	2.10	0.09	
Race/Ethnicity	-8.22	3.69	-0.15*	
Relationship Status	6.60	3.68	0.13	
COVID-19 Information Seeking	1.35	4.73	0.02	
MHLC – Internal	5.07	1.71	0.20*	
MHLC – External	10.79	1.91	0.42**	.326**
Step 3				
(Constant)	43.68	7.49		
Education	2.55	2.09	0.09	
Race/Ethnicity	-8.68	3.72	-0.16*	
Relationship Status	7.13	3.72	0.14	
COVID-19 Information Seeking	0.60	4.79	0.01	
MHLC – Internal	5.78	1.86	0.22*	
MHLC – External	10.35	1.96	0.40**	
MHLC – Internal x External	1.39	1.43	0.07	.325

Note. *p < .05. ** p≤ .001.

Table 8

Regression Analysis: Spiritual HLC on PTGI Total Score

	b	SE*b*	β	Adjusted R²
Step 1				
(Constant)	28.85	7.81		
Education	6.73	2.18	0.24*	
Race/Ethnicity	-11.97	4.06	-0.21*	
Relationship Status	8.18	4.09	0.16*	
COVID-19 Information Seeking	9.49	5.07	0.14	.158**
Step 2				
(Constant)	34.85	7.34		
Education	5.02	2.05	0.18*	
Race/Ethnicity	-7.80	3.86	-0.14*	
Relationship Status	4.50	3.87	0.09	
COVID-19 Information Seeking	6.33	4.75	0.09	
MHLC – God/ Higher Power	9.63	1.87	0.37**	.274**

Note. *p < .05. ** p≤ .001.

Table 9

Linear & Curvilinear Regression Analyses: PCL-5 Total Score on PTGI Total Score

	b	SEb	β	Adjusted R^2
Step 1				
(Constant)	28.85	7.81		
Education	6.73	2.18	0.24*	
Race/Ethnicity	-11.97	4.06	-0.21*	
Relationship Status	8.18	4.10	0.16*	
COVID-19 Information Seeking	9.49	5.07	0.14	.158**
Step 2				
(Constant)	40.76	8.24		
Education	3.31	2.31	0.12	
Race/Ethnicity	-11.35	3.92	-0.20*	
Relationship Status	8.85	3.95	0.17*	
COVID-19 Information Seeking	7.48	4.93	0.11	
PCL-5 Total Score	7.23	2.02	0.28**	.216**
Step 3				
(Constant)	35.45	8.35		
Education	3.80	2.28	0.14	
Race/Ethnicity	-12.82	3.90	-0.23**	
Relationship Status	7.34	3.93	0.14	
COVID-19 Information Seeking	6.37	4.86	0.09	
PCL-5 Total Score	5.11	2.14	0.20*	
Squared PCL-5 Total Score	5.64	2.19	0.20*	.243*

Note. *p < .05. ** p≤ .001.

Table 10

Linear & Curvilinear Regression Analyses: ERRI Total Score on PTGI Total Score

	b	SEb	β	Adjusted R^2
Step 1				
(Constant)	28.52	7.81		
Education	6.73	2.18	0.24*	
Race/Ethnicity	-11.97	4.06	-0.21*	
Relationship Status	8.18	4.09	0.16*	
COVID-19 Information Seeking	9.49	5.07	0.14	.158**
Step 2				
(Constant)	40.26	7.80		
Education	3.20	2.20	0.12	
Race/Ethnicity	-9.86	3.86	-0.18*	
Relationship Status	8.62	3.87	0.17*	
COVID-19 Information Seeking	7.20	4.82	0.10	
ERRI Total Score	8.73	1.94	0.33**	.249**
Step 3				
(Constant)	36.45	7.94		
Education	3.43	2.18	0.12	
Race/Ethnicity	-9.52	3.83	-0.17*	
Relationship Status	8.12	3.84	0.16*	
COVID-19 Information Seeking	5.99	4.81	0.09	
ERRI Total Score	8.99	1.92	0.34**	
Squared ERRI Total Score	3.24	1.59	0.14*	.264*

Note. *p < .05. ** p≤ .001.

