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Examining the impact of meaning and resilience on survivors' life satisfaction after Hurricane Harvey

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Survivors' Life Satisfaction After Hurricane Harvey

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Abstract

The experience of a traumatic event such as a natural disaster can often lead individuals to suffer a variety of negative sequelae, including the development of posttraumatic stress symptoms. However, certain positive psychological constructs like meaning and resilience have been shown to mitigate these consequences. The purpose of this study was to explore the contributions of meaning and resilience to the life satisfaction of individuals ($N = 55$) impacted by 2017's Hurricane Harvey. It was hypothesized that not only would meaning and resilience be significantly and positively related to life satisfaction but that meaning would contribute more to the prediction of life satisfaction than resilience. Significant positive relationships were found between meaning and life satisfaction ($r = .51, p \leq .05$) and between resilience and life satisfaction ($r = .32, p \leq .05$) as was expected. After conducting a multiple regression analysis, meaning was also found to significantly predict life satisfaction ($\beta = .46, t(54) = 3.48, p = .001, pr^2 = .19$), and did so to a greater extent than resilience ($\beta = .13, t(54) = .97, p = .34, pr^2 = .02$), which was not a statistically significant predictor in this instance. The implications of these findings are discussed, along with study strengths, limitations, and directions for research.

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Introduction

Impact of Disasters

One of the most pressing public health concerns today is the impact of natural and

technological disasters on individuals and communities. A disaster can be conceptualized at its

most basic level as "a serious disruption of the functioning of society, causing widespread

human, material or environmental losses, that exceeds the local capacity to respond, and calls for

external assistance" (Centers for Disease Control and Prevention [CDC], 2018). While this

simple definition does have its uses, the heterogeneity of disasters is something that must also be

acknowledged. There is a great deal of variance in not only the origin of a given disaster and the

processes involved but also in what populations and places are most vulnerable to its effects.

These myriad differences have implications for best practices in preparedness, response, and

recovery, so it is critical that they be adequately investigated and understood (National Research

Council [NRC], 2006).

Standard typology usually categorizes disasters as natural and technological (Department

of Homeland Security [DHS], 2018). However, there is yet more variability within these

categories themselves. Natural disasters include a wide range of extreme weather events like

earthquakes, floods, and tornadoes, as well as climatological hazards like extreme temperatures

and droughts (Baum, Fleming, & Davidson, 1983; DHS, 2018). Technological disasters are

distinguished by either an element of human error in operating some technology or a malfunction of said technology, in many cases such that blame can credibly be assigned to human involvement or negligence (Baum et al., 1983; Shaluf, 2007). Some examples of technological disasters include hazardous material spills, plane crashes, train wrecks, and nuclear plant explosions.

Regardless of type, disasters have serious, adverse impacts on community and individual health. Moreover, the impact of disasters is felt across numerous domains. In many cases, disasters have devastating effects on infrastructure (Pelling, Özerdem, & Barakat, 2002). Buildings and homes are often damaged, sometimes to irreparable degrees. Utilities and public health services are often put out of commission, compromising necessities like electricity, water, and sewage. This has consequences not only for rebuilding after a disaster but also for whatever regular operations are interrupted. Settings like assisted living centers and hospitals are a particular concern during disasters, as residents' health may depend on a facility keeping the power on.

Disasters are costly events. For example, in 2017 the United States saw $306 billion in damages caused by natural disasters (National Oceanic and Atmospheric Administration [NOAA], 2017). As this record-breaking sum and the definition itself suggests, the strain that disasters have on a community's typical resources is appreciable. It often falls on the shoulders of federal agencies and non-profit organizations to assist in the immediate aftermath of disasters and, depending on the severity of the event, throughout the long process of rebuilding. In addition, communities not only suffer economically from the direct loss of physical assets but

also from the indirect losses of potential revenue (Pelling et al., 2002). Already reeling from the aftereffects of a disaster, a reduction in capital is the last thing that a wounded region needs.

Following a disaster, individuals' physical health is also often affected. In 2017, disasters (in this case, defined as including "drought, earthquake, extreme temperature, flood, landslide, mass movement over land, storm, volcanic activity, and wildfire") directly caused 9,697 deaths, impacting approximately 96 million people worldwide (Below & Wallemacq, 2018, p. 1). Injuries or illness resulting from conditions created by a disaster are not uncommon. For example, some survivors of floods report suffering from respiratory problems due to dangerous black mold now growing in their homes or skin rashes after coming into contact with dredged-up sewage (Ivers & Ryan, 2006). Even cleanup efforts can also be dangerous. Acts as seemingly straightforward as clearing debris actually involve considerable risk. Beyond these more direct impacts, disasters can create additional health risks. For example, they can impede access to medications or medical equipment, either by disrupting access to prescription medications or through forced displacement or destruction of property that results in the loss of medications or equipment (Paterson, Wright, & Harris, 2018).

Aside from the physical injuries or ailments typically associated with disaster exposure, populations who experience these extreme events are also at an elevated risk for the development of a range of various psychological difficulties, including anxiety disorders, depression, and substance abuse (Breslau, 2009; Tang, Liu, Liu, Chen, & Zhang, 2014). Of particular concern is the development of posttraumatic stress disorder (PTSD; Neria, Nandi, & Galea, 2008) among individuals who experience disasters. Individuals affected by disasters often face threats of injury and death and may actually see others injured or killed. They may have lost belongings. Their

homes may have been damaged or destroyed. They may have become displaced, or see their community rendered unrecognizable.

