

BENEFIT FINDING AND RESILIENCY IN THE WAKE OF  
HURRICANE HARVEY AND CANCER

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A Dissertation

Presented to

The Faculty of the Department

of Psychology

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In Partial Fulfillment

Of the Requirements for the Degree of

Doctor of Philosophy

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By

Carol Wang

December, 2021

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## **Abstract**

Adverse life events such as cancer or exposure to a hurricane have profound and lasting impacts on the individual. The psychological and social costs of undergoing such events can be devastating. While many individuals report adverse psychological effects in response to these adverse life events, some report positive psychological growth and adaptive responses, such as proactive attempts to process the experience. These individuals are deemed resilient such that they have the capacity to successfully adapt to adversity by demonstrating positive adjustment. Thus, resiliency is thought of both a process and an outcome. There have been various strategies that have been utilized in the attempt to increase the resiliency among those exposed to adverse events. One strategy that has been found to be effective in promoting resiliency by improving the psychological and physical health of individuals who have undergone through adversity are writing interventions. Benefit finding, or finding the benefits from adversity, has also shown promising evidence in promoting resiliency. However, less is known about the relationship between benefit finding and physiological health. The current paper reviews two studies, (1) one that tests the feasibility and efficacy of a writing intervention for those exposed to Hurricane Harvey, and (2) another examining the relationship between benefit finding and cortisol profiles of Chinese American breast cancer survivors. In Study 1, participants completed baseline assessments and one writing session. Participants were randomized to either an emotional disclosure group, gratitude writing group, choice of writing prompt, or to a control group and completed one-week, four-week, and 16-week follow-up assessments. Analyses were conducted using multilevel modeling. Those in the choice of writing prompt group reported significant improvement in their satisfaction with life, over time, compared to the control group. No support was found for positive or negative affect as mediators, and benefit finding and hurricane exposure as moderators. The lack of evidence supporting the hypotheses, specifically, the

mediators and moderators, was largely due to the study's high attrition rate which rendered not enough power to sufficiently detect an effect. In terms of feasibility, this study was successful given the number of recruited participants in the short time period, the timing of the hurricane event, and the option of the choice of writing prompt. The results are discussed in the context of existing expressive writing theories and recommendations are provided for future studies. In Study 2, we sought to explore the relationship between benefit finding and cortisol markers among cancer survivors. Benefit finding was related to day one cortisol slope, but not other cortisol indices (areas of under curve or day 2 cortisol slope). There were some notable strengths the sample size and number of days sampled. This is the first study examining the link between benefit finding and diurnal cortisol among minority cancer survivors. The findings of these studies add to the research on writing interventions and benefit finding, and underscores the need for further research to examine the effects of benefit finding on psychological and physical health.

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## CHAPTER ONE

### OVERVIEW

#### Introduction

Adversity is the experience of being exposed to a stressful event that produces some form of ongoing distress to an individual, which may contribute to the onset of health consequences in the long term (Masten, Best, & Garmezy, 1990). This type of ongoing distress has implications for one's psychological well-being and overall health. The classical definition of stress defines the experience of stress as exceeding one's resources to effectively cope with a psychologically taxing experience (Lazarus & Folkman, 1984), while coping is defined as the process into which one devotes mental resources to reduce stress. More recently, an integrative approach has viewed stress as a "a process by which environmental demands that tax or exceed the adaptive capacity of an organism occasion psychological, behavioral, and biological responses that may place persons at risk for disease" (Cohen, et al., 2016). This heuristic stage model of stress incorporates the appraisal process in which an event is appraised as stressful and triggers affective states that engender behavioral and biological processes that may predispose an individual to disease onset or progression (Cohen, et al., 2016). This chapter will review the literature on stress and coping, two types of adversities (e.g., natural disasters and cancer) and their implications on health, the conceptualization of resiliency and benefit finding, and interventions promoting resiliency.

#### Stress and Coping

#### Biological Perspective

From a biological perspective, McEwen & Seeman (1999) proposed that an individual's *allostatic load*, or the "wear and tear" on the body that a person experiences as a result of chronic

stress, predisposes an individual to experience a compromised immune system and symptoms of psychological distress. The term “allostatic load” refers to allostasis, or maintaining stability through change. Those who have undergone a multitude of stressors may experience bodily responses that are maladaptive. Namely, due to constant “repeated hits” on the body, immune responses may be compromised due to environmental and psychological stressors. This over activation results in chronic stress, including impaired immune responses to fight off infectious diseases and predisposes an individual to symptoms of depression and persistent inflammation (Miller & Blackwell, 2006). The compromised immune system includes elevated physiological responses, including systolic and diastolic blood pressure, serum HDL and cholesterol, blood plasma levels, cortisol secretion, as well as elevated levels of norepinephrine and epinephrine.

### **Psychological Perspective**

From a psychological perspective, research has focused on subjective perceptions of stress exposure, including coping processes (e.g., appraisal of the stressful event, perceived threats, sense of control, resources to cope) and affective and behavioral responses to stress. This perspective stems from the observation that the same event can be perceived as stressful for some but not for others. Thus, there is not a uniform reference for a stressful experience because individual perceptions of a specific event vary. This is known as stress appraisal, a component of Lazarus and Folkman’s (1984) transactional model of stress, which defines coping as, “constantly changing cognitive and behavioral efforts to manage specific external and internal demands that are appraised as taxing or exceeding the resources of the person.” In other words, coping is the process into which one devotes mental resources to reducing stress. These resources include coping mechanisms that an individual utilizes to help mitigate a problem or reduce the perceived stress.

**The transactional model of stress.** According to the transactional model of stress, stress results from a transaction between an individual and the environment. The transactional relationship between the person and the environment is evaluated through *cognitive appraisal*, a process in which, when confronted with a stressful life event, the individual evaluates the significance of the event within the context of their abilities to handle the stress. There are two categories of the appraisal process. The first is primary appraisal which is the process whereby the individual appraises a situation as either a harm/loss, threat, or challenge (Lazarus & Folkman, 1984). *Harm/loss* appraisal regards the event to be harmful or damaging. *Threat* appraisal regards the event as having a capability to harm and may result in anger, worry, or anxiety. *Challenge* appraisal regards the event as an opportunity for learning and growth, characterized by feelings of enthusiasm and pleasure. The second category is secondary appraisal which considers one's evaluation of their resources and options for coping (Lazarus & Folkman, 1984).

**Coping processes.** One important aspect of secondary appraisal is the sense of control or accountability that one has in a stressful situation. This sense of control may guide one's thoughts and feelings related to the stressful experience, which affects their use of coping strategies. For example, an individual from an impoverished background may be working two jobs while caring for their child who may have disability needs. They might perceive their situation as harmful and feel they have little control over their situation due to a lack of resources (i.e., tangible support from friends and family, financial help) to address the stressful situation. As a result, they may utilize emotion-focused coping such as positive reframing and seeking social support by talking to others about their feelings regarding the situation.

For some types of adversities, individuals may develop and apply unique coping strategies to help mitigate the psychological and physical health consequences. When confronting potentially controllable stressors, individuals may utilize a problem-solving approach where they devise a plan to address the impact of the stressor. For example, if a student has three exams on the same day, they may adjust their study schedule to feel more prepared, and less overwhelmed with the prospect of completing the exams. When experiencing uncontrollable stressors such as losing a loved one in an accident, an individual may seek social support such as confiding in a close friend or relative, or they may choose to distance themselves from the situation. There is no universal method of coping with a stressful event; rather, individuals choose from a vast array of coping strategies that are suitable depending on individual-level factors and the context of the situation. Henceforth, I will focus on two types of adversities: natural disasters and cancer. I will consider their implications for health and well-being. I will also review mechanisms that have been proposed to account for the health consequences of undergoing adversity and mechanisms that may help alleviate the stress from encountering such stressful events.

## **Two Examples of Adversity**

### **Natural Disasters**

Natural disasters affect whole communities and vary in their scope and the extent of the loss, devastation, and displacement on individuals (Norris, et al., 2002). According to the World Health Organization (2019), natural disasters include earthquakes, hurricanes, tsunamis, volcanic eruptions, floods, wildfires, heatwaves, and droughts. These sudden and catastrophic events result in a variety of stressors, including the threat to one's own life, exposure to death and dying, symptoms of psychological distress, bereavement, social and community disruption, and lingering hardships in the wake of the aftermath among survivors. Survivors of large-scale

disasters often report post-traumatic stress symptoms, along with symptoms of depression, anxiety, somatic complaints, and unhealthy behaviors, including drinking to cope (Norris et al., 2002; Galea, et al., 2008). Sleep complaints and sleep quality suffer when compared to that of laboratory controls (Norris et al., 2002).

Hurricanes can cause extraordinary destruction and social disruption. Hurricane Andrew, which occurred in 2001, provides one example. At the time, Hurricane Andrew was one of the strongest hurricanes with a classification of category 5, the highest category on the Saffir–Simpson scale. Ironson et al. (1997) surveyed adults who were directly impacted, one and four months after the hurricane. Among the participants, 33% met the criteria for post-traumatic stress disorder (PTSD) and 44% scored in the high impact range on the Impact of Events (IES) scale. Participants also experienced compromised immune functioning such that white blood cell counts were positively related to the degree of loss and PTSD experienced. Natural killer cells and white blood cells were also retrospectively related to self-reported increase in somatic symptoms (Ironson et al., 1997). Among those exposed to Hurricane Ike, 20.6% met the criteria for suicidality, depression, panic disorder, or alcohol abuse (Pietrzak et al., 2012). Research has shown that natural disasters have been linked to increases in alcohol consumption (Shimizu et al., 2002; Cerdá et al., 2011). In a retrospective study on low-income mothers exposed to Hurricane Katrina, participants had worsened physical health and heightened perceived stress (Rhodes et al., 2010). Furthermore, among those who experienced the most stressors and loss, these health consequences persisted for over a year. In sum, undergoing a natural disaster such as a hurricane may have a profound detrimental impact on health and well-being.



## **Cancer**

The second type of adversity of focus is cancer. According to the American Cancer Society (2020), the United States is expected to have over 1,800,000 new cancer cases, and over 606,000 cancer deaths are projected to occur within the next year. Cancer is the second leading cause of death in the United States. The five-year survival rate for all cancers combined, diagnosed during 2009-2015 was 67% overall. As of January 2019, there are 16.9 million cancer survivors in the U.S. (American Cancer Society, 2019). While the number of cancer survivors has increased, cancer survivorship is an understudied area of cancer care (Gilbert et al., 2008). A diagnosis of cancer is considered a traumatic event and is considered a crisis to almost all individuals. Cancer survivors report that the diagnosis initially left them feeling out of control, and in a state of absolute confusion. Due to this sudden traumatic event, many report shock and unfamiliarity with the situation (Taylor, 1983). There is a sense of uncertainty that permeates throughout the cancer trajectory, including during the initial diagnosis, intensive treatment, and once the cancer is found to be medically “gone,” there is a fear of recurrence (Koch et al., 2013).

The literature on cancer survivorship has focused on the largest groups of cancer survivors including breast, prostate, colorectal, and gynecological cancers. An emerging series of work highlights the long-term symptom burden associated with the cancer experience. Among breast cancer survivors treated with surgery, chemotherapy, radiation, and/or hormone therapy, fatigue was often reported immediately following treatment and some two to five-years post-treatment (Harrington et al., 2010; Lee et al., 2008; Jacobsen et al., 2007). In fact, fatigue is one of the most common concerns among cancer survivors, with an estimated 50 to 100% of cancer patients experiencing fatigue across the trajectory (Morrow et al., 2005). Sleep difficulties were

also reported at the end of treatment and up to five years post-treatment, with up to 59% of survivors reporting sleep disturbances one to two years post-treatment (Mourits et al., 2002).

Symptoms of anxiety and depression also impact the quality of life in cancer survivors. Anxiety symptoms have been reported in the first year after treatment, with up to 48% of breast cancer survivors reporting anxiety (Dow & Lafferty, 2000). According to the National Cancer Institute's Physician Data Query (PDQ) cancer information summary (PDQ® Supportive and Palliative Care Editorial Board, 2019), depression affects approximately 15-25% of cancer patients and survivors. Among those patients hospitalized with significant physical impairment, at least 25% exhibit symptoms of major depression (Lynch, 1995). Depression among cancer survivors has been associated with lower medical adherence (Manning & Bettencourt, 2011; Arrieta et al., 2013; Barber et al., 2015) and have been shown to predict elevated mortality (Pinquart & Duberstein, 2010). Moreover, psychological distress may also contribute to a lower quality of life (Ehlers, et al., 2018; Zabora, et al., 2001). Some argue that the stressors experienced in the long-term after treatment differ from the stressors experienced after initial diagnosis and during treatment. Thus, the etiology of anxiety and depression among cancer survivors may change throughout treatment and recovery.

Complications and long-term consequences related to the diagnosis and treatment of cancer carries a substantial burden and affects an individual's health-related quality of life (HRQOL), psychological and social well-being, physical health, and re-integration into normal life (Gilbert et al., 2008; Harrington et al., 2010).

## **Resiliency: What is it?**

### **Developmental Perspective**

The study of resiliency has a long history and has its roots in developmental psychology with pioneers such as Norm Garmezy and Emmy Werner, who studied children who had undergone adverse life circumstances. Garmezy, a clinical psychologist, pioneered the resiliency theory, which examined the role of protective factors such as cognitive skills, motivation, and coping among children who had undergone adverse events such as childhood poverty, homelessness, divorce, and maltreatment in preventing the onset of mental illness. Over the course of ten years, Garmezy visited schools in economically deprived areas across the United States and interviewed teachers, social workers/nurses, parents, as well as conducted child interviews and experiments (Garmezy et al., 1984). He found groups of children who had shared a common denominator – they had experienced environmental threats such as socioeconomic stress and challenging home conditions. However, there were children, who, despite these disadvantageous circumstances, exhibited positive outcomes.

Similarly, Emily Werner, a developmental psychologist, followed a group of 698 infants in Kauai, Hawaii, over the course of 40 years (Werner & Smith, 1979). Werner found that those who were exposed to environmental risk factors were more likely to go on to experience problems with their mental and physical health, academic performance, and greater problems with family stability. However, among those high-risk children, about one-third had demonstrated “resiliency,” such that they developed into competent and caring adults. Some ‘protective’ factors observed by Werner included having a positive disposition, an internal locus of control, and a strong bond with a nonparent caretaker, such as a teacher or a mentor-like figure.

Ann Masten (1990, 1998), a trailblazer in the study of resiliency and theories on positive development among children and families who have undergone adversity, defined resilience as a dynamic process that results in positive adjustment despite significant adversity. According to Masten, two conditions must be met, namely: 1) one must be exposed to adversity such as a stressful life event or trauma, and 2) there must be a manifestation of positive adjustment such as a greater sense of self, meaning, and growth. From the developmental perspective in the context of adversity, resiliency may manifest in different forms including stable and healthy levels of psychological and physical functioning before or after the adversity, decline as a result of the adversity, followed by gradual improvement over time which is indicative of recovery. Various outcomes have been studied on the nature of resiliency to adversity including developmental tasks performance (Masten & Monn, 2015) and symptoms of psychopathology. Thus, resiliency may be context and outcome specific to preexisting societal norms or expectations grounded in developmental, historical, and cultural contexts. Nevertheless, the common definition is that resilience is an outcome and a continual process.

### **Adult Perspective: Trauma Research**

Within the past decade, an influx of research has focused on resiliency in adulthood and old age by examining individual variations in response to adverse life events. Some of these life events include the onset of a chronic illness such as cancer, bereavement, and the experience of a natural disaster such as a devastating hurricane. Resiliency in the adult perspective literature takes a more stringent approach compared to the developmental perspective and defines resiliency as an individual demonstrating healthy levels of psychological functioning before and after undergoing an adverse event. This is in contrast to the developmental perspective which

deems individuals who exhibit a recovery trajectory (e.g., exhibiting lower levels of functioning after adversity) as not being “resilient” by definition.

In a review on risk and resilience factors, Masten & Narayan (2012) identified four unique pathway patterns that suggest the potential for a broad theory of adaptation, resistance, and resilience. Some commonly described trajectories that have been observed in the literature on adversity and resiliency include: 1) resilience, 2) recovery, 3) growth, and 4) grief. A resilience trajectory is defined as exhibiting a stable and healthy trajectory of functioning before and after adversity. A recovery trajectory is defined as showing a decline as a result of experiencing adversity followed by gradual improvements. A growth trajectory refers to improvements in psychological functioning that are continual. Lastly, a grief trajectory refers to the decline in psychological functioning following adversity.

**Stress inoculation theory.** What might account for the distinct trajectories discussed in the resiliency literature? One factor may be the number, severity, or intensity of stressful life events an individual has encountered in their lifetime. Studies have shown that as the number, severity, or intensity of stressful life events increase, an individual may experience a greater number of problems and negative symptoms (Seery et al., 2010). Increasing evidence suggests that exposure to trauma or adversity of greater severity has a greater impact on individuals’ health and well-being as well as their ability to adapt. The cascading effects of traumatic experiences over time are called progressive effects, which can incite a chain reaction that affects multiple domains of an individual’s life. Some studies (Seery et al., 2010; Seery, 2011) have also shown an optimal effect in which encountering a certain number and intensity of stressful life events buffers an individual from experiencing negative health consequences as a result of new stressors. This is known as stress inoculation theory. That is, a person develops an adaptive stress

response and a higher-than-average resilience to negative effects of subsequent, uncontrollable stressors (Seery, et al., 2010; Southwick and Charney, 2012).

Within the context of the present research, and based on Masten & Narayan's (2012) definition of growth, resiliency is defined as *the capacity to successfully adapt to disturbances by demonstrating positive adjustment*. Thus, resiliency is thought of as an outcome and a process. From the process perspective, benefit finding, or finding benefits in adversity, may be an important mechanism to promote resiliency after trauma.

