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Religion and PTSD in Puerto Rico Natural Disaster Survivors

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Religion and PTSD in Puerto Rico Natural Disaster Survivors

by

Abraham Reynolds

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A Dissertation submitted in partial satisfaction of
the requirements for the degree
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Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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Susanne B. Montgomery

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ABBREVIATIONS

PTSD	Posttraumatic Stress Disorder
DSM	Diagnostic and Statistical Manual of Mental Disorders
ASD	Acute Stress Disorder
NET	Narrative Exposure Therapy
RCOPE	Religious Coping Scale
PCL-5	Posttraumatic Stress Disorder Checklist for DSM-5
WAS	World Assumptions Scale
MCAR	Missing Completely At Random
SDA	Seventh-Day Adventist
NegCope	Negative Religious Coping
PosCope	Positive Religious Coping
MI	Multiple Imputation

ABSTRACT OF THE DOCTORAL PROJECT

Religion and PTSD in Puerto Rico Natural Disaster Survivors

by

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Doctor of Psychology, Graduate Program in Psychology
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Dr. Kendal C. Boyd, Chairperson

Religious coping can influence recovery from natural disaster trauma. Participants were recruited from a religiously sponsored university in Puerto Rico, affected by several natural disasters between 2017 and 2020, using an online survey. A significant relationship was found between negative religious coping and changes in mood and cognition, mediated by the effect of worthiness of self. Results indicate that negative religious coping may adversely influence an individual's view of self and increase PTSD-related changes in mood and cognition. If clinicians only examine a client's view of self, they may miss the influence of negative religious coping.

CHAPTER ONE

Introduction

The purpose of the study is to investigate the effects and psychological processing of trauma following exposure to natural disasters. There are many different types of psychological trauma. For some, the precipitating traumatic event may be an isolated instance, such as a car accident. For others, the traumatic event may be prolonged or repeated, such as when there is a hurricane, series of earthquakes, or some other similar events. No matter how brief or extended the duration of a traumatic event, the effects may be long-standing for individuals who have experienced such events.

Natural disaster trauma is an area of study that has a dearth of literature due to how infrequently such events occur. For those that have lived through a near-death experience with a natural disaster, however, the awareness that future traumatic events could occur can outlast the memory of a recent event. The effect of natural disasters on the psychological wellbeing of survivors is less known, as a result of how infrequently they occur.

The literature shows that those who have experienced a natural disaster may be affected in a multitude of ways, both proximal and distal to the individual. Proximal influences include cultural factors, socioeconomic status, mass media, community factors, governmental response, personal history, natural/informal supports, and individual system-level response.

Distal influences such as cultural and socioeconomic factors may include norms about help-seeking and trust in the system. These beliefs may facilitate or even dissuade individuals from seeking help that they may need during or after these disasters. Other

factors might be beliefs in fatalism, unpredictability, familism, or benevolence of the world. One might not seek help if they believe that others will not be willing to offer aid when it is needed. On the other hand, having a belief that others are generally benevolent might facilitate in reaching out for help.

Mass media may aid in communication during a natural disaster, quickly sharing much-needed information on shelters, evacuation zones, and other essential resources. Media may also have negative influences if the information is outdated or misreported. For example, if the trajectory of a storm is reported to not be likely to affect a certain location, individuals within that location may not prepare to evacuate. Should the trajectory of the storm change, they will be left unprepared and possibly not have time to evacuate the location.

System-level response may occur at workplaces, schools, or other such entities. When a natural disaster such as an earthquake occurs, workplaces and schools may have an effect on a person's response-preparedness. When these institutions have provided drills for such occurrences, individuals may act more efficiently during a disaster and these efficiencies may serve to help get to safety or find needed resources.

Community factors include access to necessary resources, cohesion in the community, and environmental characteristics (geographical layout of roads, etc.). Natural disasters may disrupt the functioning of essential institutions and resources. Depending on the layout of roads, individuals may be aided or hindered during evacuation. Likewise, rescue might be more or less different depending on community factors. Cohesion may also be important for rebuilding efforts and establishing shelter for those who may need to evacuate or relocate.

Other supports may be faith-based communities, neighbors, or other social support networks. During natural disasters existing communities serve an essential role in providing for the needs of those who have been affected and reestablishing order following disruptions.

Government response may be limited during natural disasters, or more capable of responding to the needs of citizens depending on many factors. Governmental response may include providing necessary resources that are scarce due to disruptions or may include transportation for those who require evacuation or rescue. Rebuilding efforts may also be supported by governmental response, which might include existing community resources. Governmental response may be at a local, state, or even federal level.