According to Goldmann and Galea (2014), an estimated 13-19% of adults in the United States have experienced at least one disaster in their lifetime. The potential, then, for unfavorable mental health outcomes among the general population is high. At the same time, resilience is the rule rather than the exception (Bonanno, 2004). The vast majority of individuals who experience a traumatic event will not develop psychopathology. However, the sheer prevalence of these extreme events and their growing frequency is enough to warrant attention. Efforts should be made to improve available services and investigate pro-active solutions to enhance the capacity of communities to adaptively respond to these events when they occur. Current and nuanced research is key to appropriately informing policy and providing appropriate and efficacious prescriptions for preparing individuals and communities to contend with and mitigate the effects of disasters. A type of disaster that would benefit from particular empirical scrutiny along these lines is flooding.

Floods

In looking at what types of disasters cause the most devastation, incidents of flooding consistently rank among the most severe (Below & Wallemacq, 2018). As far as economic and property damages, injuries and fatalities, and rates of occurrence, floods have emerged in recent years as particularly problematic (Boullion, Pavlacic, Schulenberg, Buchanan, & Steger, under review; Dursun, Steger, Bentele, & Schulenberg, 2016; Halpern, Nitza, & Vermeulen, 2019). Flood impact also has the greatest reach in terms of people affected. In 2018 alone, 35.4 million people were impacted by flooding worldwide – the worst of which was seen in India (Below &

Wallemacq, 2018). Floods also accounted for over half of all disasters in terms of the number of people affected worldwide (35.4 million of a total of 61.7 million). These figures are not unexpected, as when looking at the averages since the beginning of the 21st century, floods have traditionally made up half or nearly half of all disasters in a given year (Below & Wallemacq, 2018). This is significant, given that severity of flooding experience can have a significant impact on the development of posttraumatic stress symptoms.

At the same time, individuals may be able to draw upon psychological resources even after events like floods that cause significant, widespread devastation to their communities. In a sample of individuals impacted by the 2016 Louisiana floods, Boullion et al. (under review) found that while some reported posttraumatic stress symptoms, those who perceived meaning in life (i.e., a sense that one's life matters) were more likely to experience posttraumatic growth. This indicates that the ability to recognize and appreciate the significance of one's life has value that can be helpful in adaptively responding to natural disasters such as flooding.

Given the scope of the problem and the magnitude of the threat posed by flooding, it only makes sense that the topic be given significant attention. Researchers should endeavor to better understand the impact of flooding on individuals and communities, as they will continue to be a threat in the years to come. For the purposes of exploring questions about what factors are most important to securing positive post-disaster outcomes, it is useful to take a case study as an example. As a flood-causing event, Hurricane Harvey is notable for not only being the costliest hurricane in U.S. history aside from Hurricane Katrina but also for beginning an unusually eventful and destructive storm season (Shultz & Galea, 2017). Given the wide-reaching impact that Hurricane Harvey had, it provides ample opportunity for investigation and understanding.

Hurricane Harvey and the Subsequent Flooding

Hurricane Harvey first caught the attention of meteorologists on August 17th, 2017 (Sebastian et al., 2017). At the time, it was a tropical depression just east of Barbados, but in the days to follow, the weather system would swell and grow in size, building in the Gulf of Mexico, before progressing inland. Within the week, it had developed into a tropical storm.

An official Hurricane Watch was issued on August 23rd, at which time Hurricane Harvey was still a Category 2 on the Saffir-Simpson Hurricane Wind Scale – meaning its sustained wind speed clocked in at somewhere between 96-110 miles per hour (NOAA, 2018). In a matter of 12 hours, however, the hurricane had become a Category 4 – with a sustained wind speed of over 130 miles per hour as it was nearing the mainland. Local and state officials initiated mandatory and voluntary evacuations from the flood zones designated high risk.

Hurricane Harvey made landfall in Rockport, Texas, around 10 pm local time, August 25th, bringing with it winds of approximately 150 miles per hour and torrential rains that in some places measured up to nearly 60 inches (Watson et al., 2018). While the cyclonic winds and spawning tornadoes typical of most hurricanes were present, the biggest danger that Harvey posed proved to be the rains. Floodwaters rose to engulf cars, houses, as well as the interstate, and bayous, reservoirs, and streams in the region overflowed (Zhang & Villarini, 2018).

The storm lingered in mainland Texas for nearly five days. The flooding proved most severe throughout Galveston County and the Houston area, as well as in southwestern Louisiana. In Texas and Louisiana combined, more than 33 trillion gallons of rain were estimated to have fallen over the course of the five days, for a record-breaking 51.88 inches of rainfall (Shultz & Galea, 2017). The impact was complicated further in Houston by the geography of the land and

the layout of drainage basins in Harris County (Sebastian et al., 2017). Roads were so deluged that some locations in the county were rendered inaccessible for weeks (NOAA, 2018).

Reports by NOAA (2018) attributed 105 fatalities to Hurricane Harvey, 68 of which were directly caused by the storm. Over 1 million people were displaced in Texas alone, with 779,000 mandatory evacuations and 980,000 voluntary evacuations taking place during the course of the storm. Even almost two years after the event, thousands reportedly still have not been able to return to their homes, or have no homes to return to (Watson et al., 2018). In total, estimates place the number of people directly impacted by the storm at 13 million (Shultz & Galea, 2017).

Infrastructure in the region was affected tremendously, with damages and other costs totaling nearly $125 billion, making Hurricane Harvey one of the most expensive natural disasters in U.S. history, second only to Hurricane Katrina (Sebastian et al., 2017). Relatedly, a struggle that emerged during recovery was the lack of flood insurance among homeowners. Only 17% of residents who experienced damage to their homes had coverage (Shultz & Galea, 2017). With nearly 100,000 homes reportedly damaged by the flooding, this was more than a significant problem. Many sought aid from FEMA, but the organization was not able to meet the demand.