### **Benefit Finding**

Benefit finding is the process in which individuals derive benefits from adversity (Tedeschi & Calhoun, 1996, 2004; Bower et al., 2008). In the literature of trauma-based accounts of growth, it has been referred to as post-traumatic growth (PTG) or stress-related growth (SRG). There are several theories that have been developed to explain benefit finding, both from an outcome perspective and a process perspective. Two eminent theories include: 1) Shattered Assumptions Theory, and 2) Cognitive Adaptation Theory.

**Shattered Assumptions Theory.** According to the shattered assumptions theory, growth is an outcome triggered by a highly distressing event that challenges an individual's schemas and beliefs about the world. Tedeschi and Calhoun (1996) use the metaphor of an earthquake to describe a distressing outcome. The earthquake occurs without warning and comes as a surprise to a person. The sheer force of the earthquake shatters all previous assumptive beliefs the person has about the world. Resiliency occurs when an individual comes to accept the event for what it is and rebuilds their schemas of the world. Thus, the individual reflects on their experience and takes into account their changed reality. By integrating this event into their life by deriving meaning and positively reflecting, an individual is thought to have developed positive changes,

which in turn makes them more resilient. Some of these renowned positive changes include a greater sense of self-efficacy, appreciation for their relationships with others, greater sense of control, new possibilities, spiritual change, and a greater appreciation for life. Growth is thought to be predicted by both distal and proximal factors. Distal factors include individual “pre-trauma person characteristics, self-disclosure, personal schemas, beliefs, and goals” (Zoellner & Maercker, 2006; Tedeschi & Calhoun, 2004) and proximal factors include engaging in rumination, enduring distress, and deliberate narrative construction. These factors are relatively vague in operationalization and thus, a major critique of this theory is the difficulty of empirically testing it. However, this theory has led many researchers to use the shattered assumptions theory as a heuristic model in guiding the formulation of new research questions and predictions related to resiliency.

**Cognitive Adaptation Theory.** According to cognitive adaptation theory (CAT) developed by Shelley Taylor (1983, 1996), growth is thought of as a coping strategy and a continual process. It is triggered by a highly stressful life event that challenges an individual’s beliefs about the world. These events call for individuals to question their schemas about the world and their place in it, which often is accompanied by highly distressing emotions. In order to cope with these stressful events, an individual relies on cognitive strategies that enable them to restore their self-esteem and self-efficacy. Taylor (1983) coined the term, “positive illusions” to capture the essence of this phenomenon, that is, the unveiling of positively distorted beliefs. In a series of themes that may be sequential or concurrent, the individual goes through a process. First, the individual searches for meaning in their experience through careful reflection. Second, the person attempts to gain a greater sense of control through mastery or the belief that one has a sense of personal control over the event. Lastly, an effort is put forward in restoring one’s self-

esteem and self-efficacy through self-enhancement, including social comparison through downward comparisons (Aspinwall & Taylor, 1993; Helgeson & Taylor, 1993), dissonance resolution, and active coping. Thus, this set of protective intrapersonal resources helps individuals stabilize (or grow) from their previous levels of psychological functioning, making them more resilient.

Support for this theory comes from studies of women with breast cancer and men who tested seropositive for HIV (Taylor and colleagues, 1984, 1992). Among women with breast cancer, those who perceived they had some control over one's cancer, had better psychological adjustment (Taylor et al., 1984). Men who tested seropositive for HIV (Taylor et al., 1992), and were optimistic about their ability to forestall AIDS such that they had reduced fears of developing AIDS, exhibited less avoidant coping, used active coping methods such as helping others, seeking personal growth, and practicing health-promoting behaviors.

### **Interventions Promoting Resiliency**

#### **Cognitive-Behavioral Therapies**

In a comprehensive review, Roepke (2015) suggests that active interventions may modestly increase benefit finding. One of which is cognitive behavioral therapy (CBT). Classic CBT techniques such as exposure and cognitive restructuring have been shown to reduce distress after a traumatic event (Foa et al., 1999; Resick & Schnicke, 1992; Antoni et al., 2001; Penedo et al., 2006). Specifically, if growth occurs during the process of cognitive restructuring in which people alter their beliefs about their sense of self and the world (e.g., find benefits within their adversity), this may result in PTG. For example, prolonged exposure, a specific type of CBT, teaches people to gradually approach trauma-related memories, feelings, and situations by



replacing negative beliefs (e.g., “I am weak”) with positive beliefs (e.g., “I am strong enough to confront things I fear”) (Roepke, 2015). This likens cognitive adaptation theory in which people shift their way of thinking which grants them a greater sense of self-efficacy. This shift in beliefs relates to the personal strength domain of PTG. Similarly, cognitive-behavioral stress management trains individuals to be cognizant of the source and indicators of stress, to replace their negative thoughts with positive ones, to solicit social support, and to actively use healthy coping skills (Antoni et al., 2001). This program has been shown to promote PTG among cancer patients and survivors.

Transforming Lives Through Resilience Education (Dolbier et al., 2010) is a cognitive-behavioral intervention aimed to promote benefit finding among college students through a four-week program, with 2-hour weekly sessions. The intervention incorporated psychoeducation, cognitive restructuring of traumatic thoughts, coping strategies, and social support. Those in the intervention group showed a greater increase in PTG pre- to post- intervention than the control group. Likewise, in an eight-week RCT aimed at increasing benefit finding and improving psychological well-being for Alzheimer caregivers (Cheng et al., 2014), researchers found those in the benefit finding group had lower depressive symptoms compared to those in the psychoeducation group, when controlling for baseline benefit finding, and both groups reported lower perceptions of feeling overloaded in their role as a caregiver.

### **Writing Interventions**

Writing interventions have shown great promise in promoting growth and resiliency among those who have undergone adversity. Early theories suggest that disclosure may improve emotional processes (Pennebaker, 1989), help an individual habituate to trauma-related thoughts (Foa & Kozak, 1986), and generate insight and meaning into their experiences (Pennebaker &

Francis, 1996). Early work on writing interventions was inspired by the work of James Pennebaker (1989), who developed a writing paradigm known as expressive writing.

The traditional expressive writing paradigm asks participants to write about their deepest thoughts and feelings regarding a stressful experience. Although a large body of the literature lends to the success of expressive writing in alleviating symptoms of distress, most have failed to consider cognitive processing of the experience, specifically a renewed positive outlook such as post-traumatic growth or benefit finding. Some work suggests that expressive writing may promote benefit finding. Those in the expressive writing condition who wrote for 15 minutes in 3 separate sessions showed increases in their benefit finding at the 8-week follow-up, and the greater use of insight words predicted increases in benefit finding (Stockton et al., 2014).

Another study also found similar effects such that causal and insight words were predictors of increasing meaning-making and resulted in higher levels of benefit finding (Zheng et al., 2019).

Since hurricanes can be a catastrophic event, affecting the livelihood of many individuals, a writing intervention can be easily disseminated to individuals who have been affected and help to alleviate some of the distress experienced due to hurricane exposure. In Study 1, we sought to test a brief writing intervention for individuals who reported being affected by Hurricane Harvey, examine the effect of different writing prompts on health outcomes.

## CHAPTER TWO

### STUDY 1: WRITING INTERVENTION FOR HURRICANE HARVEY SURVIVORS

#### Introduction

Hurricanes have devastating impacts on communities (Norris et al., 2002). Individuals who have first-hand encounters with hurricanes may experience the psychological and physical health toll, a result of the detrimental consequences the hurricane has on their community. These negative consequences may have a lasting impact on an individual's psychological well-being, including the experience of post-traumatic stress symptoms, depression, anxiety, as well as their physical health, including elevated stress levels and somatic symptoms (Norris et al., 2002; Galea et al., 2008; Pietrzak et al., 2012).

Given, the major impact of hurricanes, a writing intervention may be potentially beneficial in that it can be easily disseminated to those help relieve distress among those exposed to a hurricane. Writing interventions have been previously shown to be easily disseminated among a variety of individuals who have undergone stressful life events, including cancer (Lu et al., 2012), war (Sayer et al., 2015), bereavement (O'Connor et al., 2003), and growing up with a parent struggling with addiction (Gallant & Lafreniere, 2003). Written disclosure has been shown to be effective in alleviating some of the impact of these events.

#### Writing Interventions

**Expressive writing.** Expressive writing allows the individual to confront his or her most personal thoughts and feelings through writing. Emotional expression is thought to facilitate cognitive processing of traumatic memories and eventually promotes assimilation and understanding of these highly distressing events into an integrated narrative, resulting in

affective and physiological change (Pennebaker, 1989, Pennebaker & Francis, 1996, Baikie & Wilhelm, 2005). Some benefits of expressive writing include fewer visits to the doctor (Pennebaker & Beall, 1986; King & Miner, 2000), reduced blood pressure (Davidson et al., 2002), improved lung functioning (Smyth et al., 1999), improved mood and affect (Pennebaker et al., 1988), improved psychological well-being (Park & Blumberg, 2002), reduced depressive symptoms (Lepore, 1997), and fewer post-traumatic intrusion and avoidance symptoms (Klein & Boals, 2001).

In a meta-analysis, Frattaroli (2006) found that expressive writing diminishes post-traumatic stress symptoms and depressive symptoms. Additionally, in a randomized control trial, writing facilitated growth among individuals with PTSD (veterans and victims of sexual assault) (Smyth, et al., 2008). Similarly, disclosure raised growth scores among college students with unresolved stressful life experiences. However, a limitation of the approach has been shown to have mixed results for individuals with an existing trauma history, such as victims of natural disasters, children of alcoholics, individuals who have undergone bereavement, and those screened for suicidality. Moreover, cultural factors may also contribute to the effectiveness of the writing intervention given cultural norms and scripts in emotional expression (Smyth & Pennebaker, 2008; Knowles et al., 2011). Time since trauma has also been shown to moderate the relation between writing effectiveness, well-being, and perceived growth (Frattaroli, 2006). These limitations raise the question of whether the traditional paradigm of active disclosure of one's deepest thoughts and feelings promotes well-being (e.g., benefit finding and growth, increased positive affect) and reduces distress, or whether there may be other mechanisms that facilitate resiliency among those who have undergone adverse events. There has been an increase in work examining the efficacy of different types of writing instructions that taps into other

potential mechanisms that may promote resiliency, including gratitude writing and benefit finding writing.

**Gratitude writing.** Gratitude is the general acknowledgment and feeling that one has received something of beneficial value to one's life (Lambert et al., 2009). It is associated with the perception that one has received a personal benefit from another person, that was not intentionally sought, deserved, or earned (Emmons & McCullough, 2003). In this sense, gratitude functions to help affirm and strengthen relationships. In processing feelings related to gratitude, the individual affirms the goodness in one's life and recognizes that this benevolence lies outside one's self (Emmons & Stern, 2013). There is an increasing body of work suggesting the powerful utility of gratitude writing to improve psychological well-being (for a review, see Lomas et al., 2014). In a randomized control trial studying the efficacy of a gratitude writing intervention for psychotherapy clients, those who wrote letters expressing gratitude to others saw significant improvements in their mental health, compared to those in the expressive writing and control conditions at 4 and 12-week follow-ups (Wong et al., 2018). Among older adults, those who were assigned to a daily gratitude writing exercise showed increases in daily gratitude which predicted lower levels of reported loneliness and reduction in health symptoms (Bartlett & Arpin, 2019). Those who kept weekly gratitude journals were more optimistic, exercised more frequently, reported fewer physical symptoms, and had better overall well-being compared to those who recorded hassles or neutral life events (Emmons & McCullough, 2003, Study 1). Additionally, participants also reported higher levels of positive states (e.g., enthusiasm, determination, attentiveness, energy). They were also more likely to report having helped others through emotional or instrumental support (Emmons & McCullough, 2003). Thus, these studies

point to the promising function of gratitude writing as an avenue to improving psychological well-being and potentially physical health.

**Benefit finding writing.** There has been some work to indicate that writing about positive life experiences may be potentially beneficial. Research suggests that positive written disclosure can reduce the number of health complaints, health center visits, and improvement in mood and life satisfaction (Burton & King, 2004; Burton & King, 2008; Wing et al., 2006). Since much of the work has highlighted the resilient functions of positive emotions, particularly the literature that emphasizes the power of positive emotions in response to chronic stress such as the transactional model of stress (Lazarus & Folkman, 1987) and the broaden-and-build theory (Frederickson, 2004), benefit finding writing may be potentially a promising avenue to increase psychosocial resources to improve health among those that undergone adversity. While many studies focus on benefit finding as a coping process or outcome variable, there are few studies that specifically focus on harnessing benefit finding writing to improve health. A study done among adults with lupus or rheumatoid arthritis tested the efficacy of a benefit-finding writing intervention compared to a standard expressive writing or control prompt. Those in the benefit finding and expressive writing groups reported lower levels of fatigue at 3-month follow-up, and those in the benefit finding group with high levels of trait anxiety saw significant decreases in their pain levels (Danoff-Burg et al., 2006). Benefit finding writing has also been shown to be beneficial in alleviating anxiety and depression for caregivers (Lovell & Wetherell, 2020; Ashley et al., 2011). Among breast cancer patients, benefit finding writing predicted fewer medical appointments and improvement in psychological outcomes (Stanton et al., 2002). Given the evidence that points to benefit finding writing as beneficial in improving psychological and physical health, we wanted to test benefit finding writing among those exposed to Hurricane

Harvey. However, because of the recency in the timing of this study, conducted a month and a half after the hurricane, we speculated that some participants may not find it feasible to write about the benefits of their experience with the hurricane. Thus, benefit finding writing was given as an option to participants.

**Choice of writing prompt.** While much of the research has extended the traditional writing paradigm of emotional disclosure to other writing prompts (e.g., gratitude writing, benefit finding writing), less is known about the effect of having a choice in writing on well-being and health. To date, only one study testing the efficacy of the choice of prompts on expressive writing. One study done among breast cancer patients asked participants to write expressively either about their own cancer or other non-cancer experiences (Jensen-Johansen et al., 2013). Writing about topics unrelated to their own cancer predicted a greater reduction in avoidance symptoms. Furthermore, when writing about their own cancer, there was a significant reduction in depressive symptoms and an increase in positive mood. The option to choose has been related to perceived control such that having the option to choose a writing prompt may be beneficial since participants may believe they have a greater sense of control over their own emotions, feelings, and thoughts (Wallston et al., 1987). In turn, having a choice may be related to greater improvements in well-being in health. The lack of studies investigating the effect of choice in writing prompts warrants further research on the impact of having a choice on well-being and health outcomes. Thus, we sought to test the impact of having a choice in writing prompt among those exposed to Hurricane Harvey. In addition to providing the option of having a choice in writing prompt, we decided to include benefit finding writing as one of the choices to test the appropriateness of the writing prompt.

## Mechanisms

Two potential mechanisms that may explain the effect of writing on well-being and health outcomes include benefit finding and positive and negative affect.

**Benefit finding.** In the wake of a disaster, the media is drawn to survivors and the devastation of their homes and communities. It begs the question of whether one can derive benefits from experiencing such a tragic disaster. High levels of perceived growth have been reported after natural disasters including earthquakes (Xu & Liao, 2011), tsunamis (Tang, 2006), and hurricanes (Lowe et al., 2013). In fact, a systematic review by Park (2016) suggests that survivors of disasters' global meaning, including their appraisals of the event and meaning-making after the disaster, are central to their recovery and resiliency post-disaster. Given that reports of benefit finding is a recovery process and constitute active coping efforts to reappraise the disaster event, benefit finding may be beneficial to survivors of natural disasters.

There is evidence to suggest that deriving benefits from the disaster experience is related to positive outcomes. Among individuals who survived the 2010 earthquake in Haiti, benefit finding was positively related to resiliency (Mesidor & Sly, 2019). In longitudinal studies following an earthquake disaster, benefit finding at 12 months predicted fewer post-traumatic stress symptoms at 18 months. Specifically, benefit finding predicted lower numbing, intrusive, hyper-arousal, and avoidance symptoms at 18 months (Chen et al., 2015). Among survivors of the 2010 earthquake in Haiti, although there was a positive relationship between PTSD symptoms and benefit finding, PTSD symptoms were not a significant predictor of benefit finding over time (Mesidor & Sly, 2019). Likewise, in a prospective study of mostly non-Hispanic Black low-income mothers living in New Orleans, having a sense of purpose in life a year prior to Hurricane Katrina predicted increased PTG one and two years after the hurricane



(Lowe et al., 2013). It is important to note that the study did not find having a sense of purpose in life predicting post-traumatic stress symptoms, given that many studies have shown that post-traumatic growth is positively related to PTSD symptoms and other symptoms of distress (Shakespeare-Finch & Lurie-Beck, 2014). These findings reiterate the emphasis on careful consideration of methodologies to study benefit finding. For example, survivors of natural disasters may present symptoms of PTSD immediately after the disaster, and insufficient time for fully processing the event may preclude engagement in benefit finding. Once individuals have fully processed the event, benefit finding may be an important coping resource. This is consistent with the shattered assumptions theory. Researchers have found that rumination plays a key role in explaining the relationship between post-traumatic stress symptoms and benefit finding (García, et al., 2015) such that the process of rumination may help guide individuals to derive growth from adversity.

Additionally, there is some evidence to suggest that individuals who are grateful would be more likely to utilize benefit finding as a means for coping with adversity (Lambert et al., 2009). In fact, gratitude has been positively linked to making positive attributions (Wood et al., 2008), and positive reinterpretation and growth (Wood et al., 2007). In an experimental study testing the impact of gratitude writing on negative memories, those in the gratitude condition showed greater memory closure, less negative emotional impact, and lower intrusive thoughts, compared to control participants (Watkins et al., 2008). The authors argued that gratitude writing, through benefit finding, may help individuals process traumatic events. Thus, benefit finding may potentially explain the effect of gratitude writing on well-being and health outcomes.