Table 11

Moderation Analysis: Rumination by Internal HLC on Positive Psychological Adaptation

	b	SEb	β	Adjusted R^2
Step 1				
(Constant)	28.52	7.81		
Education	6.73	2.18	0.24*	
Race/Ethnicity	-11.97	4.06	-0.21*	
Relationship Status	8.18	4.09	0.16*	
COVID-19 Information Seeking	9.49	5.07	0.14	.158**
Step 2				
(Constant)	39.42	7.68		
Education	3.45	2.17	0.13	
Race/Ethnicity	-9.26	3.81	-0.17*	
Relationship Status	8.34	3.81	0.16*	
COVID-19 Information Seeking	5.70	4.78	0.08	
Rumination[a]	8.17	1.92	0.31**	
MHLC – Internal[a]	4.42	1.78	0.17*	.272**
Step 3				
(Constant)	40.04	7.68		
Education	3.23	2.17	0.12	
Race/Ethnicity	-9.31	3.80	-0.17*	
Relationship Status	8.44	3.80	0.16*	
COVID-19 Information Seeking	4.96	4.81	0.07	
Rumination[a]	7.76	1.94	0.29**	
MHLC – Internal[a]	4.60	1.79	0.18*	
Rumination X MHLC-Internal[a]	2.01	1.62	0.09	.275

Note. *p < .05. ** p≤ .001. [a]Denotes standardized predictor variable or interaction term in

regression model(s).

Table 12

Moderation Analysis: Rumination by External HLC on Positive Psychological Adaptation

	b	SE*b*	β	Adjusted R^2
Step 1				
(Constant)	29.11	7.86		
Education	6.66	2.19	0.24*	
Race/Ethnicity	-12.03	4.08	-0.22*	
Relationship Status	8.14	4.12	0.16*	
COVID-19 Information Seeking	9.57	5.09	0.14	.156**
Step 2				
(Constant)	48.10	7.67		
Education	1.09	2.16	0.04	
Race/Ethnicity	-8.31	3.70	-0.15*	
Relationship Status	7.40	3.70	0.14*	
COVID-19 Information Seeking	3.03	4.70	0.04	
Rumination[a]	5.52	2.00	0.21*	
MHLC – External[a]	8.73	2.07	0.35**	.321**
Step 3				
(Constant)	48.10	7.70		
Education	1.09	2.17	0.04	
Race/Ethnicity	-8.32	3.73	-0.15*	
Relationship Status	7.40	3.71	0.14*	
COVID-19 Information Seeking	3.03	4.72	0.04	
Rumination[a]	5.51	2.01	0.21*	
MHLC – External[a]	8.72	2.10	0.36**	
Rumination X MHLC-External[a]	0.03	1.65	0.01	.316

Note. *p < .05. ** p≤ .001. [a]Denotes standardized predictor variable or interaction term in

regression model(s).

Table 13

Moderation Analysis: Rumination by Spiritual HLC on Positive Psychological Adaptation

	b	SE*b*	β	Adjusted R^2
Step 1				
(Constant)	28.85	7.81		
Education	6.73	2.18	0.24*	
Race/Ethnicity	-11.97	4.06	-0.21*	
Relationship Status	8.18	4.09	0.16*	
COVID-19 Information Seeking	9.49	5.07	0.14	.156**
Step 2				
(Constant)	42.61	7.42		
Education	2.59	2.09	0.09	
Race/Ethnicity	-6.88	3.73	-0.12	
Relationship Status	5.46	3.74	0.10	
COVID-19 Information Seeking	5.12	4.60	0.07	
Rumination[a]	6.71	1.90	0.26**	
MHLC – God/Higher Power[a]	7.99	1.87	0.31**	.323**
Step 3				
(Constant)	42.58	7.46		
Education	2.60	2.11	0.09	
Race/Ethnicity	-6.86	3.76	-0.12	
Relationship Status	5.47	3.76	0.10	
COVID-19 Information Seeking	5.14	4.66	0.07	
Rumination[a]	6.72	1.91	0.26**	
MHLC – God/Higher Power[a]	7.97	1.90	0.31**	
Rumination X MHLC – God/HP[a]	-0.09	1.61	-0.01	.319

Note. *p < .05. ** p≤ .001. [a]Denotes standardized predictor variable or interaction term in

regression model(s). HP=Higher Power.