Initially, a significant outpouring of support for those impacted by Hurricane Harvey followed the flooding. The event received widespread media attention, and extensive volunteer and material support with cleanup and recovery needs was facilitated by organizations like the American Red Cross, Team Rubicon, Habitat for Humanity, and others. Reflective of a general tendency to move from one event to the next, however, this support dwindled (Shultz & Galea, 2017), due in no small part to the occurrence of Hurricane Maria less than two weeks later.

Beyond just the tangible, concrete consequences of the disaster that linger, community members also need continued mental health support. Past research examining the psychological impact of flooding has indicated the potential for negative outcomes in both the short- and long-term. Individuals directly affected by flooding often report psychological distress and posttraumatic stress symptoms both in the immediate aftermath of the flood and even once the event has passed (Alderman, Turner, & Tong, 2012, 2013; Chen & Liu, 2015; Collins, Jimenez, & Grineski, 2012).

Closely examining the experiences of those impacted by Hurricane Harvey will help to direct continued recovery efforts in the area as well as help to inform preparedness efforts in the Houston community and others for the occurrence of other such events in the future. In particular, constructs like meaning in life and resilience could provide useful information for how communities might be bolstered in preparation for catastrophic events like Hurricane Harvey. While much attention is directed toward the maladaptive behaviors sometimes adopted by those suffering from the lingering effects of trauma (and rightfully so) there are benefits to focusing on the role that meaning and resilience have in promoting adaptive functioning following disasters. The relevance of these concepts to human health and well-being cannot be overstated.

Positive Psychology and Disaster Mental Health: Meaning, Resilience, and Life Satisfaction

Some have suggested that positive psychology, the study of optimal human functioning, may hold some answers to positive adaptation post-disaster (Park, 2016; Schulenberg, 2016; Southwick, Satodiya, & Pietrzak, 2016). Positive psychology encompasses such concepts as flourishing, strengths-building, and general adaptive behavior – all incredibly applicable in the

context of responding to adversity. What is presently known about applications of positive psychology to disaster mental health yields some clues as to the current directions researchers need to take. For example, certain factors like social support and self-efficacy have been well-studied, having been identified as protective factors against maladaptive functioning in the aftermath of disasters (Drescher et al., 2012; Kaniasty, 2012; Luszczynska, Benight, & Cieslak, 2009; Pooley, Cohen, O'Connor, & Taylor, 2013; Schulenberg, Drescher, & Baczwaski, 2014; Walsh, 2007). In other words, social support and self-efficacy are essential for recovery.

Two concepts of growing relevance to the discussion of positive psychology and disaster mental health are meaning in life and resilience. The existing literature has shown that these constructs are keys to human health and well-being (Khawaja, Ibrahim, & Schweitzer, 2017; Steger, 2012; Steger, Bundick, & Yeager, 2011; Steger & Kashdan, 2007; Steptoe, Deaton, & Stone, 2015). Moreover, they predict better outcomes in those experiencing various forms of trauma (Bonanno, Brewin, Kaniasty, & La Greca, 2010; Bonanno, Galea, Bucciarelli, & Vlahov, 2007; Gil-Rivas & Kilmer, 2016; Goldmann & Galea, 2014; Greene, Paranjothy, & Palmer, 2015). Presently, researchers have begun to look at meaning and resilience specifically in the context of disasters. These constructs are introduced in greater detail below, as is the concept of life satisfaction, followed by the aims of the current study.

Meaning in Life

While the desire to identify the sources of meaning in one's life can ostensibly trace its origins back at least as far as philosophers in ancient Greece – and arguably even further back than that – the concept of meaning in life as a psychological construct first emerged from the work of Austrian psychiatrist Viktor Frankl (1959/2006). In *Man's Search for Meaning*, Frankl

related his experiences living in a concentration camp during World War II and the subsequent

validation of a meaning-centric approach to psychotherapy, known as logotherapy.

Informed by Frankl's insights, meaning in life enjoyed a good deal of popularity during

the humanistic-existential movement. Work by Crumbaugh and Maholick (1967, 1969) was

particularly influential, establishing purpose in life as a construct separate from meaning.

Meaning has seen a resurgence in contemporary research too. More recent conceptualizations of

meaning have focused on dimensions like global and situational meaning, modeled actual

processes of meaning-making, further differentiating meaning from purpose, and identifying the

potential for a beyond-the-self-orientation (Bronk, Riches, & Mangan, 2018; Park, 2010), a

concept mirroring Frankl's idea of self-transcendence (Frankl, 1959/2006). Broadly speaking, a

current definition of meaning in life identifies it as "a sense of one's life having a purpose or

investing time and energy into the attainment of cherished goals" (King, Hicks, Krull, & Del

Gaiso, 2006, p. 179).

Perceived meaning in life is essential to human health and well-being (Disabato,

Goodman, Kashdan, Short, & Jarden, 2016; Steger, 2012; Steger & Kashdan, 2007). It is

predictive of, and associated with, a wide range of positive outcomes. Examples include various

aspects of psychological well-being, social connectedness, and hope (Feldman & Snyder, 2005;

King et al., 2006). Meaning is also a protective factor against the development of maladaptive

behaviors and feelings of distress in individuals who have experienced trauma (Park & Ai,

2006), culminating into the study of the concept with respect to its benefits in the context of

disasters. Meaning appears to mitigate the psychological effects of trauma and helps survivors to

bounce back, and potentially even thrive, after disaster (Dursun et al., 2016; Linley & Joseph,

2010; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012; Weber, Pavlacic, Gawlik, Schulenberg, & Buchanan, under review).