**Positive and negative affect.** Another potential mechanism accounting for the health benefits of writing is positive and negative affect. The traditional expressive writing paradigm asks participants to write about their deepest thoughts and feelings related to a stressful life event. Emotions that are conjured up as a result of emotional disclosure writing may explain the effect of disclosure on well-being and health outcomes. In fact, resilient individuals use positive emotions to rebound from stressful experiences (Tugade & Frederickson, 2004). Thus, those who write about the positive aspects of their experience may evoke positive emotions, which act as a buffer to the negative emotions encountered with the experience. In contrast, those who write in detail about the negative aspects of their experience may potentially benefit from being able to freely convey their thoughts and feelings, which helps them process the experience. Stanton and colleagues (2002) assigned breast cancer patients to three writing groups: a cancer-fact group, an emotional disclosure group, and a benefit finding group. At the 3-month follow-up, those in the emotional disclosure group reported the greatest decrease in physical symptoms compared to the other two groups. A follow-up study (Low et al., 2006) revealed that the use of negative emotion words in essays predicted a greater decline in physical symptoms. Positive and negative affect may explain the effect of emotional disclosure writing on health outcomes.

### **Moderators**

There have been numerous moderators proposed that may account for the effects of writing on well-being and health. Two potential moderators include benefit finding and the impact of Hurricane Harvey.

Finding the benefits within adversity may draw upon intrapersonal (e.g., meaning-making) and interpersonal (e.g., social support) resources. Those who are more likely to report greater benefit finding prior to completing a writing session may benefit more from writing for a

couple of reasons. First, those who already engage in moderate to high levels of benefit finding may already actively draw upon intrapersonal resources, such as deriving meaning from their experience and positive reframing, to help them cope with the experience of a hurricane. Thus, writing may help them further process this experience. Second, those who are higher (vs. lower) on benefit finding may also draw upon their interpersonal resources such as social support. Expressive writing was most effective in alleviating cancer-related symptoms and depressive symptoms for those who reported elevated depressive symptoms and higher levels of social support (Milbury et al., 2017). Benefit finding may also moderate the impact of writing on health outcomes such that the intervention will have better effects among those who report greater benefits at baseline.

In addition, the self-reported impact of the hurricane may also be relevant to the benefits associated with writing about the hurricane experience. Those with a higher level of hurricane exposure during Hurricane Katrina experienced worse mental and physical health at least one year after the event (Rhodes et al., 2010). The psychological effects of the impact of these exposures were persistent in the long-term (Galea et al., 2008; Kessler et al., 2008). Hurricane-related financial and social stressors were related to poorer mental health (Galea et al., 2008). Thus, hurricane exposure may moderate the effect of writing on health outcomes such that the intervention will have better effects among those who report having experienced a greater impact of the hurricane.

### **The Present Study**

The current study examined the feasibility and efficacy of a writing intervention for improving health and well-being among those residing in Harris County, Texas during Hurricane Harvey from August to September of 2017. The specific aims of this study were to 1) examine

the feasibility and efficacy of a writing intervention in improving perceived stress (primary outcome) and psychological health and physical health (secondary outcomes); 2) examine benefit finding as a potential mechanism of the relationship between gratitude writing and health outcomes; 4) examine positive and negative affect as potential mechanisms of the relationship between emotional disclosure writing and health outcomes; 5) examine how baseline benefit finding and impact of the event moderate the impacts of writing on health outcomes.

## **Hypotheses**

### **Primary Outcome**

***Hypothesis 1.1:*** All three experimental writing conditions will report lower perceived stress compared to the control group.

### **Secondary Outcomes**

***Hypothesis 1.2:*** All three experimental writing conditions will report increased life satisfaction compared to the control group.

***Hypothesis 1.3:*** All three experimental writing conditions will report lower depressive symptoms compared to the control group.

***Hypothesis 1.4:*** All three experimental writing conditions will report lower physical symptoms compared to the control group.

***Hypothesis 1.5:*** All three experimental writing conditions will report improved sleep quality compared to the control group.

**Mediation hypotheses:** Benefit finding, and positive and negative affect will mediate the effects of writing on health outcomes.

**Hypothesis 2.1:** Health benefits of gratitude writing will be mediated by benefit finding.

**Hypothesis 2.2:** Health benefits of emotional disclosure writing will be mediated by positive and negative affect.

**Moderation hypotheses:** The ability to find benefits at baseline and the impact of the event will moderate the effects of writing on health outcomes.

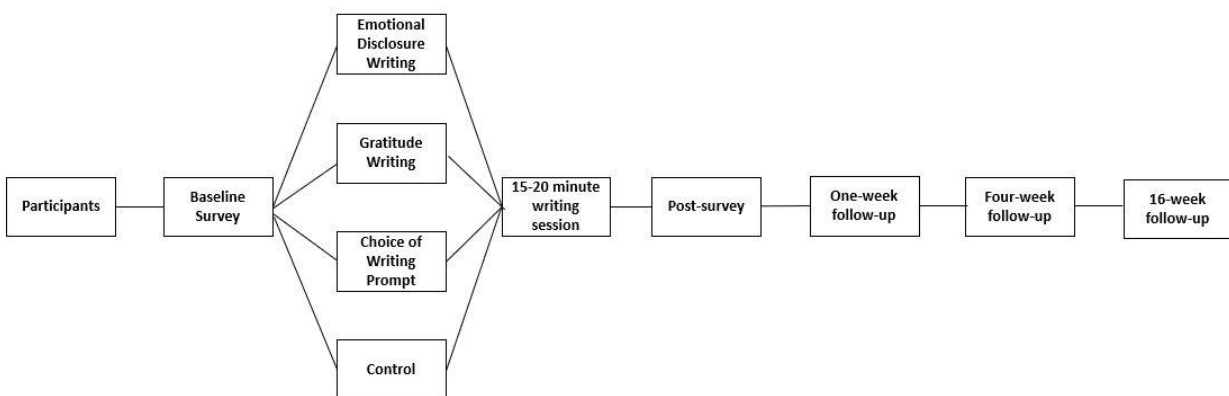
**Hypothesis 3.1:** Health benefits of the intervention will be moderated by the ability to find benefits at baseline.

- The intervention will have better effects on health outcomes among those who report greater benefits at baseline.

**Hypothesis 3.2:** Health benefits of the intervention will be moderated by the impact of the hurricane event.

- The intervention will have better effects on health outcomes among those who report having experienced a greater impact of the hurricane event.

### *Study Procedural Model*



## Methods

### Participants

A total of 438 participants signed up for the study and were assessed for eligibility. A power analysis using G\*Power 3.1 (Faul et al., 2009), suggested that a total sample size of 279 participants (363 before a 30% attrition) would have .95 power to detect a medium effect on outcome variables,  $f = .25$  (Cohen, 1969) and a sample size of 112 after attrition (146 before attrition) would have .95 power to detect a large effect,  $f = .40$ . Thus, I originally aimed to recruit a total of 400 participants from the University of Houston. Eligibility criteria included undergraduate and graduate students, ages 18 years and older, able to read English, able to provide consent, and living in areas affected by Hurricane Harvey. 426 met criteria for the study and 394 were included in the study analyses.

Demographic information of participants is presented in Table 1. Participants on average were 22.21 years of age ( $SD = 5.43$ ) and ranged from 18 to 67. Of the total sample, 80.9% identified as female and 19.1% identified as male. This was a relatively diverse sample, as 27.8% identified as White, 25.2% identified as Latinx, 24.6% identified as Asian, and 14% identified as Black/African American. 41% identified as Pell grant recipients.

### Procedure

The study was conducted in the Fall and Spring semesters of 2017 and 2018, respectively. Undergraduate students were recruited from psychology courses at the University of Houston to participate in a study to “learn about their experiences with Hurricane Harvey” in partial fulfillment of class credits. Participants signed up for the study through the SONA system, an online subject pool recruitment system. Participants must have met screening criteria before

they were able to sign up for study slots. Once a participant expressed interest through SONA, they were able to sign up for a study slot and forwarded to the study website. Participants were provided an informed consent form on Qualtrics which detailed the purpose and procedure of the study, including risks and benefits of participation. Prospective participants were reminded that their participation is completely voluntary such that they can terminate their participation at any time during the study and their responses kept confidential. After providing informed consent, participants were assigned a de-identifying code number.

The study session was held online, through Qualtrics. Participants were randomized into one of four writing conditions: emotional disclosure, gratitude writing, choice of writing prompt, and a control. Specific prompt instructions are provided below. Those in the choice of writing prompt condition had the choice of choosing to write about their deepest thoughts and feelings (i.e., emotional disclosure), what they were thankful for (i.e., gratitude writing), or perceived benefits (i.e., benefit finding), as a result of their experience with the hurricane. Writing about the perceived benefits of the experience was not given as a main choice of writing prompt because we wanted to explore the appropriateness of such a writing prompt given the context. Further analyses revealed that of those randomized in the choice of writing prompt condition, only three participants had chosen the perceived benefits writing prompt, and only one had completed the writing prompt. Participants were asked to complete a battery of questionnaires assessing outcomes, including: the impact of Hurricane Harvey they experienced, positive and negative affect, perceived stress, post-traumatic growth, life satisfaction, depression, physical symptoms, sleep quality, and demographic questions. Participants were then asked to write for 20 minutes in response to the randomized writing prompt. Immediately after completing the writing prompt, participants filled out a brief set of questionnaires assessing positive and

negative affect and manipulation check questions. One week, four weeks, and 16 weeks after completing the initial writing session, participants completed follow-up questionnaires which took 15 to 20 minutes. Participants were reminded through e-mail and phone to complete the follow-up sessions.

### *Overview of Major Variables Assessed*

Variable	Number of Items	Measure Used	Reference	Sub-dimensions
Impact of Hurricane Harvey	14	Self-developed		
Perceived Stress	10	Perceived Stress Scale (PSS)	Cohen , Kamarck, & Mermelstein (1983)	
Benefit Finding	10	Post-traumatic Growth Inventory	Tedeschi & Calhoun (1996)	1) Appreciation of Life 2) Relating to Others
Life Satisfaction	5	Satisfaction With Life Scale (SWLS)	Diener, Emmons, Larsen, & Griffin (1985)	
Depressive Symptoms	20	Center for Epidemiologic Studies Depression Scale (CES-D)	Radlof (1977)	
Physical Symptoms	10	Physical Symptoms Scale	Pennebaker & Beall (1986)	
Sleep quality	1	Pittsburg Sleep Quality Index (PSQI)	Buyse, Reynolds, Monk, Berman, & Kupfer (1989)	1) Subjective Sleep Quality
Affect	20	Positive and Negative Affect Schedule (PANAS)	Watson, Clark, & Tellegen (1988)	1) Positive Affect 2) Negative Affect

### *Measurements and Time of Assessment*

Measurement	Baseline	After first writing session	1 week follow-up	4 weeks (one month) follow-up	16 weeks (four months) follow-up
Impact of Hurricane Harvey	X				
Perceived Stress	X		X	X	X
Benefit Finding	X		X	X	X



Life Satisfaction	X		X	X	X
Depressive Symptoms	X		X	X	X
Physical Symptoms	X		X	X	X
Sleep Quality	X		X	X	X
Demographics	X				
Positive Affect	X	X	X	X	X
Negative Affect	X	X	X	X	X

### Manipulation Check

After participants completed the writing session, they were asked about their writing experience through a series of 5 questions (Pennebaker, Colder, & Sharp, 1990). On an 11-point scale with 0 indicating ‘Not at all’ and 10 indicating ‘Extremely’, participants indicated the degree to which they thought their writing experience was personal, emotional, meaningful, and how sad or depressed after the writing session.

### Intervention

#### *Control Condition*

During today's writing session, **we would like for you to write for 15 to 20 minutes about what you have eaten this week for breakfast, lunch, dinner, and snacks.** We would like you to be as descriptive as possible. For example, what type of foods did you eat? What were the colors and taste of the food? It is important that you describe your meals as you recall them. All of the information you tell us will remain confidential and will not be shared with anyone outside of the research study.

*Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until your time is up. You will be able to submit your writing after 20 minutes.*

#### *Emotional Disclosure Condition*

During today's writing session, **we would like for you to write for 15 to 20 minutes about your very deepest thoughts and feelings about your experience with Hurricane Harvey.** In your writing, we would like you to really let go and explore your very deepest emotions and thoughts regarding your experiences. You might tie your experience to your childhood, your relationships with others, including parents, lovers, friends or relatives. You may also link this event to your past, your present or your future, or to who you have been, who you would like to be, or who you are now. All of the information you tell us will remain confidential and will not be shared with anyone outside of the research study.

*Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until your time is up. You will be able to submit your writing after 20 minutes.*

### ***Gratitude Writing Condition***

During today's writing session, **we want you to write for 15 to 20 minutes about how your experiences with Hurricane Harvey has shaped your gratitude towards different elements in your life.** Think about what you feel thankful for. You may want to write about people, material items, activities and hobbies, things you took for granted day to day, and why you feel thankful for them. All of the information you tell us will remain confidential and will not be shared with anyone outside of the research study.

*Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, you continue until the time is up. You will be able to submit your writing after 20 minutes.*

### ***Perceived Benefits Condition***

People who have faced challenges as a result of a natural disaster such as Hurricane Harvey, and have overcome these challenges, report a new positive perspective on life.

During today's writing session, **we want you to write for 15 to 20 minutes about the benefits of these challenges on different domains in your life. Think about your experience with Hurricane Harvey and the challenges you faced. Now, focus on the positive aspects of the experience.**

You can write about the effect of overcoming these challenges on your self-acceptance, your relationships with others, sense of autonomy (how much control you think you have over your life), ability and resources to cope with challenges of the future, level of personal growth, or your sense of purpose in life. All of the information you tell us will remain confidential and will not be shared with anyone outside of the research study.

*Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, you continue until the time is up. You will be able to submit your writing after 20 minutes.*

### ***Choice condition***

Participants in the choice condition were given the option to choose between one of three writing prompts: 1) emotional disclosure, 2) gratitude writing, and 3) perceived benefits.

*“Please select what you would like to write about today regarding your experience:”*

- Thoughts and feelings
- What you are thankful for
- Perceived benefits

## **Measures**

### ***Outcome Measures***

**Perceived Stress.** Perceived stress was measured using the 10-item Perceived Stress Scale (PSS; Cohen et al., 1983; see Appendix A). The PSS is the most widely used instrument for measuring perceptions of stress and the degree to which situations in one's life are appraised as stressful. Items in the scale tap into the perceived sense of control and predictability of general life events within the last month. Items are measured on a 5-point Likert scale with 0 indicating 'Never' and 4 indicating 'Very often.' Example items include, "How often have you been upset because of something happened unexpectedly" and "How often have you felt nervous and stress?". The reliability in the present study was  $\alpha = 0.69$ .

**Benefit Finding.** The Post-traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996; see Appendix B) measures the degree to which an individual report experiencing a change as a result of a crisis. This study utilized a shortened version of the PTGI with 10 items. Items

are measured on a 0 to 5 scale with 0 indicating “Not at all (I did not experience this change as a result of my crisis)” to 5 indicating “A very great degree (I experienced this change to a very great degree as a result of my crisis)”. The measure included two subscales: appreciation of life and relating to others. An example item from the appreciation of life subscale includes, “I can better appreciate each day.” An example item from the relating to others subscale includes, “I have a greater sense of closeness with others.” The reliability in the present study was  $\alpha = 0.94$ .

**Satisfaction with Life.** The 5-item Satisfaction with Life Scale (Diener et al., 1985; see Appendix C) measures the degree to which an individual is satisfied with one’s life. Items are measured on a 1 to 7 scale with 1 indicating “Strongly disagree” to 7 indicating “Strongly agree.” An example item includes, “The conditions of my life are excellent.” The reliability in the present study was  $\alpha = 0.88$ .

**Depressive Symptoms.** The 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977; see Appendix D) measures the how often over the past week individuals have experienced symptoms associated with depression. Items are measured on a 0 to 3 scale with 0 indicating “Rarely or None of the Time (less than 1 day)” to 3 indicating “Most or Almost All the Time (5-7 days).” The reliability in the present study was  $\alpha = 0.84$ .

**Physical Symptoms.** The 10-item physical symptoms scale (see Appendix E) was used to assess the number of days during the last 7 days in which participants felt symptoms of an acute illness such as headache, chest pain, coughing, running/congested nose, not due to intentional physical exercise. The measure of physical symptoms was modified from Pennebaker (1982) and King and Emmons (1990). The average number of days reported by participants was used for the analysis. The reliability in the present study was  $\alpha = 0.87$ .

**Sleep Quality.** Subjective sleep quality was assessed with one item from the Pittsburgh Sleep Quality Index Scale (PSQI; Buysse, et al., 1989; see Appendix F). The question asked, “During the past month, how would you rate your sleep quality overall?” with 1 indicating “Very good” to 4 indicating “Very bad.”

### *Moderator Measures*

**Impact of Hurricane Harvey.** The 14-item scale was created by the author and assessed the degree to which an individual was affected by the hurricane (see Appendix G). Participants marked events they experienced as a result of the hurricane. Given a lack of available measures assessing the severity and intensity of experiencing a hurricane in the literature, we had developed a measure to assess the impact of a hurricane. Example items included “Home was a total loss,” “Home suffered major damage (repairable),” “Home suffered minor damage,” “Personal belongings were ruined,” and “Evacuated.” Five research assistants rated each event item and scored each item on a 1 to 4 scale with 4 indicating the most severe. An average score was derived from the ratings for each item from the raters. Hurricane exposure was assessed using the sum score based on the weighted items. The interrater reliability of the items was 0.68.