One's personal history may include prior disaster exposure. A person who has experienced a disaster before in their life may have learned ways of coping with the disaster or even learn to prepare for future occurrences. A community that has learned to prepare for such occurrences may react more efficiently during the adversity and may reestablish necessary resources sooner.

Proximal influences may include family functioning, community support (teachers, co-workers, religious community), previous disaster exposure, relationship styles which may influence responsiveness, and resources (such as mental health accessibility).

Finally, there are individual factors, such as one's knowledge of coping skills, disposition, pre-disaster functioning and adjustment, cognitive resources, and emotional development. Those with cognitive impairments may require additional assistance during and after a disaster, those with disabilities or who are mobility impaired may require

transportation, and those who lack emotional development may have more severe reactions to the disaster.

The work of Phillips and Jenkins (2010) suggests that faith-based organizations may serve a vital role in connecting individuals with resources during and following a natural disaster. Their work demonstrates that following Hurricane Katrina faith-based organizations helped meet the needs of the community, and that rather than new organizations meeting needs most recovery efforts came from existing organizations. As such, religious organizations may help by providing shelter, helping with the regulation of emotions, and providing other needed support following the events of a natural disaster.

The purpose of this study is to better understand how the beliefs of individuals who have experienced a natural disaster may influence post-traumatic symptoms during recovery. This is an under-studied area of psychological research and may provide insight into target areas for intervention with clients who may have experienced a natural disaster. The study may also highlight factors that influence one's resilience following the experience of a natural disaster.

Hypotheses

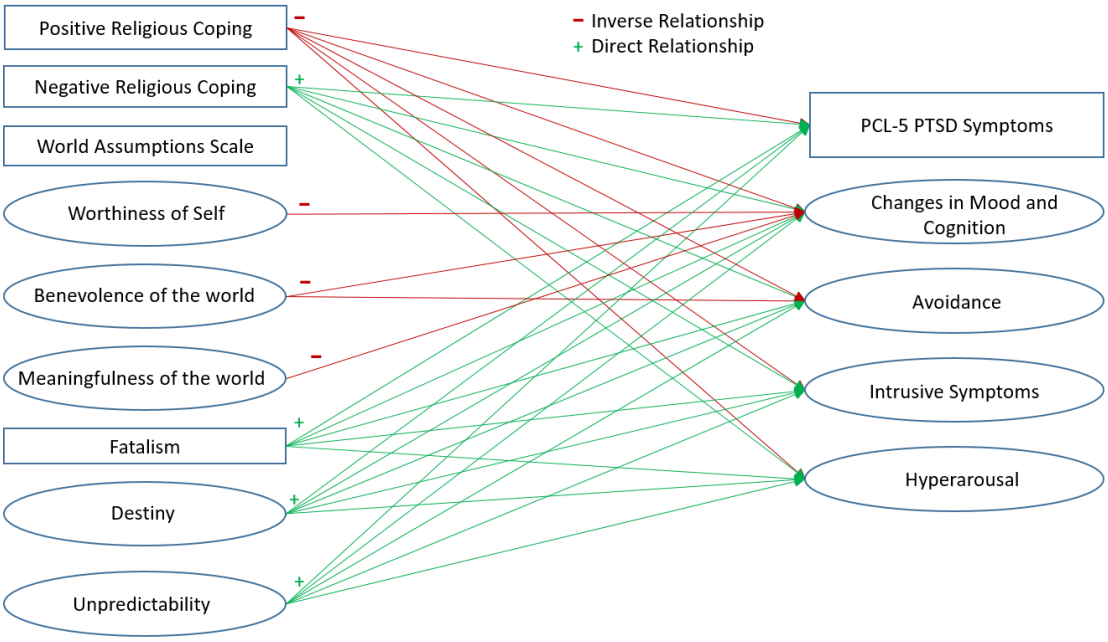


Figure 1. Expected Significant Relationships between Predictive Variables and PCL-5, all Hypotheses. No connecting lines between variables indicates no expected significant relationship.

Hypothesis 1

It is hypothesized that positive religious coping significantly predicts Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) and each of its four subscales (alteration in mood and cognition, avoidance, intrusive symptoms, and hyperarousal) with inverse relationships, such that as positive religious coping increases, the scores on the PCL-5 will decrease (see Figure 1 above for all Hypotheses, or Figure 2 below for Hypothesis 1). It is expected that positive religious coping may reduce one's PTSD-related symptoms due to increased spiritual support seeking and looking for meaning from a traumatic situation.