Resilience

Resilience is another concept that is essential to human health and well-being (Aiena, Baczwaski, Schulenberg, & Buchanan, 2015; Aiena, Buchanan, Smith, & Schulenberg, 2016; Drescher et al., 2012). Resilience is a topic of great interest to many different disciplines, each with their own definition of just what resilience means. Psychological resilience, however, as defined by George Bonanno, entails:

> the ability of adults in otherwise normal circumstances who are exposed to an isolated
> and potentially highly disruptive event, such as the death of a close relation or a violent
> or life-threatening situation, to maintain relatively stable, healthy levels of psychological
> and physical functioning (Bonanno, 2004, p. 20).

While research on psychological resilience first rose to the fore in the 1970s, this earlier work by researchers like Emmy Werner (1993) addressed resilience from a more developmental perspective and was focused primarily on the resilience of children. In contrast, Bonanno's definition concerns resilience specifically in response to trauma.

One of the most prevailing, current definitions of resilience is that endorsed by the American Psychological Association, which differs from Bonanno's definition in a subtle but significant way. This newer iteration envisions resilience as a process rather than a stable trait (APA, 2015). According to the definition put forward by APA, resilience is the process by which an individual contends with trauma or adversity through the mobilization of material, social, and psychological assets.

Interventions that involve fostering resilience have particular implications for the prevention and treatment of post-traumatic stress symptoms (Horn, Charney, & Feder, 2016; Linley & Joseph, 2010). Researchers and clinicians alike have found a good deal of utility in targeting resilience when trying to determine outcomes after various forms of trauma, including natural and manmade disasters (Bonanno et al., 2007; Lowe, Sampson, Gruebner, & Galea, 2015; Rodriguez-Llanes, Vos, & Guha-Sapir, 2013). Additionally, resilience is associated with positive emotions and adaptive coping (Gloria & Steinhardt, 2014), both useful in wrestling with adversity. For these reasons, resilience-focused interventions are of interest to those concerned with capacity building and disaster preparedness. Certainly, definitions focusing more on individual resilience (the stated ability to "bounce back") are well-suited to these endeavors (Smith et al., 2008). Cultivating resilience in individuals and, on a more macro level, communities will help reduce the cost associated with disasters by lessening their initial impact as well as the cost of recovery from them.

Life Satisfaction

Due to its ability to account for both physical and mental health outcomes, life satisfaction is a useful barometer for how an individual is doing after a disaster (Drescher et al., 2012). Life satisfaction can be most simply understood as the evaluation individuals make about their circumstances, usually informed by how they feel about these circumstances. The assessment of life satisfaction serves a variety of purposes, from helping determine an employee's workplace or job satisfaction (Hart, 1999), to assessing quality of life in assisted living facilities (Celso, Ebener, & Burkhead, 2003; Cummings & Cockerham, 2004), to the

happiness and meaning in life among individuals recovering from cancer-related treatment (Wnuk, Marcinkowski, & Fobair, 2012).

To determine how an individual is adjusting after a life-altering event, it is necessary to measure a number of outcome variables. Since life satisfaction is associated with many other desirable variables such as social support and subjective well-being (Pavot & Diener, 2007) and much of the current literature on life satisfaction has dealt with how individuals adjust to or handle adversity (Royse & Badger, 2017; Triplett et al., 2012; Veronese & Pepe, 2017), it is well-suited to the task.

Aims of the Study

Available research suggests that certain psychological constructs such as resilience and meaning in life predict positive outcomes post-disaster. Further study of the relationships involved and how these constructs might be cultivated in individuals and communities would be of great benefit in assisting those directly impacted by disasters as well as to preparing communities at a heightened risk for disasters. Therefore, in the interests of assisting in mitigation as well as strengthening response and rebuilding efforts, researchers should direct their attention toward elucidating the relationships between these different constructs.

Existing work in this vein has looked at the relationships between some predictors commonly associated with positive outcomes post-disaster. In one such study, Drescher et al. (2012) looked at how self-efficacy and meaning in life differentially impacted life satisfaction after the Deepwater Horizon oil spill. Findings revealed that individuals benefited more from meaning than they did from self-efficacy by itself, although both meaning and self-efficacy were significantly related to life satisfaction. Participants also reported greater life satisfaction if they

had both an elevated sense of meaning in life and perceived self-efficacy. Aiena, Buchanan, Smith, and Schulenberg (2016) examined relationships of interest in individuals impacted by the Deepwater Horizon oil spill but looked at resilience and meaning in life. It was found that greater meaning in life and greater resilience were both predictive of fewer posttraumatic stress symptoms. While this study did not look at life satisfaction directly, lower life satisfaction has typically been found to accompany greater levels of posttraumatic stress symptoms after a disaster (Drescher et al., 2012).

The present study sought to combine the aims of these studies and elaborate on them further. By examining the relationships between the constructs of interest (i.e., meaning and resilience), it was hoped that some judgment could be made about their relative predictive power for life satisfaction after a flood-related disaster. It was hypothesized that life satisfaction would vary more significantly with meaning in life than it would vary with resilience. That is to say, in a sample of flood-impacted individuals, meaning would be a stronger predictor of life satisfaction than resilience, although both meaning and resilience were expected to significantly relate to life satisfaction.

In short, this study aimed to determine whether meaning would be a more powerful predictor of life satisfaction than resilience. Generally speaking, an answer to this question would reveal more about what variables matter most in disaster-impacted populations. This is not to say that resilience and meaning are mutually exclusive or that one should necessarily be neglected in favor of the other, but if one is a better predictor of positive outcomes post-disaster than the other, that is something that clinicians and policymakers would want to know. Targeting this variable, logically, could be a more effective way to reach desired outcomes after a disaster.