### *Mediator Measures*

**Positive and Negative Affect.** Was assessed using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988; see Appendix H). The 20-item inventory measures general affective states and includes two distinct sub dimensions of affect: positive ( $\alpha = .86$  to  $.90$ ) and negative affect ( $\alpha = .84$  to  $0.87$ ). Participants are asked to rate the extent to which they have experienced each of the 20 emotions within the past seven days. Items in the PANAS are measured on a 5-point Likert scale ranging from 1 indicating ‘Very Slightly or Not at All’ to 5

‘Extremely.’ Items from the positive dimension include "Interested" and "Excited." Items from the negative dimension include "Distressed" and "Hostile." The reliability in the present study was  $\alpha = 0.90$ .

### ***Other Baseline Measures***

**Demographics.** Participants were asked to complete questions to assess for demographic information. Demographic variables include age, gender, class standing, race/ethnicity, years in the U.S., country (or countries) of citizenship, household size, current cumulative GPA, last semester’s GPA, Pell grant recipient, educational level of mother, and educational level of father, personal income, and household income (See Appendix I).

**Subjective Social Status Scale.** Subjective social status was measured using the MacArthur Scale of Subjective Social Status Scale (SSS; Operario et al., 2004; see Appendix J), which depicts a “social ladder” and asks participants to place an “X” on the rung that they believe they stand in relation to others in the United States. It captures a common sense of social status linked to traditional socioeconomic indicators.

### **Analysis Strategy**

Preliminary analyses were conducted to examine descriptive statistics, variable distributions, missing data, and ensuring statistical assumptions were met using SPSS 27.0 and STATA 15. Relationships between demographic variables and the dependent variables were examined to assess for potential covariates to control for in the regression analyses.

Analyses were conducted using multilevel modeling using STATA (Version 17.0; StataCorp, 2017). Multilevel modeling was used to account for unbalanced groups and missing data across time points. Full information maximum likelihood (FIML) estimation is the default

for STATA programs. The feasibility of the study was tested by analyzing the compliance of the writing sessions by determining the number of completers and non-completers at each time point.

In order to test Hypotheses 1.1 to 1.5, analyses were conducted in four steps for the primary outcome and secondary outcomes. First, an unconditional means and an unconditional growth model were run examining the outcome over time. Time was coded as 0, 1, 2, 3 for each time point. Writing condition was coded via STATA, with the control group set as the reference group, emotional disclosure writing as 1, gratitude writing as 2, and choice of prompt as 3. Second, writing condition was entered as a level 2 predictor. Third, in Model 1, the Time x Writing condition interaction was entered. Fourth, in Model 2, time-invariant covariates (e.g., demographic variables associated with writing condition) were entered in our final model. Analyses for the best model error covariance structure was run using maximum likelihood and the autoregressive model error covariance structure was chosen as the best fitting model by comparing model fit statistics. For Hypothesis 1.4, testing the effect of writing across time on physical symptoms, analyses were conducted by fitting a multi-level negative binomial regression model (menbreg in STATA) given that physical symptoms constituted count data and included zeroes.

Next, to test Hypothesis 2.1 and 2.2, tests of mediation were conducted to measure the indirect effect of gratitude writing through benefit finding on perceived stress across time, and emotional disclosure writing through positive and negative affect on perceived stress across time. Baseline perceived stress were controlled for.

Lastly, analyses were conducted to test Hypothesis 3.1 and 3.2, whether benefit finding at baseline and impact of the hurricane event would moderate the effect of the intervention on

outcomes across time. The predictors (i.e., writing condition and moderator) were entered. To reduce multicollinearity, the individual moderating variable was entered before the interaction term was computed. The interaction term between the predictor (writing condition) and the individual moderating variable was then entered. Lastly, the Time X Writing Condition X Moderator was entered in the last step. If the results indicated a significant interaction, simple slopes of two-way significance were computed (Aiken & West, 1991; Preacher, Curran, & Bauer, 2006).

## Results

**Preliminary Analyses.** Preliminary analyses were conducted to examine statistical assumptions, outliers, distribution, and randomization across study conditions. Manipulation check items were analyzed across the four conditions.

**Skewness and Kurtosis.** Tests for skewness and kurtosis indicated no items with a value over 2.

**Tests of Randomization.** A general linear model was conducted to compare the differences in the demographic variables (see Table 1) across conditions and to assess whether randomization yielded equivalent groups. Results showed that there was a significant difference in age, gender, ethnicity, class standing, household income, and personal income among the four conditions. Participants in the conditions did not significantly differ by U.S. born status, Pell grant recipient, mother's education, father's education, and subjective social status (all  $ps > .05$ ). See Table 2 for descriptive statistics of baseline measures and reliabilities. Further examining group differences in outcome variables at baseline, those in the gratitude writing condition ( $b = .44$ ,  $SE = .13$ ,  $z = 3.27$ ,  $p = .001$ , 95% CI: [.17, .70]) and those in the choice of prompt condition ( $b = .28$ ,  $SE = .14$ ,  $z = 2.01$ ,  $p = .04$ , 95% CI: [.007, .55]) had significantly higher satisfaction



with life compared to those in the emotional disclosure group. For an overview of baseline group differences in outcomes, see Table 3.

**Recruitment.** Hurricane Harvey occurred on August 17<sup>th</sup> to September 2<sup>nd</sup>, 2017.

Recruitment for the study took place in the Fall semester of 2017, and begun in November 2017 or a month and a half after the hurricane. Recruitment concluded in December, or a couple weeks before the end of the semester. 438 participants signed up for the study and were assessed for eligibility. 12 were ineligible and 426 met criteria for the study (e.g., residing in Houston-area and were affected by Hurricane Harvey) and were invited for the study. 394 consented and 355 completed the baseline writing session along with the questionnaires. All materials were completed online, including the consent form.

**Attrition Across Conditions.** 355 completed the baseline writing session along with the questionnaires, 173 completed the one-week follow-up, 63 completed the four week follow-up, and 93 completed the 16 week follow-up. There were significant group differences in baseline physical symptoms and baseline sleep quality between those who completed baseline and those who completed the one-week follow-up (see Table 4). Those who completed ( $M = 12.36$ ,  $SD = 11.50$ ) the one-week follow-up had significantly less physical symptoms compared to non-completers ( $M = 15.01$ ,  $SD = 12.82$ ). Moreover, those who completed ( $M = 2.35$ ,  $SD = 0.67$ ) the one-week follow-up had better sleep quality compared to non-completers. ( $M = 2.48$ ,  $SD = 0.67$ ). Those who completed ( $M = 3.28$ ,  $SD = 0.37$ ) the four-week follow-up had significantly higher baseline perceived stress compared to those who did not complete the follow-up ( $M = 3.11$ ,  $SD = 0.51$ ) (see Table 5). Lastly, there were no significant baseline outcome differences between completers and non-completers of the 16-week follow-up (see Table 6). There were no

significant group differences in demographic variables among completers and non-completers for all the follow-up sessions. For an overview of attrition by group condition, see Table 7.

**Manipulation check.** Four general linear models were run to assess potential differences among the four conditions on manipulation check items. The manipulation check items asked participants to rate the degree (from a scale of 0 to 10) to which they believed: how personal their writing was, how much emotions they revealed through their writing, how depressed or sad they felt throughout the writing session, and the degree to which they found their writing meaningful. The contrasts yield significant group differences on all items ( $p < .05$ ). For an overview, see Table 8.

All of the intervention conditions reported their writing to be more personal, emotional, sad or depressed, valuable, and meaningful when compared to the control group. Those in the gratitude condition reported their writing to be more personal compared to emotional disclosure writing condition. Participants in the emotional disclosure condition reported their writing to be more sad or depressed compared to those in the gratitude condition. Participants in the choice of writing prompt condition reported their writing to be more valuable or meaningful compared to those in the emotional disclosure condition.

**Primary analysis of main effects.** For an overview of the descriptive statistics of the outcomes by writing condition across time, please see Table 9. First, an unconditional means model and unconditional growth model was run to examine the variation of the primary outcome variable, perceived stress, over time. The unconditional means model revealed that approximately 42% of variation in perceived stress lies between people with significant within-person variation in perceived stress due to the linear effect of time. The linear effect of time in

the growth model was significant such that participants decreased in .06 units of perceived stress at each time point ( $b = -.06$ ,  $SE = .01$ ,  $z = -4.40$ ,  $p < .001$ , 95% CI:  $[-.09, -.04]$ ).

There was significant variance left in both the initial status and rate of change of perceived stress, so writing condition was included as a level two predictor. There was no significant difference in perceived stress among those in the emotional disclosure writing, gratitude writing, and choice of writing prompt conditions, when compared to the control condition,  $ps > .05$  (See Table 10). Testing Hypothesis 1.1, that all three experimental writing conditions will report lower perceived stress compared to the control group, the Time X Condition was added and not significant. Next, age, gender, ethnicity, class standing, household income, and personal income were added as time-invariant covariates given their significant associations with the writing conditions. When controlling for time-invariant covariates, those in the choice of prompt condition reported .21 units less in perceived stress ( $b = -.21$ ,  $SE = .04$ ,  $z = -2.24$ ,  $p = .02$ , 95% CI:  $[-.40, -.03]$ ), on average, compared to those in the control condition.

An unconditional means model and unconditional growth models were run to examine to variation of the secondary outcomes: satisfaction with life, depressive symptoms, and physical symptoms, over time.

An unconditional means model revealed that approximately 59% of the variation in satisfaction with life lies between people. The linear effect of time in the growth model was not significant,  $b = .03$ ,  $SE = .04$ ,  $z = .71$ ,  $p = .48$ , 95% CI:  $[-.04, .10]$ . Testing Hypothesis 1.2, all three experimental writing conditions will report increased life satisfaction at the follow-ups compared to the control group, writing condition was added as a level two predictor. When controlling for time-invariant covariates, there was a significant Time x Choice of Prompt condition effect such that those in the choice of prompt writing condition reported significantly

higher satisfaction with life across time ( $b = .34$ ,  $SE = .17$ ,  $z = 2.05$ ,  $p = .04$ , 95% CI: [.01, .67]), compared to the control condition. Those in the emotional disclosure writing condition, on average, reported .43 units lower in satisfaction with life ( $b = .43$ ,  $SE = .18$ ,  $z = -2.37$ ,  $p = .02$ , 95% CI: [-.79, -.07]), compared to the control condition (See Table 11).

Examining depressive symptoms, the unconditional means model revealed 58% of the variation in depressive symptoms lies between people. The linear effect of time was significant,  $b = -.04$ ,  $SE = .01$ ,  $z = -3.01$ ,  $p = .003$ , 95% CI: [-.06, -.01]. Testing Hypothesis 1.3, all three experimental writing conditions will report lower depressive symptoms compared to the control group, writing condition was added as a predictor. For an overview, see Table 12. Results showed that there was no significant effect of writing condition on depressive symptoms across time. Furthermore, the Time x Writing condition interaction was not significant. After adding time-invariant covariates, both the writing condition main effect and the Time x Writing condition interaction remained the same such that both were not significant.

To test the linear effect of writing condition on physical symptoms across time, a multi-level negative binomial regression model (menbreg in STATA) was used. The linear effect of time in the growth model was significant such that participants decreased in .14 physical symptoms at each time point ( $b = -.14$ ,  $SE = 0.03$ ,  $z = -4.03$ ,  $p < .001$ , 95% CI: [-.20, -.07]). Testing Hypothesis 1.4, all three experimental writing conditions will report lower physical symptoms compared to the control group, writing condition was added as a predictor and there were no significant differences in physical symptoms (Table 13). Furthermore, the Time x Writing Condition interaction was not significant.

An unconditional means model was run for sleep. The model revealed that 52% of the variation in sleep lies between people. The growth model showed that the linear effect of time

was significant,  $b = -.08$ ,  $SE = .02$ ,  $z = -4.42$ ,  $p < .001$ , 95% CI:  $[-.12, -.05]$ . In order to test Hypothesis 1.5, all three experimental writing conditions will report improved sleep quality compared to the control group, writing condition was added as a predictor (see Table 14). There was not a significant effect of writing condition. Additionally, the Time x Writing Condition interaction was not significant. When adding the time invariant covariates, the writing main effect and the interaction remained the same such that both were not significant.

**Primary Analysis of Mediators.** Tests of mediation were conducted to examine the potential mediators, positive and negative affect of the relationship between emotional disclosure writing and health outcomes (Hypothesis 2.2) across time, while controlling for baseline perceived stress. Benefit finding was not assessed after the baseline writing session, thus was not examined as a mediator (Hypothesis 2.1). Results showed that positive affect and negative affect were not significant mediators of the relationship between emotional disclosure writing and outcomes.

**Primary Analysis of Moderators.** Tests of moderation were conducted to examine the potential moderating effect of benefit finding (Hypothesis 3.1) and impact of hurricane (Hypothesis 3.2) on outcomes. Two tests of moderation were run assessing the interactions between benefit finding and writing condition, impact of hurricane and writing condition, on outcomes across time. There was not a significant benefit finding X writing condition interaction nor was there a significant impact of hurricane X writing condition interaction.

## Discussion

This study examined the feasibility and efficacy of a writing intervention in improving health among those exposed to Hurricane Harvey and examining the relationships between benefit finding, writing, and health.

We wanted to test the feasibility of such a study given and previous work demonstrating the efficacy of writing interventions as a non-intrusive, cost-effective, and easily disseminated to help improve the psychological and physical health among those who had experienced adversity. Given the timing of study recruitment, there were a couple of challenges presented. First, participants were recruited a month and a half after the hurricane. The recency of the hurricane may have precluded individuals from participating in the study and may have also affected the study's high attrition. Nevertheless, we were able to recruit a total of 426 eligible participants. Second, in regards to eligibility criteria, participants must have specified that they were affected by Hurricane Harvey to take part in the study. We did not specify to what degree they must have been affected by the Hurricane. This may have limited the study's ability to detect an effect. For instance, some participants wrote that they were not directly impacted by the hurricane (i.e., physically lost a car, job, house etc.), but knew others who had been more severely impacted. Other participants wrote that there was 3 feet of water in their house, so they had to stay with other family members. Time since trauma has been shown to moderate the efficacy of expressive writing interventions (Frataroli, 2006). These varying degrees of different experiences may have contributed to differences in writing content. Future studies could investigate the impact of writing about vicarious adverse events on psychological and physical health as well as clearly delineate eligibility criteria with regard to exposure to an event.

The intervention groups included an emotional disclosure writing, gratitude writing, and choice of writing prompt. Those in the emotional disclosure writing group wrote about their deepest thoughts and feelings about their experience with Hurricane Harvey. Those in the gratitude writing group were asked to write about how their experiences with the hurricane had shaped their gratitude towards different elements in their life, including what they feel thankful for. Those in the choice of writing prompt condition were given the option to choose between one of three writing prompts, including emotional disclosure, gratitude writing, and perceived benefits. The control group wrote objectively about what they consumed the past week for breakfast, lunch, dinner, and snacks. Those in the choice of writing prompt group showed improvement in their satisfaction with life, over time.

It was hypothesized that those in the intervention groups would report improved health outcomes (e.g., lower perceived stress, higher satisfaction with life, lower depressive symptoms, lower physical symptoms, and better sleep quality) compared to the control group. The results of the current study partially supported these hypotheses. First, it was found that in comparison to the control group, those in the choice of writing prompt group had shown improvement in their satisfaction with life, over time. The option to choose a writing prompt may be beneficial for participants since they may believe they have a greater sense of control over their own emotions, feelings, and thoughts (Wallston et al., 1987) which is particularly beneficial for those who have experienced adversity (Taylor et al., 1984; Taylor & Armor, 1996; Seery, 2011). Thus, having a choice in writing may be related to greater improvements in psychological health. It may be the case that among participants in this study, choosing what to write about (e.g., emotional disclosure, gratitude writing, perceived benefits) affords participants a sense of autonomy over their experience with the hurricane, and allows them to appreciate their life for what it is. Thus,

we see this effect holding over time. This supports recent work published by Cosme & Berkman (2020) suggesting that having autonomy is particularly beneficial in the context of adversity, such that autonomy may be a motivational factor for individuals in contexts that limit their individual autonomy (e.g., cancer) and impact their affect regulation, which in turn, has an effect on their overall health. In the context of a catastrophic disaster, such as Hurricane Harvey, individuals may experience a variety of stressors that are not under their direct control, such as the threat to one's life, social and community disruption, and lingering hardships after the wake of the Hurricane. Having the option to choose a writing prompt to help process the adverse experience of the hurricane might boost an individual's sense of control, and allow them to confront and process the experience through writing about their personal experience and reducing stress (Pennebaker, 1989).

The effect of choice of writing prompt on perceived stress did not hold over time such that there was not a significant Time X Choice of Prompt interaction. There are several potential explanations as to why this may be the case. First, perceived stress is largely variable day-to-day and week-by-week. Participants were recruited a month and a half after the Hurricane event. Many were potentially still processing the experience and may have had to readjust if they were highly impacted such as losing their job, car, or without adequate housing. In fact, previous work has shown that it may take time for individuals to process stressors (Smyth, 1998). Secondly, it is possible that one writing session was enough to help lower perceived stress in the short term, among those who had the choice of writing prompt, but not potent enough in the long-term. In fact, the traditional expressive writing paradigm calls for participants to write at least three times in separate writing sessions within a span of a week. Third, there was a sizable number of participants lost to attrition such that only 21.1% and 18.9% of those originally randomized into



the choice of prompt group completed the four-week and 16-week follow-ups, respectively. This may have limited the potential to detect an effect if writing does lower perceived stress, over time.