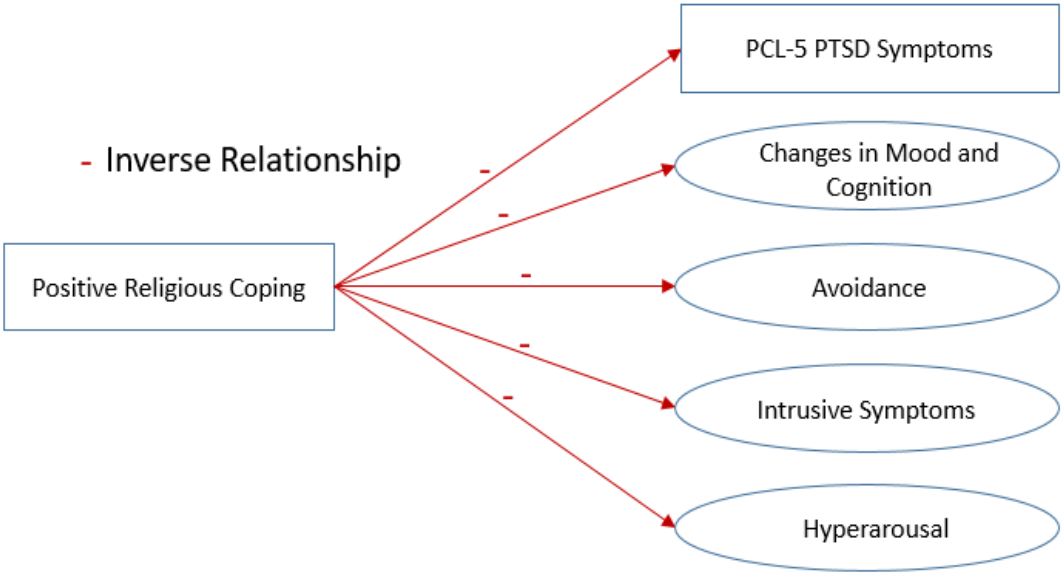


Figure 2. Expected Significant Relationships between Positive Religious Coping and PCL-5 (Hypothesis 1). No connecting lines between variables indicates no expected significant relationship.

Hypothesis 2

It is hypothesized that negative religious coping significantly predicts the PCL-5 and each of its four subscales with direct relationships, such that as negative religious coping increases, so too will the scores for the PCL-5 (see Figure 3). It is expected that negative religious coping would increase PTSD-related symptoms due to greater reported conflict and doubt regarding issues of faith.

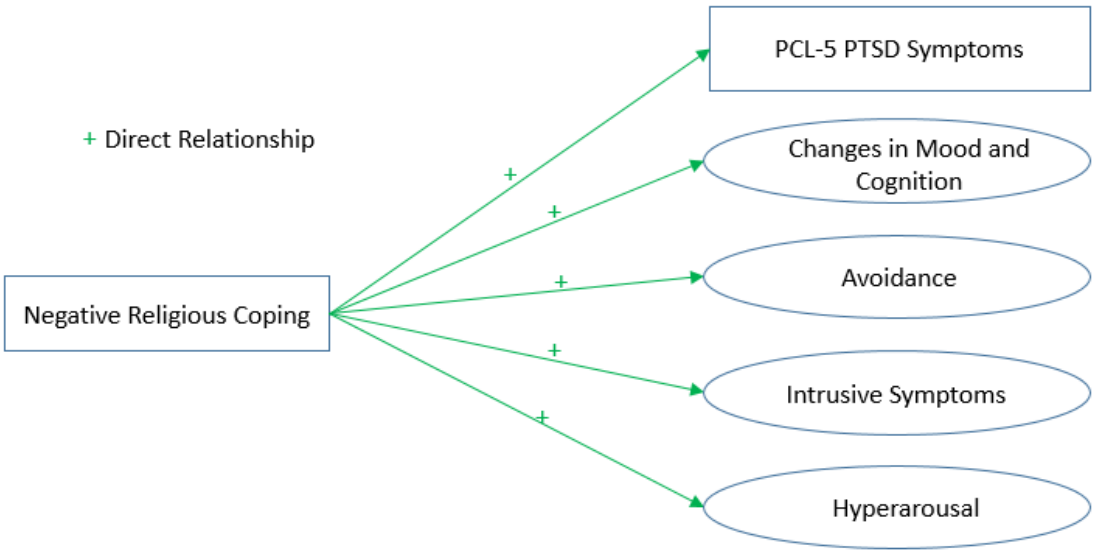


Figure 3. Expected Significant Relationships between Negative Religious Coping and PCL-5 (Hypothesis 2) No connecting lines between variables indicates no expected significant relationship.