Findings could potentially assist in making prescriptions for future research directions, helping to direct the development of interventions to hone in on these better predictors, and providing a deeper understanding of these constructs in promoting adaptive functioning post-disaster.

Methods

Participants

All participants identified themselves as Houston locals or as belonging to one of the surrounding counties impacted by the flooding ($N = 55$). Of the 55 participants, the majority were female (78.2%; $n = 43$). Seven participants identified as male (12.7%), and the remainder (9.1%; $n = 5$) did not report their gender. The sample identified as predominantly White (78.2%; $n = 43$) with some individuals identifying as Hispanic or Latinx (3.6%; $n = 2$), some identifying as multiracial (7.3%; $n = 4$), and the rest either not responding or stating that they preferred to not disclose this information (10.9%; $n = 6$). In terms of age, the sample was slightly more diverse. The largest group of respondents reporting their age fell into the 55-64 age range (27.3%; $n = 15$), followed by those aged 35-44 (23.6%; $n = 13$), those aged 25-34 (18.2%; $n = 10$), those aged 45-54 (14.5%; $n = 8$), and those aged 65-74 (7.3%; $n = 4$). The remaining respondents (9.1%; $n = 5$) did not report their age.

Procedure

Recruitment involved contacting community groups in the affected area, primarily churches and aid organizations, as well as the moderators of relevant support groups on Facebook. A link to the survey was sent to interested organizations via email for distribution to their membership and shared through social media posts. The questionnaire that participants completed was comprised of other measures besides those of interest, as it was distributed as part

of a larger study. Additionally, participants were asked questions about the degree to which they

were impacted by Hurricane Harvey and by any other traumatic event(s) they may have

experienced recently. They were also asked to provide demographic information, including

gender, age, race, highest level of education attained, marital status, number of children,

religious affiliation, political affiliation, and annual household income.

The specific measures administered in the questionnaire included the Posttraumatic

Growth Inventory (PTGI; Tedeschi & Calhoun, 1996), the Satisfaction with Life Scale (SWLS;

Diener, Emmons, Larsen, & Griffin, 1985), the Meaning in Life Questionnaire (MLQ; Steger,

Frazier, Oishi, & Kaler, 2006), the PTSD Checklist for DSM-5 (PCL-5; Blevins, Weathers,

Davis, Witte, & Domino, 2015), the Brief Resilience Scale (BRS; Smith et al., 2008), the

Acceptance and Action Questionnaire - II (AAQ-II; Bond et al, 2011), the Valuing Questionnaire

(VQ; Smout, Davies, Burns, & Christie, 2014), and the Multidimensional Scale of Perceived

Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988). Of these measures, the

MLQ-Presence subscale, the BRS, and the SWLS were of particular interest given the aims of

this study. A more in-depth look at these measures' common usage and psychometric properties

follows, providing further information as to their reliability and validity as well as rationale for

their inclusion.

Measures

MLQ. The Presence subscale of the Meaning in Life Questionnaire was utilized to assess

meaning. The Meaning in Life Questionnaire (Steger, Frazier, Oishi, & Kaler, 2006; Appendix

A) is a 10-item, 7-point Likert-type multidimensional scale that measures presence of meaning

and search for meaning. Scores on the MLQ are calculated as a sum. On both subscales, scores

range from 5 to 35 (Steger et al., 2006) with higher scores suggesting a greater perceived presence of meaning in life. The Presence subscale (MLQ-P) is comprised of five items, measuring the degree to which an individual perceives a sense of meaning in their life, with higher scores indicating a greater perceived presence of meaning. This subscale includes items like *"I understand my life's meaning," "I have a good sense of what makes my life meaningful,"* and *"I have discovered a satisfying life purpose."*

Data from the Search subscale of the MLQ were not used. This subscale measures an individual's ongoing attempts to find a sense of meaning in their life. Since assessing the impact that the presence of meaning has on life satisfaction was of primary interest, Search was not relevant to the analyses and therefore was not examined.

In terms of reliability, coefficient alphas between .80 and .90 are commonly reported for the MLQ (Steger, 2006; Strack, 2007; Weber et al., under review), and its factor structure has shown good construct validity when evaluated (Schulenberg, Strack, & Buchanan, 2011; Steger & Kashdan, 2007). Researchers have used the MLQ in trauma-affected populations, most commonly employing the Presence subscale as a predictor of positive outcomes. For example, Steger, Frazier, and Zacchanini (2006) found that presence of meaning was correlated with positive outcomes, specifically posttraumatic growth and perceived positive life changes, in American and Spanish samples of individuals exposed to terroristic violence. Even more pertinent to the present project is a study conducted by Dursun, Steger, Bentele, and Schulenberg (2016), which looked at how meaning in life contributed to recovery after the 2013 Colorado floods. Dursun and colleagues found that among survivors, presence of meaning was positively correlated with posttraumatic growth.

BRS. The Brief Resilience Scale was administered for the purposes of measuring resilience. The BRS (Smith et al., 2008; Appendix B) is a 6-item, 5-point Likert-type scale that measures individual psychological resilience. Scores on the BRS are calculated as an average, with 1 - 2.99 indicating low resilience, 3 - 4.30 "normal" resilience, and 4.31 - 5.00 high resilience (Smith et al., 2008). Past studies have found that an average score on the BRS is 3.70 (Smith, Epstein, Ortiz, Christopher, & Tooley, 2013). High resilience as indicated by the BRS signifies that an individual is, in short, better able to "bounce back or recover from stress" (Smith et al., 2008, p. 194). The BRS includes such items as *"I tend to bounce back quickly after hard times," "It does not take me long to recover from a stressful event,"* and *"I usually come through difficult times with little trouble."*

In evaluating the psychometric properties of the BRS, researchers have found alphas ranging from .84 to .95, indicating good internal consistency (Smith et al., 2008; Smith, Tooley, Christopher, & Kay, 2010). Even though it consists of only six items, the BRS has good construct validity and reliability (Windle, Bennett, & Noyes, 2011). It is also applicable to a wide variety of contexts and is considered by resilience researchers to be a strong contender in the realm of brief resilience measures (MacLeod, Musich, Hawkins, Alsgaard, & Wicker, 2016; Windle et al., 2011).