When compared to the control group, no intervention group differences were found for secondary outcomes of depressive symptoms, physical symptoms, and sleep quality. It is prudent to review reasons that may account for these null findings within the context of this study. First, a reason for the null findings may be the timing of the recruitment for this study. It could be the case that the recent exposure to the hurricane event could potentially affect the efficacy of the intervention on depressive symptoms, physical symptoms, and sleep quality. Time since adverse event has been shown to be an important moderator in writing effectiveness, well-being, and perceived growth (Frattaroli, 2006). Second, it is possible the intervention writing conditions were effective, but we were unable to detect an effect. This study had a large percentage of attrition, which may have reduced the power to detect a significant effect. Only 26.6% in the emotional disclosure group, 27.7% in the gratitude writing group, and 27.2% in the choice of prompt group completed the one-week follow-up. Follow-up rates continued to decline in the four-week and 16-week follow-ups which could have masked our ability to detect effects.

No significant mediators were found, specifically, positive and negative affect did not mediate the effect of emotional disclosure writing on perceived stress across time. In fact, positive and negative affect were unrelated to perceived stress at the one-week follow-up among those in the emotional disclosure group. There are a number of ways this could be interpreted. First, the results could indicate that positive nor negative affect mediate improvements among those in the emotional disclosure group. There is some support to suggest that positive affect mediates the effect of emotional disclosure writing among health patient samples (Tugade &

Frederickson, 2004; Hevey & Wilczkiewicz, 2014; Williamson et al., 2017; Low, et al., 2006). However, some results have been mixed and suggest the important consideration of the co-occurrence of both emotions (positive and negative) such that a weaker negative correlation between positive affect and negative affect during stressful situations has been shown to related to be related to greater psychological resilience, particularly in response to heightened stress (Ong et al., 2006; Coifman, Bonanno, & Rafaeli, 2007). Another explanation for the null finding may be that we were simply unable to detect an effect due to study limitations (i.e., high attrition, number of tests).

Furthermore, no significant interactions between benefit finding and writing condition and impact of the hurricane event and writing condition emerged, across time. It was hypothesized that those higher on initial benefit finding and those higher on hurricane exposure prior to completing the writing session may benefit more from writing. This null finding is inconsistent with theoretical work on benefit finding suggesting that those who engage in greater levels of benefit finding may actively take advantage of their intrapersonal resources such as deriving meaning from their experience and engaging in positive reframing to help them cope with their experience (Taylor, 1983; Taylor et al., 2000). Lee and colleagues (2017) found that benefit finding attenuated the link between non-disclosure and depressive symptoms among breast cancer survivors. Further, higher levels of benefit finding were related to lower depression, greater social support, and physical activity (Littlewood et al., 2007). There are several potential explanations for the current finding. First, the link between benefit finding and psychological well-being is intricate such that the benefits of benefit finding may largely depend on a variety of different factors, including time since event, type of sample, racial and ethnic composition of the sample, and the measure used to assess benefit finding (Helgeson et al, 2006).

Second, it may be possible that benefit finding and hurricane exposure are moderators but the current study was unable to detect these effects given the high attrition rates which rendered us under powered. Study limitations will be addressed.

### **Limitations**

There were a number of limitations within the current study. First, this study had a large percentage of attrition at each time point, which may have masked the power to detect a significant effect. 26.6% in the emotional disclosure group, 27.7% in the gratitude writing group, and 27.2% in the choice of prompt group completed the one-week follow-up. Follow-up rates continued to decline in the four-week and 16-week follow-ups. Moreover, those who were more likely to not complete the one-week follow-up had higher physical symptoms and worse sleep quality. It is quite possible that these factors (i.e., somatic symptoms) may have prohibited these participants from completing the subsequent follow-ups. Future studies testing multiple types of writing instructions could ensure lower attrition rates by providing incentive for participants to complete follow-up sessions.

Second, participants only wrote for one session. The traditional expressive writing paradigm calls for participants to write for three sessions for three days (Pennebaker, 1998). Moreover, meta-analyses have documented that the effect of expressive writing is higher when participants write for a greater number of sessions (Fratarolli, 2006; Reinhold, Burkner, & Holling, 2006). Given the recency of the event, we wanted to test the efficacy of a brief writing intervention that would be easily disseminated to a group of individuals affected by Hurricane Harvey. Thus, participants only wrote for one session. Nevertheless, future studies should test whether the effect of one session of writing will hold for others affected by natural disasters, and how this might change for those who write for more than one session.

## **Conclusion and Future Directions**

The purpose of the current study was to examine the feasibility of a brief writing intervention among those affected by Hurricane Harvey. We tested the effectiveness of three different intervention writing instructions including: (1) emotional disclosure writing, (2) gratitude writing, and (3) choice of writing prompt, and a control prompt in improving health. We also tested the positive and negative affect as potential mediators, and benefit finding and impact of hurricane event as moderators. Additionally, those in the choice of writing prompt group also saw improvements in their satisfaction with life over time. We did not find any significant mediators nor did we find moderators. Given the relatively high attrition rates and number of tests, the current study lacked sufficient power to truly detect an effect. Nevertheless, as a feasibility study, this is only one of two studies that have tested the efficacy of the choice of writing prompt on psychological and physical health among those who have experienced a hurricane. More research is needed to clarify the effectiveness of different writing prompts, the role of choice in writing prompt, and for whom does a writing prompt benefit. The findings in the current study add to the existing work on expressive writing by presenting a novel writing intervention, one that tests several different writing instructions including the choice of prompt, for those who have been exposed to a hurricane.

## **CHAPTER THREE**

### **STUDY TWO: BENEFIT FINDING AND DIURNAL CORTISOL AMONG BREAST CANCER SURVIVORS**

#### **Introduction**

Cancer survivors have unique stressors, even long after the completion of treatment. Cancer survivors report depressive symptoms (PDQ, 2019), anxiety related to the cancer experience (Dow & Lafferty, 2000), post-traumatic stress symptoms, and even post-traumatic growth or benefit finding (Taylor, 1983). The stressors associated with the cancer experience have been linked to comprised hypothalamic pituitary adrenal axis (HPA) functioning, the physiological stress system. One proxy for HPA activity is cortisol, a biomarker for stress. There is some evidence to suggest that benefit finding is related to healthier cortisol profiles among cancer survivors. Among cancer-related samples, Cruess & colleagues (2000) enrolled women being treated for breast cancer in a cognitive-behavioral stress management intervention. Participants were also asked to report benefit finding related to their cancer experience. Those in the intervention condition reported greater benefit finding and reduced serum cortisol levels. Moreover, the effect of the intervention was explained by increases in benefit finding. Benefit finding has also been found to be related to steeper diurnal cortisol slopes among women with metastatic breast cancer (Diaz et al., 2014) and men with prostate cancer (Wang & Hoyt, 2018). This warrants the need for further research into the relationship between benefit finding and cortisol, particularly ethnically diverse samples of cancer patients and survivors. The current study sought to examine benefit finding in relation to cortisol markers among Chinese American breast cancer survivors, an understudied and underserved group. First, I will review the literature

on benefit finding in the context of cancer, the role of the HPA axis and cortisol, the relationship between breast cancer and cortisol, and benefit finding and HPA activity.

### **Benefit Finding in the Context of Cancer**

There were an estimated 16.9 million cancer survivors in the United States as of January 2019 (American Cancer Society, 2019). An individual is considered a cancer survivor from the time of diagnosis through the course of his or her life. This includes those living with cancer and those free from cancer (National Coalition for Cancer Survivorship, 2014). Intuitively, finding benefits within the cancer experience is linked to enhanced well-being. Still, the question remains whether the experience of benefit finding translates to actual improvements in psychological and physical health.

In early work researching the role of growth among cancer survivors, Taylor (1983, 1984) interviewed breast cancer survivors and many reported that they had a renewed sense of meaning and purpose in life such that finding benefits within the cancer experience was related to better health and psychological well-being. This provided a sense of control over their illness, improved their self-esteem, and granted them a sense of meaning (Taylor and Armor, 1996). When comparing women with breast cancer with those matched healthy comparison women (Cordova et al., 2001; Ruini et al., 2013) and those with benign breast problems (Andrykowski et al., 1996), the breast cancer survivors showed a greater positive psychosocial adjustment in benefit finding including improvement in their interpersonal relationships, appreciation of life, and deeper spiritual satisfaction.

In cross-sectional studies examining the relationship between benefit finding and well-being, Ruini and colleagues (2013) reported that breast cancer survivors with high levels of

reported PTG displayed an increased level of physical well-being and less distress. PTG was also found to attenuate the relationships between post-traumatic stress symptoms and both depression and QOL (Morrill et al., 2008). The researchers argue that finding benefits in response to a distressing event such as cancer may be psychologically protective. In longitudinal studies, benefit finding has been shown to predict improved psychological well-being and physical health. Carver and Antoni (2004) followed a group of 96 early-stage breast cancer survivors over the course of 5-8 years post-diagnosis. Their sample was relatively diverse with 11 participants identifying as Black and 21 participants identifying as Hispanic. Initial benefit finding predicted an increase in perceived quality of life, positive affect, decrease in negative affect, and decrease in depressive symptoms after controlling for education, age, and stage of the disease. Likewise, Bower et al. (2008) found that deriving meaning from the experience was associated with higher levels of positive affect and marginally higher ratings of mental health at baseline.

Researchers have also found a curvilinear pattern for the relationship between benefit finding and QOL such that those with low or high benefit finding reported higher QOL compared to those who reported moderate benefit finding. In the follow-up, researchers found a similar pattern such that there was also a curvilinear pattern between benefit finding and QOL, and benefit finding and PA, while an adverse quadratic effect for negative affect, depressive symptoms, and perceived social disruption (Lechner et al., 2006, Study 1). An increase in benefit finding from one month to one year following surgery predicted fewer depressive symptoms, improved QOL, and less worry about cancer at a one-year follow-up (Schwarzer et al., 2006).

In contrast, some studies have not found any positive relationship between benefit finding and psychological and physical health. Tomich and Helgeson (2004) found that women with poorer prognosis (e.g., Stage III) of cancer, greater initial benefit finding predicted more negative

affect at both 3- and 9-month follow-ups. Additionally, benefit finding did not predict distress or QOL at 3- and 12-month follow-ups among women with early-stage (e.g., Stage I and II) breast cancer (Sears et al., 2003). Among long-term colorectal cancer survivors, benefit finding was not found to be related to QOL (Jansen et al., 2011).

These mixed findings point to several important factors that may contribute to the relationship between benefit finding and psychological well-being among cancer survivors. These factors include the type of study design and the diversity of race/ethnicity and statuses among participants. While most of the cancer literature on benefit finding and QOL and well-being is cross-sectional, the few longitudinal studies following cancer survivors show promising evidence that benefit finding in the long-term may be beneficial for cancer survivors' health and well-being (Carver & Antoni, 2004; Lechner et al., 2006; Scharwzer et al., 2006). Further work is needed to examine the long-term effects of benefit finding on cancer survivors' well-being. Likewise, due to the lack of prospective studies, it is unclear whether growth results in improved well-being among survivors or those who are already high in positive well-being report greater growth. Indeed, in a systematic review, Bostock et al. (2009) found that dispositional optimism is related to the development of PTG when an individual perceives the event to be controllable. However, when the event is perceived to be a threat, dispositional optimism may not predict PTG or positive health outcomes. The racial composition of the study sample has also been found to be a critical factor in the link between benefit finding and well-being. Those who identify as belonging to a racial/ethnic minority group report greater growth, compared to those who identify as Non-Hispanic White (e.g., Bellizzi et al., 2010). Indeed, Helgeson et al. (2006) found that benefit finding was more strongly associated with better health (e.g., lower depression, anxiety, global distress, and higher positive well-being) when minority respondents



comprised 25% or more of the study sample (i.e., cancer and non-cancer) in their meta-analysis. Thus, greater work is needed to examine the link between benefit finding and psychological health among diverse groups of cancer patients and survivors.

Although the literature points to a positive relation between benefit finding and psychological and mental health, little work has been done to examine the relationship between benefit finding and physiological health. A marker of physiological health is optimal hypothalamic pituitary adrenal axis functioning, which is responsible for the cascading effects of stress on the human body.

### **The Hypothalamic Pituitary Adrenal (HPA) Axis**

The hypothalamic pituitary adrenal (HPA) axis is activated upon the perception of a stressful experience and a cascade of biological events occurs to help the individual manage the stressful event (Herman et al., 2016). First, the activation of the HPA axis causes the paraventricular nucleus (PVN) of the hypothalamus in the brain, which is responsible for stress regulation including one's body temperature, emotions, appetite, emotions, sleep cycle, and blood pressure/heart rate, through the release of hormones from the pituitary gland, to secrete the corticotrophin-releasing hormone (CRH). Next, CRH then stimulates the pituitary gland which releases the adrenocorticotrophic hormone (ACTH). Following, ACTH stimulates the release of cortisol, the stress hormone, from the outer part of one's cortex of the adrenal gland. Once blood cortisol levels are sufficient, cortisol creates a negative feedback loop whereby the PVN and the pituitary gland are signaled to stop the secretion of CRH and ACTH. This allows the body to return to homeostasis (McEwen, 1998; McEwen & Seeman, 1999) by signaling other bodily pathways to go downstream, in turn, alleviating some of the impact of the stressor on the body.

Although activation of the HPA axis is beneficial in the short-term, products of prolonged activation of the HPA axis, such as abnormal cortisol profiles, has detrimental consequences on one's health in the long-term.

### **Cortisol**

Cortisol is a glucocorticoid hormone produced by the cortex within the adrenal gland and is released as a result of HPA axis activation. Cortisol is commonly used as a physiological biomarker for stress among animals and humans (Kirschbaum & Hellhammer, 1989). Specifically, exposure to cortisol activates allostatic processes which serve to stabilize bodily functions (McEwen & Wingfield, 2003) in response to stress. However, a period of chronic stress produces a high allostatic load which has negative consequences on one's health (McEwen, 1998). Within this study, cortisol is defined as an indicator of the body's response (i.e., HPA axis reactivity) to a stressor and may be an indicator of normal biological or pathogenic processes.

Salivary cortisol is a non-invasive method to test cortisol levels (Kirschbaum and Hellhammer, 1994) and a biomarker of the allostatic load. Extensive research has indicated that salivary cortisol is a reliable physiological measure of stress (for a review, see Kirschbaum & Hellhammer, 1989). Salivary cortisol levels are often determined by the use of a high sensitivity enzyme immune assay kit (EIA kit) which uses antibodies to capture unbound cortisol in saliva (Nalla et al., 2015). Typically, saliva is collected using a sample device called a "Salivette" (Sarstedt Inc., Rommelsdorf, Germany). Among healthy individuals, cortisol patterns follow a normative pattern of highest cortisol levels before awakening, with a spike approximately 30 minutes after awakening (known as the cortisol awakening response, CAR), and a gradual decrease in levels over the course of the day (Elder et al., 2014). For healthy adults, the normal

range of morning diurnal salivary cortisol levels ranges from 3.5 to 27 nmol/L in the morning and < 6.0 nmol/L in the late evening (Aardal & Holm, 1995). However, among breast cancer patients and survivors, patterns of diurnal cortisol may be abnormal.

### **Breast Cancer and Diurnal Cortisol**

Up to 70% of breast cancer patients and survivors may have abnormal cortisol patterns such that their profiles are flattened, consistently high, or erratic (van der Pompe et al., 1996). In fact, among those with more advanced disease, these cortisol patterns are even more disrupted such that they may have lower levels of early-morning peak and flatter diurnal cortisol profiles overall (Touitou et al., 1995). Altered cortisol profiles are a manifestation of abnormal HPA axis reactivity and have been associated with being chronically stressed (Wüst et al., 2000).

These deviations in normal cortisol patterns have been linked to both the physical stress of cancer (Cash et al., 2015; Bower et al., 2005) and the psychological stress associated with the cancer experience (Dedert et al., 2012; Porter et al., 2003). Breast cancer patients with elevated cortisol awakening responses (CAR) had higher levels of biomarkers (e.g., VEGF) associated with tumor invasion and immunosuppression, while those with strong circadian activity patterns showed less evidence of tumor growth as evidenced by their cortisol profiles (Cash et al., 2015). Flatter cortisol slopes with a less rapid decline in levels in the evening hours were associated with high levels of fatigue among breast cancer survivors (Bower et al., 2005). Psychological stress markers have also been linked to deviations in cortisol patterns. Among breast cancer patients awaiting surgery, distress and avoidant coping was positively related to disruption of the circadian rhythm and had flatter cortisol patterns (Dedert et al., 2012). Similarly, breast cancer survivors who were due for a mammography screening had higher levels of cortisol at baseline compared to women without a history of cancer. Moreover, the survivors also had suppressed

cortisol responses to a cancer-related stressor even after several years of completing treatment (Porter et al., 2003). This suggests that the stressor of being screened for cancer may elicit compromised HPA functioning, and result in abnormal cortisol patterns associated with the cancer treatment or the fear of recurrence.

### **Benefit Finding and HPA activity**

Benefit finding has been shown to have a positive impact on psychological adjustment to cancer including improvement in psychological well-being (Carver & Antoni, 2004) and subjective reports of physical health (Bower et al., 2008). Finding benefits in adversity has also been linked to positive intrapersonal and interpersonal resources (Bower et al., 2008; Bower & Segerstrom, 2004), including greater positive affectivity, sense of control, positive reappraisals, effective emotional regulation skills, optimism, and greater perceived social support. This uptake in positive reserves is thought to result in ‘enhanced allostasis,’ which could potentially buffer the impact of catabolic stress on the individual by regulation of the HPA axis.

Research on the relationship between benefit finding and HPA activity has been limited, but there is evidence to suggest that benefit finding is related to healthier cortisol profiles. In a study examining healthy women’s cortisol reactivity in response to a laboratory stressor, women who reported greater benefit finding from facing a past trauma, showed quicker cortisol habituation to the laboratory-induced stressor task (Epel et al., 1998). This is aligned with stress inoculation theory which suggests that previous exposure to stressors may result in an individual developing an adaptive stress response, and a resilience to negative effects of future stressors (Seery et al., 2010). Cortisol reactivity adaptation to stress may be one marker of resiliency to psychological and physical stress.