Hypothesis 3

It is hypothesized that the WAS composite measure does not significantly predict the PCL-5 and each of its four subscales. These hypotheses are based on the results of Zukerman and Korn (2014), who found few significant relationships between the WAS subscales and the subscales of the PCL (based on the DMS-4 for their study). Since few subscales were predicted to have significant relationships with the PCL-5, the overall subscale was not hypothesized to significantly predict PTSD-related symptoms overall (See Figure 4).

Hypothesis 4

It is hypothesized that the WAS's subscale meaningfulness of the world does not significantly predict the PCL-5 overall measure or its subscales of avoidance, intrusive symptoms, or hyperarousal. Since previous literature has suggested that there is not a relationship among these variables, we are not expecting a relationship for this study.

Hypothesis 5

It is hypothesized that the WAS's subscale meaningfulness of the world significantly predicts the PCL-5's subscale of changes in mood and cognition with an inverse relationship, such that as beliefs in randomness, controllability, and justice increase, the scores for changes in mood and cognition will decrease. With the inclusion of a new subscale in the PCL-5 to reflect the changes made to the criteria for PTSD in the DSM-5, the researchers expect that the WAS's subscales might have relationships with the new subscale in the PCL-5. With greater belief in the meaningfulness of the world, the scores for changes in mood and cognition might decrease.

Hypothesis 6

It is hypothesized that the WAS's subscale benevolence of the world does not significantly predict the PCL-5 overall measure or its subscales of intrusive symptoms and hyperarousal, as indicated in previous literature.

Hypothesis 7

It is hypothesized that the WAS's subscale benevolence of the world significantly predicts the PCL-5's subscales of changes in mood and cognitions and avoidance with inverse relationships, such that as benevolence of the world increases, the scores for changes in mood and cognitions and avoidance will decrease. The researchers expect that if beliefs in benevolence of people and benevolence of the world are strong following a traumatic experience, they would reduce PTSD-related symptoms.

Hypothesis 8

It is hypothesized that the WAS's subscale of worthiness of self does not significantly predict the PCL-5 overall measure or its subscales of avoidance, intrusive symptoms, and hyperarousal, as indicated by the previous literature.

Hypothesis 9

It is hypothesized that the WAS's subscale of worthiness of self significantly predicts the PCL-5's subscale of changes in mood and cognition with an inverse relationship, such that as worthiness of self increases, the scores for changes in mood and cognitions will decrease. It is logical that as one's beliefs in self-controllability, luck, and self worth increase, their symptoms associated with PTSD-related changes in mood and cognition might decrease. Previous literature has also indicated the importance of view of self in influencing PTSD-related outcomes.