The BRS is often used in studies of individuals directly impacted by trauma. For example, Harville et al. (2011) examined resilience among women affected by both Hurricanes Katrina and Gustav. Results indicated that women who were higher in resilience suffered from fewer depressive and posttraumatic stress symptoms after Hurricane Katrina. Thus, perceived

resilience placed them at lower risk for the development of psychopathology. More resilient

women also reported that they benefited from greater social support.

     SWLS. Life satisfaction was measured using the Satisfaction with Life Scale (Diener et

al., 1985; Appendix C). The SWLS is a 5-item, 7-point Likert-type scale that assesses perceived

life satisfaction. Scores on the SWLS are calculated as a sum. Based on the available interpretive

criteria for the measure, an individual scoring anywhere from 5-9 would be considered extremely

dissatisfied, 10-14 would be considered dissatisfied, 15-19 would be considered slightly

dissatisfied, and 20 would be regarded as neutral. Someone scoring in the 21-25 range would be

classified as slightly satisfied, 26-30 would be considered satisfied, and 31-35 would be

considered extremely satisfied. The interpretation of what exactly life satisfaction entails is left

up to the individual filling out the survey, as different aspects of life are theorized to be weighted

differently by respondents. Sample items from the SWLS include *"In most ways, my life is close*

to my ideal," "The conditions of my life are excellent," and *"I am satisfied with my life."*

     Initial testing of the SWLS found alphas of .87 for internal consistency and .82 for

test-retest reliability (Diener et al., 1985). In the hopes of generating further support for the

scale's psychometrics, Arrindell, Meeuwesen, and Huyse (1991) tested its reliability and validity

among non-psychiatric medical outpatients. Their results were similar to Diener and colleagues

(1985), calculating an alpha of .82 for internal consistency. They also found that the scale had

good concurrent validity with other measures tapping into aspects of subjective well-being. More

recent validation work with the SWLS (Athay, 2012; Rosengren, Jonasson, Brogårdh, & Lexell,

2015) has also confirmed good internal consistency reliability, with alphas approximating .90.

Researchers have found utility for the SWLS in a variety of settings (e.g., relating to work,

relating to marriage). Of most relevance to the current study, the SWLS has been used in disaster contexts. In one such study, mentioned in the literature review, Drescher et al. (2012) looked at different predictors of life satisfaction, including meaning in life and self-efficacy, in a sample of individuals affected by the Deepwater Horizon oil spill. Life satisfaction correlated significantly and positively with both meaning and self-efficacy in the population surveyed.

Statistical Analyses

The MLQ, BRS, and SWLS were selected for the current study due to their established presence in the literature and their demonstrated psychometric properties. With respect to addressing the aforementioned hypotheses, a multiple linear regression was conducted to determine whether meaning in life is a better predictor of life satisfaction than resilience and whether both meaning and resilience are significant predictors of life satisfaction. A significant difference in predictive value along these lines may be just cause to devote more attention to interventions designed to enhance individuals' sense of meaning in life post-disaster.

<div align="center">

Results

</div>

Data Screening

Data were screened for accuracy errors, missing data, outliers, and multivariate assumptions. Initially, 92 individuals opened the link and began the questionnaire. Data were re-coded to resolve issues related to how some scores exported (e.g., for the SWLS, scores for Agree and Strongly Agree, which should be scores of 6 and 7 respectively, exported as scores of 10 and 11). Next, data were screened for missingness. Individuals who completed less than 60% of the survey were excluded from the analyses ($N = 37$). No imputation procedures were necessary after removing these individuals. After screening for accuracy issues and missing data,

the final sample comprised 55 individuals ($N = 55$). Data were then screened for outliers and

multivariate assumptions. No multivariate outliers were detected using Mahalanobis distance,

and data met multivariate assumptions of normality, linearity, homogeneity, and

homoscedasticity. In further screening for additivity, variance inflation factors indicated no

adjustment in variance due to multicollinearity. The analyses presented below were conducted in

SPSS.

Means, Internal Consistency, and Pearson Correlations

      The mean score for the MLQ-P in this sample was $M = 26.45$ ($SD = 5.84$). An internal

consistency reliability of $\alpha = .88$ was calculated for this subscale. For the BRS, an average score

was also approximated ($M = 3.59$, $SD = .84$). Based on the interpretive guidelines, this score

would be considered "normal" resilience. The internal consistency reliability calculated in this

sample for the BRS was $\alpha = .9$. The mean score for the SWLS was $M = 22.87$ ($SD = 6.47$). The

overall sample mean was in the slightly satisfied range. For the SWLS, an internal consistency

reliability of $\alpha = .78$ was calculated. These data are reported in Table 1, along with calculated

Pearson correlations.

      Pearson product moment correlations were calculated to examine the relationships

between meaning and resilience, meaning and life satisfaction, and resilience and life satisfaction

(see Table 1). As was predicted, meaning was significantly and positively related to life

satisfaction ($r = .51$, $p \le .05$). Moreover, meaning was also significantly and positively correlated

with resilience ($r = .43$, $p \le .05$). Finally, resilience was also significantly and positively

correlated with life satisfaction ($r = .32$, $p \le .05$).