Among cancer-related samples, Cruess & colleagues (2000) found higher levels of benefit finding explained the effect of a cognitive-behavioral intervention on reduced serum cortisol levels. Additionally, a literature search revealed only two studies examining the link between benefit finding and cortisol among cancer samples. Benefit finding was related to steeper diurnal cortisol slopes among women with metastatic breast cancer (Diaz et al., 2014) and men with prostate cancer (Wang & Hoyt, 2018). This highlights the need for further research examining benefit finding and cortisol among diverse populations.

### **The Present Study**

The purpose of this study was to examine the relationship between benefit finding and diurnal cortisol profiles of Chinese American breast cancer survivors (CABCS), an underserved and understudied group. While work has documented disparities in the cancer continuum among ethnic minorities and those medically underserved, little work has focused on Asian American breast cancer survivors. CABCS encounter unique psycho-social barriers in eliciting and receiving support for cancer care, including smaller social networks (Wen et al., 2014), greater ambivalence over emotional expression or the desire to express emotions but failing to do so (Lu et al., 2015), pain severity and interference (Wang et al., 2017), and self-stigma (Wu et al., 2019). Thus, it is important to explore potential factors that may promote better psychological and physical health, including benefit finding. No other studies have examined benefit finding and cortisol among minority cancer survivors. The specific aim of this study was to explore the relationship between benefit finding and physiological indices of stress, e.g., diurnal cortisol measures including waking cortisol, cortisol slopes, and area under the curve (AUC) cortisol profiles among CABCS.

## Hypotheses

Hypothesis 1: Benefit finding will be positively related to cortisol slopes.

Hypothesis 2: Benefit finding will be positively related to AUC.

Hypothesis 3: Benefit finding will be positively related to diurnal cortisol waking level.

## Methods

This study utilized secondary baseline data from a study titled ‘Joy Luck Academy’ (R01CA180896-01A1, Clinical Trial # NCT02946697) PI: Dr. Qian Lu, a randomized control trial testing the efficacy of a psycho-educational and peer-mentoring program for Chinese American breast cancer survivors.

## Participants

167 participants were included in the study analyses. Demographic information of study participants is presented in Table 15. Participants on average were 56.56 ( $SD = 9.03$ ) years of age and had been in the U.S. for 21.28 ( $SD = 11.86$ ) years on average.

## Procedure

Participants were recruited from the Greater Los Angeles area in Southern California through community partner organizations, advertisements, and through the Los Angeles cancer registry. Inclusion criteria included: 1) identifying as a woman, 2) being of 18 years of age or older, 3) Chinese-speaking (i.e., Mandarin or Cantonese), 4) have a breast cancer diagnosis of stages 0, I, II, or III, and 4) have completed primary treatment (e.g., surgery, chemotherapy, or radiotherapy) within the last 36 months.

Once a participant enrolled in the study, research staff from the community organization, Herald Cancer Organization (HCA), conducted a study orientation session with participants. During orientation, the HCA staff explained the study procedures and answered any study-related questions from participants. Next, participants completed the informed consent form and medical authorization release form. Following, participants received training from staff on saliva collection and completion of baseline questionnaires which included demographic and medical information and health outcomes.

During orientation, staff trained participants on saliva collection using Salivettes, a saliva collection tool. Participants received a saliva collection kit (Sarstedt, Inc. Newton, NC) to collect samples at home. Participants were asked to complete the saliva assessment for two consecutive days and then return their samples to HCA using a postage-paid envelope. Saliva samples were taken 20 minutes after awakening, noon, 5PM, and 9PM on each of two consecutive days following standard protocol. If a participant went to bed before 9PM, they were asked to collect their sample prior to going to sleep and record their time. Participants were also informed to refrain from eating, drinking, brushing or flossing teeth, using mouthwash, or smoke for 30 minutes prior to collecting their sample. In addition to saliva sampling, participants were also asked to complete a daily questionnaire during the days they collected saliva samples to assess variables (e.g., medical conditions, medications, and other health behaviors) that may influence cortisol levels during the sampling period.

Once HCA received the saliva samples, they were refrigerated. Once all samples for one cohort of the JLA had been collected, the HCA staff packaged the samples for mailing. The saliva samples were sent to the lab of Dr. Clemens Kirschbaum at the Technical University of Dresden, Germany. Cortisol saliva samples are stable at room temperature for up to three weeks

(Nater et al., 2007). Dr. Kirschbaum's lab performed immuno-assays for cortisol and results were sent back to Dr. Lu's lab.

## Measures

**Salivary cortisol.** Cortisol was measured using samples provided by participants prior to beginning the JLA study session. Saliva samples were provided on two consecutive days following standard protocol. Analyses was done using the first time point on each day (e.g., 20 minutes after waking, Time 1), the cortisol slope, and area under the curve (AUC).

The cortisol slope is used to measure the diurnal cortisol decline. Two separate slopes were computed for each day, one using Time 1 (e.g., 20 minutes after waking) and Time 4 (e.g., 9PM) time points and another using all four time points (e.g., 20 mins after waking, 12PM, 5PM, 9PM). Other studies examining cortisol profiles of cancer samples also used this method in calculation of the slope (Cash et al., 2015; Dedert et al., 2013, Bower et al., 2005). The slope values were calculated by fitting a linear regression line for each study participant (Cash et al., 2015).

The AUC is used as a measure of total cortisol secretion. It was computed using all four saliva collection time points from 20 minutes after awakening to 9PM or bedtime. It was computed by using the cortisol measures assessed in nmol/L on the y-axis and the time of collection on the x-axis (Pruessner et al., 2003). The AUC was divided by the number of hours between the first cortisol measurement during the day and the last measurement before bedtime. Given the large percentage of missing data (~20%), two AUC values were computed for each of the two days, one that included all time points (excluding missing) and another that included the imputed grand mean for that day.



**Benefit finding.** Benefit finding was measured using the Post-traumatic Growth Inventory Short-form (PTGI-SF; Cann et al., 2010; Tedeschi & Calhoun, 1986, See Appendix K). The PTGI-SF is a 10-item shortened version of the 21-item original scale which measures the degree to which an individual reports experiencing a change as a result of a crisis. Studies have documented the validity of the short-form version of the scale (Cann et al., 2010). Items are measured on a 0 to 5 scale with 0 indicating “Not at all (I did not experience this change as a result of my crisis)” to 5 indicating “A very great degree (I experienced this change to a very great degree as a result of my crisis).” The measure includes five subscales: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life. This measure has been validated among Chinese cancer survivors (Ho, Chan, & Ho, 2004).

**Other variables.** On days of saliva collection, participants were asked about factors that may affect their cortisol levels. Participants were asked to report whether they were taking medications containing steroids, other medications, an autoimmune disorder, oral/gum disease, waking and bed-times, exercise, and perceived stress levels.

### **Analysis Strategy**

Pearson correlations were run between the overall benefit finding and all six cortisol variables (e.g., Day 1 waking, Day 2 waking, Day 1 T1-T4 slope, Day 1 all time points slope, Day 2 T1-T4 slope, Day 2 all time points slope, Day 1 AUC (not-imputed), Day 1 AUC (imputed mean), Day 2 AUC (not-imputed), Day 2 AUC (imputed mean). Correlations were also run between each individual benefit finding dimension (e.g., relating to others, new possibilities, personal strength, spiritual change, and appreciation of life) and the corresponding cortisol variables.

## Results

Correlations were run between benefit finding and cortisol indices (see Table 16). Testing Hypothesis 1, Pearson correlations were run between benefit finding and the cortisol slope indices. There was a significant relationship between benefit finding and day one (T1-T4) slope ( $r = -.24, p = .01, 95\% \text{ CI: } [-.41, -.04]$ ) and benefit finding and day one (all time points) slope ( $r = -.19, p = .049, 95\% \text{ CI: } [-.36, -.001]$ ). There were no significant relationships between benefit finding and day two (T1-T4) slope ( $r = .02, p = .85, 95\% \text{ CI: } [-.18, .22]$ ) and benefit finding and day two (all time points) slope ( $r = -.01, p = .94, 95\% \text{ CI: } [-.19, .18]$ ).

Testing Hypothesis 2, benefit finding was not related to AUCg such that there were no significant relationships between benefit finding and Day 1 AUCg ( $r = .10, p = .34, 95\% \text{ CI: } [-.11, .31]$ ) and Day 2 AUCg ( $r = .02, p = .83, 95\% \text{ CI: } [-.19, .23]$ ). Moreover, benefit finding was not related to Day 1 AUCg imputed ( $r = .05, p = .60, 95\% \text{ CI: } [-.13, .22]$ ) and Day 2 AUCg imputed ( $r = -.06, p = .54, 95\% \text{ CI: } [-.23, .12]$ ).

Testing Hypothesis 3, there was no significant relationship between benefit finding and cortisol at waking time for both day one ( $r = .15, p = .10, 95\% \text{ CI: } [-.03, .33]$ ) and day two ( $r = -.04, p = .63, 95\% \text{ CI: } [-.22, .14]$ ).

## Covariate Analyses

In our preliminary analyses, we did not find any of the demographic variables including age, months since last treatment, education, number of years in the U.S., stage of cancer diagnosis, and household income to be related to benefit finding nor to any of the cortisol indices.

## Discussion

The present study sought to examine the relationship between benefit finding and cortisol indices among Chinese American breast cancer survivors. CABCS are an understudied group and encounter unique psychosocial barriers when eliciting support for cancer care. Although there are a few studies that examined the relationship between benefit finding and cortisol profiles, this is the first study to explore the relationship between benefit finding and diurnal cortisol among minority cancer survivors.

The results of the study suggest that benefit finding is related to more negative cortisol slopes among Chinese American breast cancer survivors. This finding is consistent with Diaz et al.'s (2014) study with metastatic breast cancer patients and Wang & Hoyt's (2018) study with prostate cancer patients. Both these studies found that benefit finding was related to steeper diurnal cortisol slopes. Evidence suggests that cortisol slope predicts breast cancer survival such that breast cancer patients with abnormal patterns, or relatively "flat" patterns had higher rates of mortality (Sephton et al., 2000). Thus, benefit finding may potentially be a positive response to the cancer experience.

We did not find an association between benefit finding and AUCg. Consistent with Wang & Hoyt (2018)'s study on benefit finding and cortisol among prostate cancer patients, it is possible that benefit finding is unrelated to overall daily cortisol production, which tends to be linked to ongoing stress or higher allostatic load (van der Pompe et al., 1996; McEwen, 1998). The cancer survivors in this study were recruited from primarily community partner organizations, thus, participants may have not perceived that they were undergoing a chronic stressor, that may have resulted in prolonged activation of their HPA axis. Thus, benefit finding was unrelated to their overall cortisol profiles.

### **Limitations and Future Directions**

There are some limitations worth noting. First, the study design was cross-sectional, thus we cannot infer causality. Future studies should investigate the longitudinal effect of benefit finding on diurnal cortisol of cancer survivors, over time. Second, our study focused exclusively on Chinese American breast cancer survivors. Only two other studies have examined the link between benefit finding and cortisol profiles of cancer-related samples. However, this is the first study to examine this relationship among ethnic minority cancer survivors. Further work is needed to explore this link among other groups (e.g., other-related cancers, young adult cancer survivors). Nevertheless, the current study has some notable strengths including the sample size and multiple number of days of sampling. Since benefit finding was found to be related to one of the cortisol slope indices, this points to the potentially beneficial effect of benefit finding on stress among cancer survivors. This is the first study examining the link between benefit finding and diurnal cortisol among Chinese American breast cancer survivors and highlights the need for further research on the link between benefit finding and the HPA axis. It would be fruitful to potentially develop an experiment implementing benefit finding through an intervention.

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Table 1. Study 1: Demographic Information of Participants

Variable		Emotional Disclosure	Gratitude Writing	Choice of Prompt	Control	Pooled %	Range	<i>M(SD)</i>
		<i>n</i> = 101	<i>n</i> = 107	<i>n</i> = 90	<i>n</i> = 89	<i>n</i> = 394		
Age		22.12 (5.28)	22.81 (7.08)	22.89 (4.76)	21.25 (3.00)		18-67	22.21(5.43)
Subjective Social Status		5.54 (1.83)	5.45 (1.73)	5.32 (1.56)	5.47 (1.76)		1-10	5.47(1.77)
U.S. born								
Gender	Yes	84	86	62	73	83.1		
	No	17	16	16	13	16.9		
Gender	Women	87	80	59	71	80.9		
	Men	14	22	19	15	19.1		
Class standing								
Class standing	Freshman	16	15	8	9	13.0		
	Sophomore	23	14	13	15	17.7		
	Junior	32	38	27	33	35.3		
	Senior	28	35	31	26	32.6		
	Post-bac or graduate	2	0	79	3	1.4		
Ethnicity								
Ethnicity	Asian	25	23	18	20	24.6		
	White	22	27	18	30	27.8		
	Latinx/Hispanic	23	26	18	21	25.2		
	African American/Black	14	11	14	10	14.0		
	Multiracial/Other	11	9	6	3	8.3		
Pell Grant								
Pell Grant	Yes	46	44	36	36	162		
	No	54	58	43	48	203		
Mother's Education								
Mother's Education	Did not complete high school	14	13	10	11	13.2		

Father's Education	High school/GED	23	22	18	18	22.2
	Some college	26	34	16	21	26.6
	Bachelor's Degree	24	22	18	22	23.6
	Advanced Graduate Work	10	10	11	11	11.5
						3.0
	Did not complete high school	20	20	15	15	19.2
	High School/GED	22	19	15	17	20.1
	Some college	18	28	12	20	21.4
	Bachelor's Degree	16	16	18	15	17.9
	Advanced Graduate Work	21	16	11	16	17.6
Personal Income						3.8
	Under \$25,000	79	88	63	80	85.4
	\$25,000-\$39,999	13	9	9	4	9.6
	\$40,000-\$49,999	3	2	1	0	1.7
	\$50,000-\$74,999	1	1	5	0	1.9
	Over \$75,000	3	2	0	0	1.4
Household Income	Under \$25,000	15	17	17	18	18.5
	\$25,000-\$39,999	11	17	14	15	15.7
	\$40,000-\$49,999	22	17	8	10	15.7
	\$50,000-\$74,999	10	17	17	15	16.3
	Over \$75,000	42	34	22	25	33.9

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Note: Results demonstrated a significant difference in age, gender, ethnicity, class standing, household income, and personal income among the four writing groups.

Table 2. Descriptive Statistics of Baseline Measures and Reliabilities

	N	Minimum	Maximum	M( <i>SD</i> )	Reliability ( $\alpha$ )
<b>Baseline Outcome Variables</b>					
Perceived Stress	373	1.00	5.00	3.13(0.50)	0.69
Satisfaction with Life	372	1.00	7.00	4.39(1.28)	0.88
Depressive Symptoms	368	1.00	4.00	2.14(0.47)	0.84
Physical Symptoms	367	0.00	70.00	13.78(12.28)	0.87
Sleep Quality	367	1.00	4.00	2.42(0.67)	*
<b>Mediators</b>					
Positive Affect	273	1.00	5.00	3.04(0.84)	0.90
Negative Affect	273	1.00	5.00	2.36(0.82)	0.89
<b>Moderators</b>					
Impact of Hurricane	364	1.00	23.00	6.63(4.37)	*
Benefit Finding*	372	1.00	6.00	3.78(1.37)	0.94

Table 3. Baseline Group Differences in Outcomes

	$X^2$ (df = 3)	Emotional Disclosure Condition M (SD) (N = 98)	Gratitude Condition M (SD) (N = 101)	Choice Condition M (SD) (N = 74)	Control M (SD) (N = 82)
Perceived Stress	5.21	3.08 (.53)	3.10 (.52)	3.12 (.50)	3.21 (.44)
Satisfaction with Life	10.94*	4.11 (1.32)	4.50 (1.25)	4.38 (1.40)	4.51 (1.14)
Depressive Symptoms	3.32	2.17 (.45)	2.10 (.50)	2.17 (.48)	2.15 (.43)
Physical Symptoms	1.59	13.89 (11.49)	14.06 (12.48)	13.72 (13.32)	13.58 (11.09)
Sleep Quality	3.76	2.45 (0.70)	2.35 (0.67)	2.46 (0.64)	2.44 (0.68)
Benefit Finding	4.39	3.76 (1.24)	3.76 (1.18)	3.87 (1.34)	3.87 (1.33)
Impact of Hurricane	1.84	6.71 (4.09)	6.52 (4.69)	6.38 (3.75)	6.70 (4.91)

Note: \* indicates  $p < .05$ , \*\* indicates  $p < .01$ , \*\*\* indicates  $p < .001$ . Those in the gratitude writing condition ( $b = .44$ ,  $SE = .13$ ,  $z = 3.27$ ,  $p = .001$ , 95% CI: [.17, .70]) and those in the choice of prompt condition ( $b = .28$ ,  $SE = .14$ ,  $z = 2.01$ ,  $p = .04$ , 95% CI: [.007, .55]) had significantly higher satisfaction with life compared to those in the emotional disclosure group.