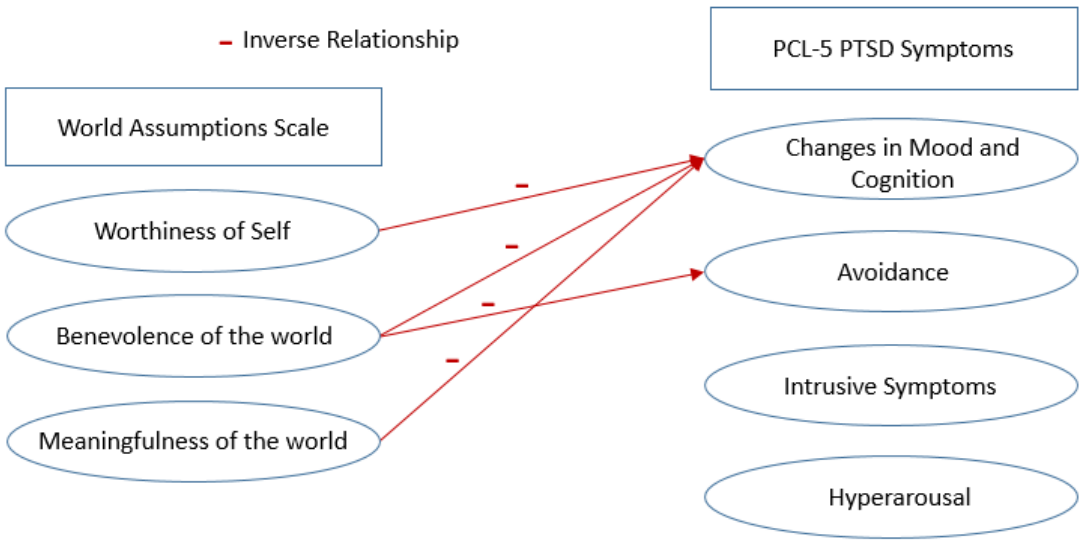


Figure 4. Expected Significant Relationships between WAS and PCL-5 (Hypotheses 3-9). No connecting lines between variables indicates no expected significant relationship.

Hypothesis 10

It is hypothesized that general fatalism significantly predicts the PCL-5 and each of its four subscales with direct relationships, such that as general fatalism increases, so too will the scores for the PCL-5 (See Figure 5). It is expected that fatalism may cause an individual to engage in more avoidant coping and therefore to experience greater increases in PTSD-related symptoms.

Hypothesis 11

It is hypothesized that general fatalism's subscale of unpredictability significantly predicts the PCL-5 and each of its four subscales with direct relationships, such that as the subscale of unpredictability increases, so too will the scores for the PCL-5 and each of its subscales. It is logical that as belief in unpredictability increases, one may be more alert and therefore have increased PTSD-related symptoms.

Hypothesis 12

It is hypothesized that general fatalism's subscale of destiny significantly predicts the PCL-5 and each of its four subscales with direct relationships, such that as the subscale of destiny increases, so too will the scores for the PCL-5 and each of its subscales. It is expected that fatalistic beliefs in destiny may increase one's avoidant coping and therefore increase PTSD-related symptoms.

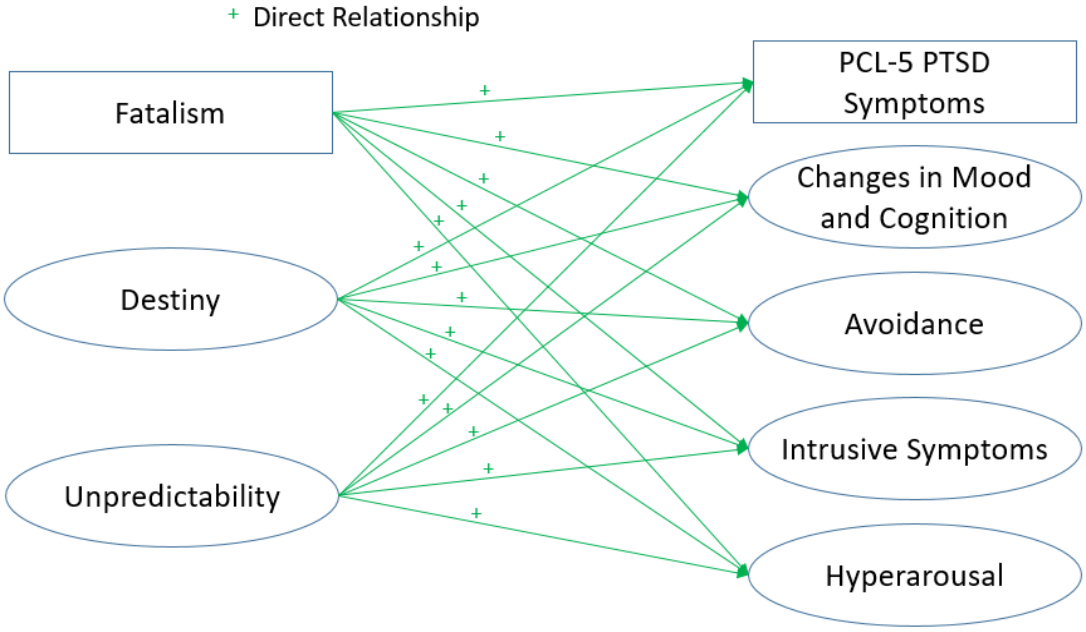


Figure 5. Expected Significant Relationships between Fatalism and PCL-5 (Hypotheses 10-12). No connecting lines between variables indicates no expected significant relationship.