Multiple Regression

A multiple regression was conducted to determine whether meaning and resilience predicted satisfaction with life following the flooding that occurred subsequent to Hurricane Harvey. The overall model was statistically significant, $F = (2, 52) = 9.781$, $p < .001$ (see Table 2). Meaning was a significant predictor of life satisfaction, $\beta = .46$, $t(54) = 3.48$, $p = .001$, $pr^2 = .19$. As perceptions of meaning increased, life satisfaction also increased. Alternatively, resilience was not significantly related with life satisfaction in the context of the multiple regression, $\beta = .13$, $t(54) = .97$, $p = .34$, $pr^2 = .02$. This seems to indicate that, as hypothesized, meaning in life is a stronger predictor of life satisfaction versus resilience in this sample.

Model Fit

To better understand how the variables of interest relate to each other, it was necessary to also briefly examine the fit of the model. In doing so, the correlation coefficient of both resilience and meaning in life together as predictors was calculated and subsequently interpreted. The correlation coefficient calculated was $R = 0.523$. Itself relatively mediocre, this correlation coefficient also indicated that the R Square (R^2) would be low. Indeed, the coefficient of determination was $R^2 = 0.273$, indicating that resilience and meaning in life accounted for 27.3% of the variance exhibited in the model. Taking this measure of fit into consideration, the model does not seem to be a very good fit, as 72.7% of the variance seen could be attributable to error.

Discussion

Current directions in research have set a course for resilience-focused, growth-oriented approaches to disaster intervention and pre-intervention (Bryant & Litz, 2009; Young, 2006). Literature on meaning-based interventions also makes a strong case for its inclusion among them

(Vos, 2016). Despite these ongoing programs of research, it is not yet clear as to which of these or related constructs might contribute more to higher levels of life satisfaction post-disaster. Data collected from a sample of flood-impacted community members do seem to suggest that meaning may indeed be especially important to life satisfaction in this context.

The current study sought to compare the relative strength of two positive psychological constructs as predictors of life satisfaction post-disaster. It drew from a sample of community members in the Houston/Galveston area ($N = 55$), which was predominantly female (78.2%; $n = 47$), White (78.2%; $n = 47$), and in the 55-64 age range (27.3%; $n = 15$). Pearson product correlations revealed that meaning was positively correlated with life satisfaction ($r = .51, p \le .05$), as was resilience ($r = .32, p \le .05$). Meaning and resilience were also positively correlated with one another ($r = .43, p \le .05$). It was hypothesized that meaning in life and resilience would both be positively correlated with life satisfaction. These relationships were reflected in the analyses. Individuals who reported greater meaning or greater resilience tended to report greater life satisfaction post-flooding.

The second hypothesis, positing that meaning would be a greater predictor of life satisfaction than resilience, was also upheld. In modeling these relationships through multiple regression, meaning was found to significantly predict life satisfaction ($\beta = .46, t(54) = 3.48, p = .001, pr^2 = .19$), while resilience was not found to predict life satisfaction at a statistically significant level ($\beta = .13, t(54) = .97, p = .34, pr^2 = .02$). There was a fair bit of variance unaccounted for in the model, which limited the general fit. While this does not entirely impede conclusions from being drawn from the data, it does suggest that there are other variables that play a sizable role in predicting life satisfaction that need to be accounted for in this context.

Limitations

Several limitations of this study should be acknowledged. As previously stated, the room for error that exists in the sample makes it clear that there are other variables unaccounted for in the model that need to be considered due to their relevance to life satisfaction in a post-disaster context. Therefore, the relationships that were found are not as definitive as would be liked.

While meaning in life was shown to outpace resilience in so far as predicting greater life satisfaction and did so significantly, resilience did not vary significantly with life satisfaction. The huge disparity in p-values seen in the multiple regression analysis could be due in part to the small sample size ($N = 55$) just as well as to natural variance. Resultantly, a replication of this study with a larger sample would be useful in supporting the claims made.

Additionally, the sample was not particularly representative of the country as a whole and certainly not representative of the diversity characteristic to the Houston/Galveston area. Houston is traditionally considered to be one of the most diverse metropolitan areas in the United States, with great variance in race, ethnicity, and religious affiliation (Mejia, 2017). However, the sample was mostly female (78.2%) and mostly White (78.2%). These demographic characteristics of the sample limit the generalizability of the findings. At the same time, it is worth noting the difficulty of acquiring a community sample like this remotely, particularly a disaster-impacted one. While efforts were made to recruit from a variety of sources, most survey respondents seemed to come from predominantly White churches, which skewed the results in a direction that was not necessarily representative of the region. However, these organizations were the most responsive to solicitation for participation in the study.

Beyond concerns of generalizability and sample size, it should also be noted that the use of brief measures could have had an influence on the results. Brief measures are much easier to administer and seem to garner greater participation from respondents, but this does come at the cost of lower reliability due to the use of fewer items (Zimmerman et al., 2006). While the brief measures used in this study do have good psychometric properties and yielded decent internal consistency reliabilities (for the BRS, $\alpha = .9$; for the SWLS, $\alpha = .78$; for the MLQ-P, $\alpha = .88$), their brevity should be considered when evaluating possible limitations of the study.

Implications for Research and Future Directions

While the level of error possible in the analyses appeared to be quite high, this could also be an indication that although the difference in predictive ability between meaning and resilience does exist, the bigger picture is just much more complicated. Accounting for additional variables in the regression model may lead to a better fit and, ultimately, a more coherent idea of which factors are most important in determining an individual's life satisfaction post-disaster. The inclusion of other variables known to be relevant to adaptive functioning post-disaster like social support and material resources is the natural next step to answering the questions propelling this line of research forward (Bonanno et al., 2007; Boullion et al., under review; Kaniasty, 2012).