Table 4. Comparison of Completers and Non-Completers at the One Week Follow-up

	Completers (N = 172)		Non-Completers (N = 201)		Sig. (2-tailed)	t	df
	Mean	(SD)	Mean	(SD)			
Perceived Stress	3.13	0.55	3.13	0.45	0.92	0.10	371
Satisfaction with Life	4.37	1.32	4.41	1.24	0.79	0.26	370
Depressive Symptoms	2.12	0.44	2.16	0.47	0.41	0.72	366
Physical Symptoms	12.36	11.50	15.01	12.82	<b>0.04</b>	2.07	365
Sleep Quality	2.35	0.67	2.48	0.67	<b>0.04</b>	1.99	365
Benefit Finding	3.81	1.36	3.74	1.22	0.58	-0.56	370
Impact of Hurricane	6.49	4.31	6.75	4.43	0.57	0.56	362

Table 5. Comparison of Completers and Non-Completers at the Four-week Follow-up

	Completers (N = 57)		Non-Completers (N = 316)		Sig. (2-tailed)	t	df
	Mean	(SD)	Mean	(SD)			
Perceived Stress	3.28	0.37	3.11	0.51	<b>0.01</b>	-2.45	371
Satisfaction with Life	4.09	1.24	4.44	1.28	0.05	1.93	370
Depressive Symptoms	2.16	0.38	2.14	0.48	0.76	-0.31	366
Physical Symptoms	12.74	10.31	13.97	12.61	0.49	0.69	365
Sleep Quality	2.56	0.63	2.39	0.68	0.08	-1.74	365
Benefit Finding	3.92	1.24	3.75	1.29	0.35	-0.93	370
Impact of Hurricane	6.67	3.78	6.62	4.48	0.95	-0.06	362

Table 6. Comparison of Completers and Non-Completers at the 16-Weeks Follow-up

	Completers (N = 88)		Non-Completers (N = 285)		Sig. (2-tailed)	t	df
	Mean	(SD)	Mean	(SD)			
Perceived Stress	3.21	0.45	3.11	0.51	0.08	-1.75	371
Satisfaction with Life	4.26	1.37	4.43	1.24	0.27	1.11	370
Depressive Symptoms	2.16	0.47	2.14	0.46	0.64	-0.46	366
Physical Symptoms	14.29	13.16	13.62	12.00	0.65	-0.45	365
Sleep Quality	2.44	0.71	2.41	0.66	0.71	-0.38	365
Benefit Finding	3.66	1.30	3.81	1.28	0.33	0.96	370
Impact of Hurricane	6.88	4.30	6.56	4.40	0.55	-0.60	362



Table 7. Attrition by Group Condition and Time Points

	Emotional Disclosure (n=101)	Gratitude Writing (n=107)	Choice of Prompt (n=90)	Control (n=89)
<b>Completers</b>	N (%)	N (%)	N (%)	N (%)
Baseline	98 (97)	101 (94.4)	74 (82.2)	82 (92.1)
One week follow-up	46 (26.6)	48 (27.7)	47 (27.2)	32 (18.5)
Four week follow-up	14 (24.6)	16 (28.1)	19 (33.3)	8 (14)
16 week follow-up	30 (34.1)	23 (26.1)	17 (19.3)	18 (20.5)
<b>Non-completers</b>				
Baseline	3 (2.9)	6 (5.6)	16 (17.7)	7 (7.8)
One week follow-up	55 (24.9)	59 (27.6)	43 (20.1)	57 (26.6)
Four week follow-up	87 (26.4)	91 (27.6)	71 (21.4)	81 (24.5)
16 week follow-up	71 (23.7)	84 (28.1)	73 (24.4)	71 (23.7)

Table 8. Manipulation Check Questions

	$X^2(df=3)$	Emotional Disclosure M (SD)(N=98) <sup>3</sup>	Gratitude Writing M (SD)(N=101) <sup>2</sup>	Choice of Prompt M (SD)(N=74) <sup>4</sup>	Control M (SD)(N=82) <sup>1</sup>
Personal	171.66***	6.97 (2.56)	7.47 (2.47)	7.18 (2.47)	4.67(3.29)
Emotions	178.16***	7.47 (2.50)	6.52 (2.30)	6.46 (2.59)	3.97(3.07)
Sad or depressed	113.25***	7.18 (2.76)	3.45 (2.87)	3.80 (3.00)	1.72(2.64)
Valuable or meaningful	141.17***	4.67 (2.59)	5.83 (2.44)	6.21 (2.80)	3.67(2.74)

Note: \* indicates  $< .05$ , \*\* indicates  $< .01$ , \*\*\* indicates  $< .001$ . <sup>1</sup>All of the intervention conditions reported their writing to be more personal, emotional, sad or depressed, valuable, and meaningful when compared to the control group. <sup>2</sup>Those in the gratitude condition reported their writing to be more personal compared to emotional disclosure writing condition. <sup>3</sup>Participants in the emotional disclosure condition reported their writing to be more sad or depressed compared to those in the gratitude condition. <sup>4</sup>Participants in the choice of writing prompt condition reported their writing to be more valuable or meaningful compared to those in the emotional disclosure condition.

Table 9. Outcome Variables by Writing Condition Across Time Points

	Emotional Disclosure Writing ( <i>N</i> =101)	Gratitude Writing ( <i>N</i> =107)	Choice of Prompt Writing ( <i>N</i> =90)	Control ( <i>N</i> =89)
Outcomes	Mean ( <i>SD</i> )	Mean ( <i>SD</i> )	Mean ( <i>SD</i> )	Mean ( <i>SD</i> )
Perceived Stress				
Pre-writing	3.01 (.56)	3.05 (.55)	3.06 (.48)	3.14 (.46)
One-week FU	2.94 (.57)	2.95 (.69)	2.87 (.46)	3.01 (.42)
Four-week FU	2.95 (.47)	3.07 (.53)	3.12 (.43)	2.99 (.54)
16-week FU	2.90 (.65)	2.99 (.36)	3.10 (.36)	3.04 (.47)
Satisfaction with Life				
Pre-writing	4.12 (1.29)	4.55 (1.26)	4.40 (1.41)	4.36 (1.26)
One-week FU	4.06 (1.31)	4.50 (1.36)	4.30 (1.55)	4.24 (1.30)
Four-week FU	4.48 (.98)	4.60 (1.09)	4.40 (1.33)	3.35 (1.14)
16-week FU	4.05 (1.29)	4.72 (1.21)	4.74 (1.38)	4.06 (1.40)
Depressive Symptoms				
Pre-writing	2.11 (.44)	2.03 (.48)	2.07 (.42)	2.11 (.47)
One-week FU	1.97 (.37)	1.91 (.49)	1.89 (.32)	1.98 (.47)
Four-week FU	2.20 (.45)	1.95 (.33)	2.14 (.27)	2.27 (.47)
16-week FU	2.08 (.47)	2.05 (.42)	2.07 (.32)	2.06 (.58)
Physical Symptoms (Sum)				
Pre-writing	12.18 (10.98)	13.19 (12.32)	11.94 (11.48)	13.18 (12.13)
One-week FU	11.11 (11.03)	13.74 (14.12)	10.28 (8.75)	12.61 (11.23)
Four-week FU	10.50 (9.24)	10.56 (9.21)	11.84 (10.71)	7.62 (8.72)
16-week FU	9.63 (9.37)	10.17 (8.53)	10.88 (10.55)	11.94 (12.56)
Sleep Quality				
Pre-writing	2.37 (.69)	2.24 (.71)	2.34 (.65)	2.35 (.69)
One-week FU	2.17 (.73)	2.12 (.77)	2.25 (.63)	2.27 (.75)
Four-week FU	2.50 (.50)	2.12 (.60)	2.21 (.62)	2.25 (.67)
16-week FU	2.33 (.65)	2.09 (.72)	2.18 (.71)	2.17 (.61)
Benefit Finding				
Pre-writing	3.51 (1.27)	3.76 (1.19)	3.73 (1.38)	3.58 (1.38)
One-week FU	3.27 (1.28)	3.68 (1.30)	3.58 (1.35)	3.49 (1.48)
Four-week FU	3.84 (.81)	4.25 (.95)	4.09 (1.30)	2.90 (.81)
16-week FU	3.17 (1.20)	3.56 (1.07)	3.25 (1.48)	2.8 (1.21)

Table 10. Multilevel Mixed Effects Results for Perceived Stress by Writing Condition

Predictor	Model A <sup>1</sup>		Model B <sup>2</sup>	
	<i>b</i>	95% CI	<i>b</i>	95% CI
Intercept	3.19***	[3.09 – 3.29]	3.10***	[2.79 – 3.42]
Hypothesized predictors				
Time	-0.08*	[-.15 – -.01]	-0.09*	[-.17 – -.01]
<i>Writing Condition</i>				
Expressive Writing	-0.12	[-.26, .02]	-0.13	[-.27 - .01]
Gratitude Writing	-0.10	[-.24, .03]	-0.10	[-.24 - .05]
Choice of Prompt	-0.11	[-.26, .03]	-0.21*	[-.40 - -.03]
Time x Writing Condition				
Expressive Writing	0.01	[-.08, .09]	0.01	[-.08, .11]
Gratitude Writing	0.02	[-.07, .11]	0.02	[-.08 - .12]
Choice of Prompt	0.01	[-.08, .10]	0.02	[-.12 - .16]
Covariates				
Age			0.01**	[.004 - .02]
Female			0.01	[-.13 - .14]
Class standing			-0.06*	[-.11, -.005]
Personal Income			-0.14**	[-.23, -.05]
Household Income			0.02	[-.01, .06]
Ethnicity				
Asian/Pacific Islander			-0.03	[-.18, .12]
Latinx/Hispanic			0.13	[-.007, .27]
Black/African American			0.06	[-.11, .25]
Multiracial			0.003	[-.20, .20]
Variance components				
Level 1: Within-person, $\varepsilon_{ij}$	0.14	[.11 – .16]	0.12	[0.10 – 0.15]
Level 2: In initial status	0.12	[.09 – .16]	0.09	[0.05 – 0.12]
Level 2: In rate of change, $\zeta_{1i}$	0.004	[.0001 – .001]	0.002	[.0003 – .01]
Covariance	0.006	[.003 – .01]	0.01	[.001 – .02]
Rho	-0.14	[-.32 – .04]	-0.06	[-.26 – .14]

Note. \* indicates  $p < .05$ , \*\* indicates  $p < .01$ , and \*\*\* indicates  $p < .001$ ; CI = confidence interval

Time was coded 0, 1, 2, and 3. Time-varying predictors are italicized.

<sup>1</sup>Model A represents the model with the inclusion of the Time x Writing Condition as a predictor using an autoregressive error-covariance structure

<sup>2</sup>Model B is an extension of Model A with covariates

Table 11. Multilevel Mixed Effects Results for Satisfaction with Life by Writing Condition

Predictor	Model A <sup>1</sup>		Model B <sup>2</sup>	
	<i>b</i>	95% CI	<i>B</i>	95% CI
Intercept	4.54***	[4.27 – 4.80]	3.34***	[2.44 – 4.23]
Hypothesized predictors				
Time	-0.12	[-.28 – .04]	-0.13	[-.32 – .06]
<i>Writing Condition</i>				
Expressive Writing	-0.43*	[-.79, .-07]	-0.47*	[-.88 - .-06]
Gratitude Writing	-0.04	[-.40, .32]	-0.06	[-.48 - .36]
Choice of Prompt	-0.21	[-.59, .17]	-0.45	[-.99 - .08]
Time x Writing Condition				
Expressive Writing	0.16	[-.04, .37]	0.17	[-.06, .41]
Gratitude Writing	0.20	[-.01, .41]	0.22	[-.02 - .47]
Choice of Prompt	0.17	[-.05, .40]	<b>0.34*</b>	[.01 - .67]
Covariates				
Age			0.004	[-.02 - .03]
Female			0.27	[-.12 - .67]
Class standing			0.04	[-.12, .19]
Personal Income			0.11	[-.16, .37]
Household Income			0.19***	[.09, .29]
Ethnicity				
Asian/Pacific Islander			0.07	[-.33, .47]
Latinx/Hispanic			-0.10	[-.49, .30]
Black/African American			-0.009	[-.53, .51]
Multiracial			-0.14	[-.72, .43]
Variance components				
Level 1: Within-person, $\varepsilon_{ij}$	0.60	[.37 – .96]	0.54	[.31 – .93]
Level 2: In initial status	1.06	[.72 – 1.55]	1.10	[.74 – 1.65]
Level 2: In rate of change, $\zeta_{1i}$	0.04	[.003 – .39]	0.06	[.01 – .28]
Covariance	-0.03	[-.17 – .12]	-0.06	[-.74 – 1.65]
Rho	-0.13	[-.56 – .36]	-0.15	[-.64 – .44]

Note. \* indicates  $p < .05$ , \*\* indicates  $p < .01$ , and \*\*\* indicates  $p < .001$ ; CI = confidence interval

Time was coded 0, 1, 2, and 3. Time-varying predictors are italicized.

<sup>1</sup>Model A represents the model with the inclusion of the Time x Writing Condition as a predictor using an autoregressive error-covariance structure

<sup>2</sup>Model B is an extension of Model A with covariates

Table 12. Multilevel Mixed Effects Results for Depressive Symptoms by Writing Condition

Predictor	Model A <sup>1</sup>		Model B <sup>2</sup>	
	<i>b</i>	95% CI	<i>b</i>	95% CI
Intercept	2.13***	[2.03 – 2.22]	2.08***	[1.77 – 2.39]
Hypothesized predictors				
Time	-0.04	[-.10 – .01]	-0.06	[-.12 – .003]
Writing Condition				
Expressive Writing	0.01	[-.12, .14]	-0.004	[-.15 – .14]
Gratitude Writing	-0.54	[-.18, .07]	-0.05	[-.19 - .10]
Choice of Prompt	-0.005	[-.14, .13]	-0.02	[-.21 – .17]
Time x Writing Condition				
Expressive Writing	0.01	[-.06, .08]	0.03	[-.05 - .10]
Gratitude Writing	-0.004	[-.08, .07]	0.008	[-.07 - .09]
Choice of Prompt	0.001	[-.08, .08]	-0.004	[-.12 - .11]
Covariates				
Age			-0.001	[-.01 - .01]
Female			0.12	[-.01 - .26]
Class standing			-0.002	[-.06, .05]
Personal Income			-0.07	[-.16, .03]
Household Income			0.02	[-.02, .05]
Ethnicity				
Asian/Pacific Islander			-0.01	[-.15, .13]
Latinx/Hispanic			0.06	[-.08, .20]
Black/African American			0.13	[-.05, .31]
Multiracial			-0.07	[-.27, .13]
Variance components				
Level 1: Within-person, $\varepsilon_{ij}$	0.09	[.37 – .96]	0.09	[.07 – 0.12]
Level 2: In initial status	0.13	[.72 – 1.55]	0.11	[.08 – 0.15]
Level 2: In rate of change, $\zeta_{1i}$	0.002	[.003 – .39]	2.03e-156	
Covariance	-0.004	[-.17 – .12]		
Rho	0.09	[-.35 – .50]	0.08	[-.17 – .32]

Note. \* indicates  $p < .05$ , \*\* indicates  $p < .01$ , and \*\*\* indicates  $p < .001$ ; CI = confidence interval

Time was coded 0, 1, 2, and 3. Time-varying predictors are italicized.

<sup>1</sup>Model A represents the model with the inclusion of the Time x Writing Condition as a predictor using an autoregressive error-covariance structure

<sup>2</sup>Model B is an extension of Model A with covariates

Table 13. Multilevel Negative Binomial Results for Physical Symptoms by Writing Condition

Predictor	Model A <sup>1</sup>		Model B <sup>2</sup>	
	<i>b</i>	95% CI	<i>b</i>	95% CI
Intercept	2.46***	[2.24 – 2.67]	2.64***	[1.95 – 3.23]
Hypothesized predictors				
Time	-0.13	[-.27 – .02]	-0.11	[-.26 – .04]
<i>Writing Condition</i>				
Expressive Writing	-0.05	[-.34, .24]	0.001	[-.32 – .32]
Gratitude Writing	0.003	[-.28, .29]	-0.01	[-.34 - .31]
Choice of Prompt	-0.11	[-.42, .19]	-0.09	[-.51 – .32]
Time x Writing Condition				
Expressive Writing	-0.53	[-.24, .14]	-0.05	[-.23, .14]
Gratitude Writing	0.02	[-.18, .22]	0.03	[-.17 - .22]
Choice of Prompt	0.002	[-.20, .20]	0.01	[-.26 - .28]
Covariates				
Age			-0.01	[-.04 - .01]
Female			0.23	[-.08 - .54]
Class standing			-0.03	[-.16, .08]
Personal Income			0.12	[-.09, .32]
Household Income			-0.02	[-.10, .06]
Ethnicity				
Asian/Pacific Islander			-0.28	[-.59, .03]
Latinx/Hispanic			0.17	[-.13, .47]
Black/African American			-.21	[-.61, .19]
Multiracial			-0.33	[-.77, .12]
Variance components				
Level 2: In initial status	0.49	[.45 – .05]	0.50	[.35 – 0.71]
Level 2: In rate of change, $\zeta_{1i}$	0.004	[.004 – .005]	1.25e-15	
Covariance	0.05	[.04 – .05]	-2.07e-10	[-5.66e-07 - -5.66e-07]
Dispersion	-0.89	[-1.10 - -.68]	-1.02	[-1.30 – -.74]

Note. \* indicates  $p < .05$ , \*\* indicates  $p < .01$ , and \*\*\* indicates  $p < .001$ ; CI = confidence interval

Time was coded 0, 1, 2, and 3. Time-varying predictors are italicized.