Hypothesis 13

It is hypothesized that negative religious coping will predict changes in mood and cognition through the mediating effect of worthiness of self. We hypothesize that the direct effect will be significant as well as the indirect effect. Negative religious coping is expected to have a significant inverse relationship with worthiness of self, and worthiness of self is expected to have a significant inverse relationship with changes in mood and

cognition. Negative religious coping is hypothesized to have a significant direct relationship with changes in mood and cognition (see Figure 6 below).

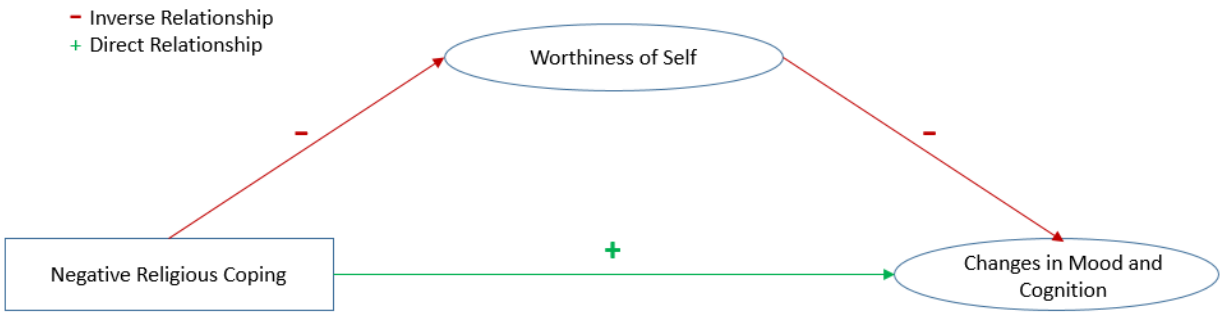


Figure 6. Expected Significant Mediation between Negative Religious Coping, Worthiness of Self, and Changes in Mood and Cognition (Hypothesis 13)

CHAPTER TWO

Literature Review

Posttraumatic Stress Disorder

The cause of posttraumatic stress disorder (PTSD), unlike many other psychological disorders, is well understood. One or several traumatic events precipitate the development of the disorder. While the contexts and the specifics of the traumatic events might differ, such as trauma from combat exposure in war, intimate partner violence, or surviving a natural disaster, the trajectory of the disorder is less understood than the initial cause—one or several experienced events. Due to the limitations of our knowledge on the nature of the progression of PTSD, research on the disorder tends to focus on the trajectory of patient outcomes under differing circumstances and interventions.

The Diagnostic and Statistical Manual of Mental Disorders (DSM–5) specifies that those with PTSD typically have had direct or indirect exposure to the threat of death, violence, or sexual violence, intrusive symptoms, avoidance of stimuli related to the traumatic event(s), negative cognitions or moods related to the traumatic event(s), and changes in reactivity and arousal (American Psychiatric Association, 2013). These changes after a traumatic event often cause distress to or impairment of the individual who has PTSD symptoms. Symptoms of PTSD can cause a person to become impaired personally, socially, and professionally.

Research has also demonstrated that many individuals with PTSD may also have an increased risk of comorbidities. One meta-analysis found that 52% of the individuals with PTSD also presented with major depressive disorder (Rytwinski, Scur, Feeny, &

Youngstrom, 2013). The existence of comorbidities calls into question whether the PTSD diagnostic criteria are sufficiently specific and whether there might be shared contributors to the co-occurring disorders.

PTSD is associated with neurological changes following the traumatic event(s). Shortly after the traumatic event(s), memories become more fragmented for those with acute stress disorder (ASD), compared to those without (Harvey & Bryant, 1999). This fragmentation of memories may be responsible for the following symptoms of dissociation. If memories are consolidated in an unorganized way, access to recall and the ability to modify such memories may become difficult.

PTSD is also characterized by flashbacks, where the individual experiences intrusive thoughts or emotions related to the traumatic experience. Research has shown these flashbacks to be more notable than normal autobiographical memory and is typically more visually-based (van der Kolk & Fisler, 1995). Intrusive symptoms such as nightmares or flashbacks are common for those who suffer from PTSD, although individuals may differ in how these symptoms are presented.

Neurological models of PTSD have emphasized the importance of the amygdala, hippocampal formation, and the medial prefrontal cortex (Rauch, Shin, & Phelps, 2006). In particular, hyper-responsive activation of the amygdala and the inability of the medial prefrontal cortex and hippocampus to exert top-down influence over amygdala responses have been shown.