Additionally, the battery of surveys administered in this study has seen use in other projects. Dursun et al. (2016) examined the impact of the 2013 Colorado floods on community members, with a particular emphasis placed on the role of meaning and posttraumatic growth in mitigating posttraumatic stress symptoms. In this case, meaning was shown to contribute significantly to adaptive functioning post-disaster. Another research team looked at the relationships between meaning, resilience, social support, and posttraumatic growth in a sample

affected by the 2016 Louisiana floods (Boullion et al., under review). Such studies will continue to build upon one another, creating a solid empirical foundation on which to base further research. The continued refinement and deployment of this battery in several different flood events is on its own a rewarding end. Even if the data themselves do not lend so easily to cogent results, as was partially the case here, qualitative feedback from participants may be useful in shaping future flood-specific surveys.

Although the sample for this study was not as diverse as expected given the location, Houston is a prime example of somewhere that good research can and should be done. Evidence gathered from representative samples and samples depicting the people that clinicians and policymakers are actually trying to serve is particularly valuable. Particularly with disasters, which disproportionately impact the elderly, individuals living with disabilities, people of color, and people of lower socioeconomic status, there is a definite need to know how diverse populations will be impacted and what might help them most.

Given that this sample was older (the largest age stratum was the 55-64 age range; 27.3%), one point that became especially salient through this study was the need for studying post-disaster outcomes among older Americans. This population may be a key focus for future research, as literature has suggested that older adults and the elderly are at particular risk during disaster response and recovery, given issues with securing medications, mobility, and sometimes tenuous social support or isolation (Cherniack, 2008; Jia et al., 2010; McGuire, Ford, & Okoro, 2007; Şahin, Özer, & Yanardağ, 2019). While life satisfaction among the elderly seems to have been studied largely in the context of difficulties with health, social connectedness, death of friends or a spouse, and progression out of the work world (Chen, 2001), there seems to be little

literature in the disaster space that focuses on life satisfaction on this population. As such, life satisfaction post-disaster among the elderly may yet be a developing area of research. Conducting research with populations underrepresented in the literature like these and that are especially vulnerable in times of disaster would serve a dual purpose. Moreover, it would be beneficial to the broader understanding of concepts like meaning and resilience to see how they interact in these contexts and with these populations.

     Another possible direction for this line of research would be to look at post-disaster outcomes over time. There is a stated need for more longitudinal studies looking at the role that meaning and resilience play in improving quality of life for survivors of disasters further down the line (Goldmann & Galea, 2014). Research examining the different trajectories that individuals follow after a traumatic experience is also of interest (Galatzer-Levy, Huang, & Bonanno, 2018; Osofsky, Osofsky, Weems, King, & Hansel, 2015). In particular, it would be informative to directly compare the outcomes of interventions targeted at increasing resilience and meaning. Examining such interventions may be a more direct avenue to investigate whether one construct should be favored, or prioritized, over the other.

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Tables

Table 1

*Correlation Matrix for Meaning, Resilience, and Life Satisfaction (*N = 55)

Measures	*M*	*SD*	1	2	3
1 Meaning	26.45	5.84	-		
2 Resilience	3.59	0.84	.43*	-	
3 Life Satisfaction	22.87	6.47	.51*	.32*	-

Note: * indicates $p \leq .05$

Table 2

*Multiple Regression Analyses of Meaning and Resilience Predicting Life Satisfaction (*N = 55*)*

Predictor	β	*B*	*SE*$_b$	*T*	*p*	*pr*^{2}
Meaning	0.46	0.50	0.15	3.48	.001*	.19
Resilience	0.13	0.98	1.01	0.97	.34	.02

Note: β = Standardized beta; *B* = Unstandardized beta; *SE*$_b$ = Standard error of unstandardized beta, *pr*^{2} = partial correlation. * indicates $p \leq .001$.

Appendix A

Meaning in Life Questionnaire (MLQ)

Please indicate the degree to which you agree or disagree with each statement below by using the following scale.

1 = Absolutely untrue, 2 = Mostly untrue, 3 = Somewhat untrue, 4 = Can't say true or false,

5 = Somewhat true, 6 = Mostly true, 7 = Absolutely true

1. I understand my life's meaning.
2. I am looking for something that makes my life meaningful.
3. I am always looking to find my life's purpose.
4. My life has a clear sense of purpose.
5. I have a good sense of what makes my life meaningful.
6. I have discovered a satisfying life purpose.
7. I am always searching for something that makes my life feel significant.
8. I am seeking a purpose or mission for my life.
9. My life has no clear purpose.
10. I am searching for meaning in my life.

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Appendix B

Brief Resilience Scale (BRS)

Use the following scale to indicate how much you disagree or agree with each of the statements.

1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree

1. I tend to bounce back quickly after hard times.
2. I have a hard time making it through stressful events.
3. It does not take me long to recover from a stressful event.
4. It is hard for me to snap back when something bad happens.
5. I usually come through difficult times with little trouble.
6. I tend to take a long time to get over set-backs in my life.

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Appendix C

Satisfaction with Life Scale (SWLS)

Please indicate your agreement with each of the following statements using the scale below.

1 = Strongly disagree, 2 = Disagree, 3 = Slightly disagree, 4 = Neither agree nor disagree,

5 = Slightly agree, 6 = Agree, 7 = Strongly agree

1. In most ways, my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far, I have gotten the important things I want in life.
5. If I could live my life over, I would change almost nothing.

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