<sup>1</sup>Model A represents the model with the inclusion of the Time x Writing Condition as a predictor

<sup>2</sup>Model B is an extension of Model A with covariates

Table 14. Multilevel Mixed Effects Results for Sleep by Writing Condition

Predictor	Model A <sup>1</sup>		Model B <sup>2</sup>	
	<i>B</i>	95% CI	<i>b</i>	95% CI
Intercept	2.42***	[2.28 – 2.56]	2.42***	[1.96 – 2.88]
Hypothesized predictors				
Time	-0.11**	[-.19 – -.03]	-0.11*	[-.20 – -.01]
<i>Writing Condition</i>				
Expressive Writing	-0.01	[-.21, .17]	-0.04	[-.25 – .17]
Gratitude Writing	-0.09	[-.28, .09]	-0.12	[-.34 -- .09]
Choice of Prompt	0.02	[-.18, .22]	0.07	[-.21 – .35]
Time x Writing Condition				
Expressive Writing	0.07	[-.03, .18]	0.07	[-.04, .19]
Gratitude Writing	0.04	[-.07, .15]	0.04	[-.09, .16]
Choice of Prompt	-0.01	[-.13, .10]	-0.09	[-.26 – .07]
Covariates				
Age			-0.0001	[-.01, .01]
Female			-0.006	[-.21, .20]
Class standing			-0.0005	[-.08, .08]
Personal Income			-0.04	[-.18, .10]
Household Income			-0.002	[-.05, .05]
Ethnicity				
Asian/Pacific Islander			0.02	[-.19, .23]
Latinx/Hispanic			0.22*	[.02, .42]
Black/African American			-0.07	[-.33, .20]
Multiracial			0.19	[-.10, .49]
Variance components				
Level 1: Within-person, $\varepsilon_{ij}$	0.20	[.17 – .24]	0.21	[.17– .26]
Level 2: In initial status	0.26	[.20 – .34]	0.25	[.19 – .33]
Level 2: In rate of change, $\zeta_{1i}$	1.84e-07	[3.19e-08 – 1.06e-06]	0.00005	[.00001, .0002]
Covariance	0.0002	[.00002 – .0004]	-0.003	
Rho	-0.12	[-.30 - .07]	-0.13	[-.34, .10]

Note. \* indicates  $p < .05$ , \*\* indicates  $p < .01$ , and \*\*\* indicates  $p < .001$ ; CI = confidence interval

Time was coded 0, 1, 2, and 3. Time-varying predictors are italicized. Sleep was coded as 1 = “Very Good” to 4 = “Very Bad”.

<sup>1</sup>Model A represents the model with the inclusion of the Time x Writing Condition as a predictor

<sup>2</sup>Model B is an extension of Model A with covariates



Figure 1. Flow Chart of Study

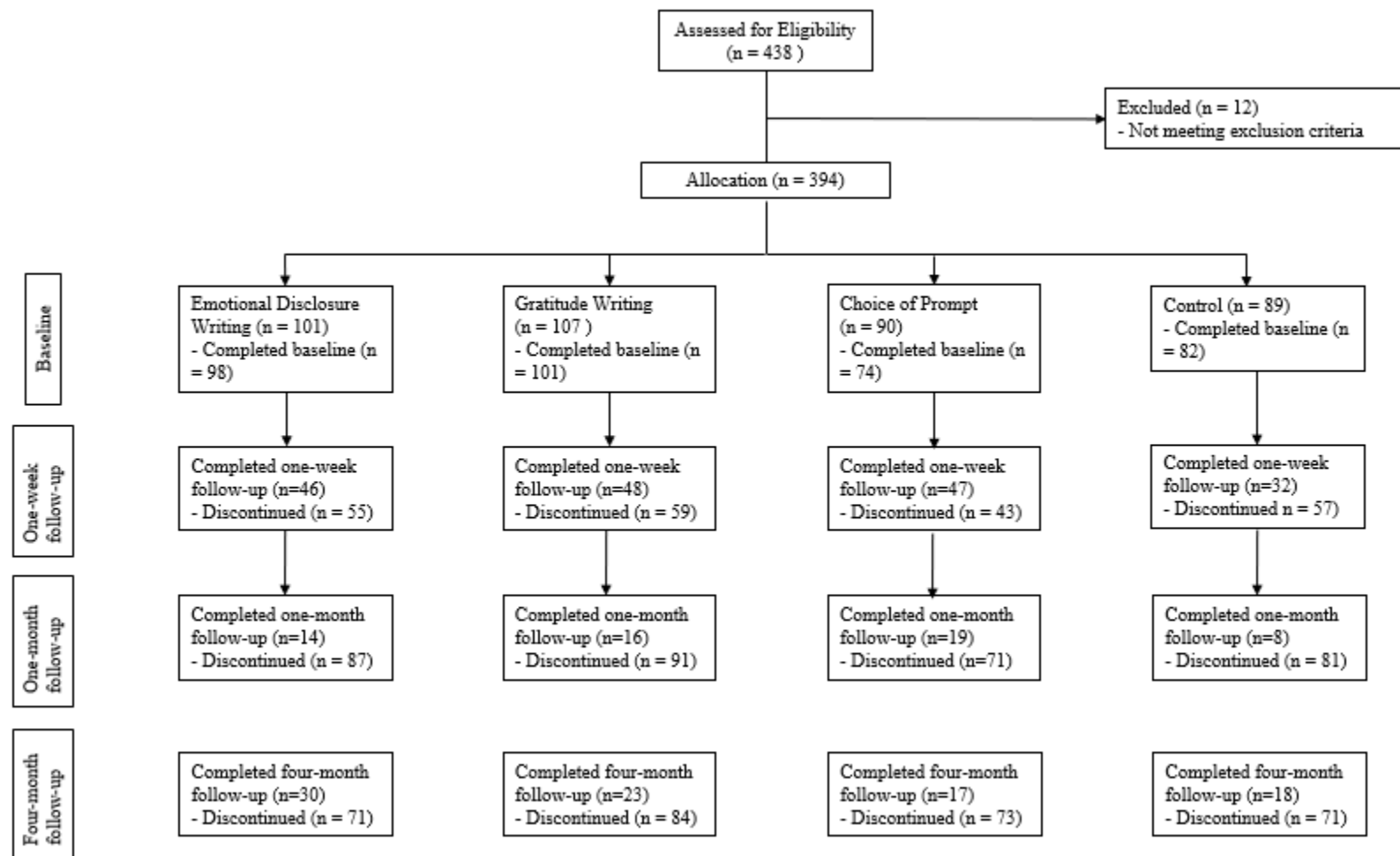


Table 15. Study 2: Demographic Information of Participants

Variable	N	%	Range	M( <i>SD</i> )
Age	163		33-76	56.56(9.03)
Years in the U.S.	159		2-53	21.28(11.86)
Months since finishing treatment	167		0-46	12.84(10.54)
Stage at Diagnosis				
0	22	14.0		
I	52	33.1		
II	66	42.0		
III	17	10.8		
Education Level				
Some high school or below	25	15.2		
High school	40	24.2		
Some college/specialized training	46	27.9		
College graduate	45	27.3		
Graduate/professional school	9	5.5		
Household Income				
Less than \$15,000	29	22.1		
\$15,000 - \$45,000	49	37.4		
\$45,001-\$75,000	21	16.0		
More than \$75,000	32	24.4		

Table 16. Descriptive Statistics and Bivariate Correlations of Variables of Interest

	Count	Mean	SD	Correlations									
				(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Benefit Finding	165	3.25	0.94										
<b>Cortisol indices</b>													
(2) Day 1 (T1-T4) Slope	143	-0.18	0.09	-0.24*									
(3) Day 2 (T1-T4) Slope	138	-0.17	0.09	0.02	0.32***								
(4) Day 1 (All time points) Slope	155	-0.17	0.09	-0.19*	0.95***	0.27**							
(5) Day 2 (All time points) Slope	152	-0.16	0.09	-0.01	0.26**	0.94***	0.21*						
(6) Day 1 AUCg	121	6.97	9.50	0.11	0.20*	0.17	0.21*	0.09					
(7) Day 2 AUCg	121	7.60	11.04	0.02	-0.01	-0.07	0.09	-0.06	0.54***				
(8) Day 1 AUCg imputed	167	43.81	22.63	0.05	-0.05	-0.05	-0.07	-0.05	0.75***	0.38***			
(9) Day 2 AUCg imputed	167	47.29	27.38	-0.06	0.06	-0.24**	0.12	-0.27***	0.33*	0.72***	0.37***		
(10) Day 1 Waking Cortisol	162	1.88	0.96	0.15	-0.51***	-0.27**	-0.55***	-0.23**	0.50***	0.42***	0.53***	0.29***	
(11) Day 2 Waking Cortisol	163	1.93	1.01	-0.04	-0.22**	-0.63***	-0.19*	-0.59***	0.37***	0.63***	0.36***	0.56***	0.56***

Note. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ . Cortisol indices were log-transformed.

## Appendix A

## Perceived Stress Scale

**Directions:** The questions in this scale ask you about your feelings and thoughts during the last month. For each item, please indicate how often you felt or thought a certain way. Please use the following scale for all ten items.

0	1	2	3	4
Never	Almost never	Sometimes	Fairly often	Very often

In the LAST MONTH, how often have you...

- \_\_\_\_\_ 1. Been upset because of something that happened unexpectedly?
- \_\_\_\_\_ 2. Felt that you were unable to control the important things in your life?
- \_\_\_\_\_ 3. Felt nervous and “stressed?”
- \_\_\_\_\_ 4. Felt confident about your ability to handle personal problems?
- \_\_\_\_\_ 5. Felt that things were going your way?
- \_\_\_\_\_ 6. Found that you could not cope with all the things that you had to do?
- \_\_\_\_\_ 7. Been able to control irritations in your life?
- \_\_\_\_\_ 8. Felt that you were on top of things?
- \_\_\_\_\_ 9. Been angered because of things that were outside of your control?
- \_\_\_\_\_ 10. Felt difficulties were piling up so high that you could not overcome them?

## Appendix B

The Post Traumatic Growth Inventory (Appreciation of Life and Relating to Others subscales)

**Directions:** Indicate for each of the following statements below the degree to which this change occurred in your life as a result of the crisis.

0 = I did not experience the change as a result of my crisis.

1 = I experienced the change to a *very small degree* as a result of my crisis.

2 = I experienced this change to a *small degree* as a result of my crisis.

3 = I experienced this change to a *moderate degree* as a result of my crisis.

4 = I experienced this change to a *great degree* as a result of my crisis.

5 = I experience this change to a *very great degree* as a result of my crisis.

	0	1	2	3	4	5
1. I have changed my priorities about what is important in my life.						
2. I have a greater appreciation for the value of my own life.						
3. I developed new interests.						
4. I have a greater feeling of self-reliance.						
5. I have a better understanding of spiritual matters.						
6. I more clearly see that I can count on people in times of troubles.						
7. I have established a new path for my life.						
8. I have a greater sense of closeness with others.						
9. I am more willing to express my emotions.						
10. I know better that I can handle difficulties.						
11. I am able to do better things with my life.						
12. I am better able to accept the way things work out.						

13. I can better appreciate each day.						
14. I have more compassion for others.						
15. I have more compassion for others.						
16. I put more effort into my relationships.						
17. I am more likely to try to change things which need changing.						
18. I have a stronger religious faith.						
19. I discovered that I'm stronger than I thought I was.						
20. I learned a great deal about how wonderful people are.						
21. I better accept needing others.						

**PTGI Factors:**

Factor I: Relating to Others

Factor II: New Possibilities

Factor III: Personal Strength

Factor IV: Spiritual Change

Factor V: Appreciation of Life

## Appendix C

## Satisfaction with Life Scale

**Directions:** Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item. Please be open and honest in your responding.

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

\_\_\_\_\_ In most ways my life is close to my ideal.

\_\_\_\_\_ The conditions of my life are excellent.

\_\_\_\_\_ I am satisfied with my life.

\_\_\_\_\_ So far I have gotten the important things I want in life.

\_\_\_\_\_ If I could live my life over, I would change almost nothing.

## Appendix D

## Center for Epidemiologic Studies Depression Scale (CES-D)

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the last month.

---

**During the Past Week**


---

	Rarely or none of the time (less than 1 day )	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



- |                                    |                          |                          |                          |                          |
|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 12. I was happy.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. I talked less than usual.      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. I felt lonely.                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. People were unfriendly.        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. I enjoyed life.                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. I had crying spells.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. I felt sad.                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. I felt that people dislike me. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. I could not get "going."       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

## Appendix E

## Physical Symptoms Scale

Think back over the past 7 days. On **how many of these days** have you experienced each of the physical symptoms below? For example, if you have a headache on 3 out of the last 7 days, put a 3 in the space beside that item. If you are not sure about the number of days you have experiences each symptom, please give your best estimate. Do not count any symptoms (e.g., sore muscles) that you have experiences as a result of intentional physical exercise.

- \_\_\_\_\_ 1. Headache
- \_\_\_\_\_ 2. Chest pain
- \_\_\_\_\_ 3. Coughing
- \_\_\_\_\_ 4. Shortness of breath
- \_\_\_\_\_ 5. Stiff/sore muscles
- \_\_\_\_\_ 6. Stomach ache/pain/upset
- \_\_\_\_\_ 7. Runny/ congested nose
- \_\_\_\_\_ 8. Faintness/ dizziness
- \_\_\_\_\_ 9. Racing/ pounding heart
- \_\_\_\_\_ 10. Sore throat

## Appendix F

**Sleep Quality**

During the past month, how would you rate your sleep quality overall?

Very good \_\_\_\_\_

Fairly good \_\_\_\_\_

Fairly bad \_\_\_\_\_

Very bad \_\_\_\_\_

## Appendix G

## Impact of Event – Hurricane Exposure

Which of the following applies to you because of the hurricane? (Multiple Choice)

- |       |  |
|-------|--|
| _____ | 1. Home was a total lost                                     |
| _____ | 2. Home suffered major damage (repairable)                   |
| _____ | 3. Home suffered minor damage                                |
| _____ | 4. Car was a total lost                                      |
| _____ | 5. Car suffered major damage (repairable)                    |
| _____ | 6. Car suffered minor damage                                 |
| _____ | 7. Personal belongings were ruined                           |
| _____ | 8. Evacuated   |
| _____ | 9. Moved to a different place to live                        |
| _____ | 10. I was hurt   |
| _____ | 11. Lost job ( you or your parents)                          |
| _____ | 12. Lost electricity/water/ and/or gas during hurricane      |
| _____ | 13. Had trouble getting enough food or water after hurricane |
| _____ | 14. Any other loss not described above?                      |
|       | _____  |

## Appendix H

## Positive and Negative Affect Schedule

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel have felt this way over **the past week**.

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
1. Interested	1	2	3	4	5
2. Distressed	1	2	3	4	5
3. Excited	1	2	3	4	5
4. Upset	1	2	3	4	5
5. Strong	1	2	3	4	5
6. Guilty	1	2	3	4	5
7. Scared	1	2	3	4	5
8. Hostile	1	2	3	4	5
9. Enthusiastic	1	2	3	4	5
10. Proud	1	2	3	4	5
11. Irritable	1	2	3	4	5
12. Alert	1	2	3	4	5
13. Ashamed	1	2	3	4	5
14. Inspired	1	2	3	4	5
15. Nervous	1	2	3	4	5
16. Determined	1	2	3	4	5
17. Attentive	1	2	3	4	5
18. Jittery	1	2	3	4	5
19. Active	1	2	3	4	5
20. Afraid	1	2	3	4	5

## Appendix I

**Demographic Information**

**What is your age?** \_\_\_\_\_

**What is your gender?**

- ☐ Female  
☐ Male

**What is your current class standing?**

- ☐ Freshman  
☐ Sophomore  
☐ Junior  
☐ Senior  
☐ Post-bac or graduate student

**What is your ethnicity?**

- ☐ Asian/Pacific Islander/East Indian  
☐ European American/Caucasian  
☐ Latino/Hispanic/Mexican-American  
☐ African American/Black  
☐ Other: Please specify \_\_\_\_\_

**How long have you lived in the United States?**    ☐ All my life, or: \_\_\_\_\_ years

**What is your country (or countries) of citizenship?**

\_\_\_\_\_

**What is current household size?** \_\_\_\_\_

**What is your current cumulative GPA?** \_\_\_\_\_

**What was your last semester's GPA?** \_\_\_\_\_

**Are you a Pell grant recipient?**

- ☐ Yes  
☐ No

**What is your mother's highest level of education?**

- ☐ Did not complete high school  
☐ High School/GED  
☐ Some college  
☐ Bachelor's Degree  
☐ Advanced Graduate work (e.g. Master's Degree, Ph.D., etc.)  
☐ Not sure

**What is your father's highest level of education?**

- ☐ Did not complete high school
- ☐ High School/GED
- ☐ Some college
- ☐ Bachelor's Degree
- ☐ Advanced Graduate work (e.g. Master's Degree, Ph.D., etc.)
- ☐ Not sure

**What is your current personal income?**

- ☐ Under \$25,000
- ☐ \$25,000 - \$39,999
- ☐ \$40,000 - \$49,999
- ☐ \$50,000 - \$74,999
- ☐ Over \$75,000

**What is your current household income?**

- ☐ Under \$25,000
- ☐ \$25,000 - \$39,999
- ☐ \$40,000 - \$49,999
- ☐ \$50,000 - \$74,999
- ☐ Over \$75,000

## Appendix J

## Subjective Social Status

At the **top** of the ladder are the people who are the best off – those who have the most money, the most education and the most respected jobs. At the **bottom** are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

**Where would you place yourself on this ladder?**

Please place an “X” on the step where you think you stand at this time in your life, relative to other people in the United States.





## Appendix K

## The Post Traumatic Growth Inventory – Short Form

**Directions:** Indicate for each of the following statements below the degree to which this change occurred in your life as a result of the crisis.

0 = I did not experience the change as a result of my crisis.

1 = I experienced the change to a *very small degree* as a result of my crisis.

2 = I experienced this change to a *small degree* as a result of my crisis.

3 = I experienced this change to a *moderate degree* as a result of my crisis.

4 = I experienced this change to a *great degree* as a result of my crisis.

5 = I experience this change to a *very great degree* as a result of my crisis.

	0	1	2	3	4	5
1. I have changed my priorities about what is important in my life.						
2. I have a greater appreciation for the value of my own life.						
3. I am able to do better things with my life.						
4. I have a better understanding of spiritual matters.						
5. I have a greater sense of closeness with others.						
6. I established a new path for my life.						
7. I know better that I can handle difficulties.						
8. I have a stronger religious faith.						
9. I discovered that I'm stronger than I thought I was.						
10. I learned a great deal about how wonderful people are.						