The amygdala's hyper-responsiveness makes sense, given the amygdala's role in the experience of emotion and PTSD's association with fear and negative affect. The role of the amygdala has also been experimentally demonstrated during fear acquisition and

the incitement of PTSD symptoms (Bremner et al., 2005). PTSD is dependent upon interaction with the environment and is a learned disorder. Unlike psychological and physical disorders that are genetically endowed, PTSD requires a precipitating event that then results in changes to the individual's neurological activation and behavior afterwards. The amygdala responds to these environmental interactions with increased activation.

Heightened activation of the amygdala is also significantly correlated with PTSD symptoms severity (Armony, Corbo, Clément, & Brunei, 2005). The same article concluded that heightened activation of the amygdala occurred as early as one month after the traumatic event, suggesting that the development of PTSD could be an extension of the heightened physiological arousal seen in ASD and that those heightened levels of activation may be responsible for more severe symptoms.

Over enough time, these changes in functional activation may yield structural changes to the individual's neurological substrates. Reduced volumes of the hippocampal formation are seen for individuals with PTSD, compared to those who have experienced trauma without PTSD (Kühn & Gallinat, 2013). This correlation between PTSD and hippocampal volume indicates that there might be structural changes in the hippocampal formation following the traumatic event(s).

Just as increased amygdala activity plays a role in PTSD symptom severity, the reduction of the hippocampal formation's volume should predictably lead to changes in behavior. Individuals with PTSD typically experience the greatest reduction in the cornu ammonis 3/dentate gyrus subfield of the hippocampus (Wang et al., 2010). Chronic stress

could cause less generation of neurons in this region, possibly accounting for the volume reduction.

The cornu ammonis 3/dentate gyrus subfield of the hippocampus is responsible for context memory (McHugh & Tonegawa, 2009). If PTSD is significantly associated with reduced hippocampal volume, which is associated with reduced contextual memory, then dissociative memories may be explained by these structural changes over time due to the presence of chronic stress. The dissociative memories may then lead to intrusive cognitions, such as flashbacks.

In an article by Flor (2011), the argument is made that the reduction in hippocampal volume leads to difficulties discerning safe contexts from dangerous contexts, with signals of danger becoming more prominent in individuals with PTSD. The author also points out that dissociation impedes learning, meaning that these deficits may account for why those with PTSD are unable to learn how to modulate their fear and pain responses.

There has been a growing emphasis in pioneering PTSD interventions on meaning-making for individuals after a traumatic event. One such intervention is Narrative Exposure Therapy (NET). This intervention prompts the individual to create a life story that incorporates their traumatic event, while being guided by a supportive clinician who maintains contextual awareness by reminding the participants that their current feelings and reactions are from memory recall (Schnyder et al., 2015). NET helps the individual with PTSD to discern where their emotions originate and to contextualize their fears. The therapy also focuses on helping the individual to construct a meaning for

their trauma, potentially combatting the effect on contextual awareness seen by the reduction in hippocampal volume for individuals with PTSD.

NET has proven successful, even though the therapy is short-term in duration and only requires a competent clinician to administer the intervention. Research has shown the intervention's usefulness in locations where psychotherapy availability is limited, as well. However, as Ventevogel (2014) points out, there is controversy over the extent to which NET may be successfully implemented in regions with varying cultures and whether more local means of therapy should be explored instead. While addressing the controversy of bringing therapies to war-torn or devastated areas in lieu of more local forms of therapy, the article nevertheless supports the use of NET in novel settings.

Models of meaning-making have also been supported by recent research. Steger, Owens, and Park (2015) demonstrate support for a model of PTSD that incorporates meaning in life and the search for meaning. They found that violations of beliefs and goals were linked to military stress, and meaning indirectly connected those violations with PTSD symptoms and posttraumatic growth. Their findings demonstrate the importance of meaning-making in models of PTSD. While goal and belief violations may be most important to the development of PTSD symptoms, meaning-making is shown to be an important part of explaining PTSD outcomes.

Meaning-making has also been shown to be an important part of the relationship of spiritual intimacy to marital intimacy and well-being. Holland et al. (2016) found that spiritual meaning mediated the relationship and that without spiritual meaning, greater spirituality could negatively influence marital intimacy and well-being. This study suggests the centrality of meaning-making in determining the outcomes of one's spiritual

intimacy and has implications for the importance of one's ability to create meaning through religious coping in determining PTSD outcomes.

Religious Coping

There are a few models explaining how religion may affect health outcomes. Dull and Skokan (1995) describe how "Religion as a complex system of beliefs can heavily influence major attitudes such as family planning or structure, work, politics, and interpretation of daily life events" (p. 50). As a cognitive system that influences our perceptions and assumptions, religion may play a large role in health outcomes. Religion can also function as a means of providing direction, a sense of belonging, and purpose behind what people do.

Pargament provides another model for the influence of religion as a cognitive system that influences health outcomes through the religious orienting system. The model consists of personal, social, and religious resources that a person may employ to deal with stressors and difficult life events (Pargament, 1997). The religious orienting system provides direction for a person, and spiritual struggle occurs when a person's religious orienting system is challenged by difficult life events.

Both models provide cognitive systems for dealing with life stressors and guiding people through their attributions, judgments, and assumptions. Pargament later went on to emphasize the importance of the sacred in the religious orienting system (Pargament, 2011). People tend to hold sacred beliefs that may also be violated during stressful life events. When exposed to new ideas or faced with events that challenge what they hold sacred, individuals may experience a spiritual struggle. Those who are religious and develop PTSD from a traumatic event might experience such struggles, as beliefs that

they hold sacred could be violated. The resulting struggle could end with positive or negative health outcomes, depending on how the individual addresses the situation and the type of coping resources they possess to deal with these experiences.

Those who have suffered a traumatic event are able to construct a meaning for that event, influencing the outcome of PTSD symptoms. According to Park (2010), "Various types of meaning-making coping, including positive reappraisal, seeking emotional social support, and religious coping, have been related to perceived growth" (p. 285). Posttraumatic growth may occur depending on the way one interprets the events of a trauma and makes a positive meaning. Those who are religious or spiritual may preferentially rely on religious and spiritual means of coping.

Religious coping studies that use measures of religion that are too narrow or too broad may not have the accuracy needed to determine how religious and spiritual coping may influence health outcomes. For this reason, Pargament, Koenig, and Perez developed a religious coping scale, called the RCOPE, identifying meaning, comfort, control, life transformation, and intimacy as the roles religion performs in coping (Gall & Guirguis-Younger, 2013). The measure includes aspects of religiousness and spirituality that are important to the process of coping. The shorter version that was created later also contains positive and negative subscales.

The religious cognitive systems that one employs after trauma might help to orient the individual and provide meaning in the face of stress and adversity. Depending on whether the individual employs positive or negative religious coping strategies, however, might influence whether they experience subsequent posttraumatic growth or worsened PTSD symptoms.

Worldview

An article by Matthews and Marwit (2006) calls for more research on the relationship between religious coping and worldview, showing how clear operational measures are necessary in determining how one's world assumptions are violated during trauma and how people seek meaning after such an experience. Much of the bereavement research focuses on adaptive and maladaptive coping strategies, but these researchers call for more methodologically sound studies on the process by which people turn to religion and spirituality after trauma, to address shattered assumptions about the world.

One study that attempted the type of experiment called for by Matthews and Marwit (2006) examined religious coping by using Pargament's religious problem-solving scales (Pargament et al., 1988) and worldview by using the world assumptions scale (Janoff-Bulman, 1989). The findings of the experiment supported the view that those who experience trauma use religious coping for meaning reconstruction, and the type of religious coping employed has impacts on meaning-related outcomes (Hibberd, Vandenberg, & Wamser, 2011). While this study does not use positive or negative religious coping, the general finding that religious coping style influences meaning-related outcomes would lend support for studying whether positive or negative religious coping may lead to different world assumptions, influencing PTSD symptom severity.

Another study demonstrates the relationship between trauma-related beliefs and PTSD symptom severity. Change in negative beliefs about the self, self-blame, and the world resulted in PTSD symptom improvement for participants in prolonged exposure therapy (Cooper, Zoellner, Roy-Byrne, Mavissakalian, & Feeny, 2017). This finding supports the assertion that worldview might predict PTSD symptom severity, as change

in trauma-related beliefs has been shown to influence health outcomes directly (See "Support for Models").

Since religious coping has been shown to influence worldview assumptions and worldviews have been shown to influence PTSD symptom severity, examination of the potential mediating effect worldview might have on the relationship between religious coping and PTSD symptom severity is justified.

Fatalism

Fatalism has been shown to be a particularly strong predictor of outcomes in stress research and has been especially noted for heightened severity in individuals with hurricane exposure in the Latino population. Perilla et al. (2002) suggest that "the mediating role of fatalism [for the relationship between ethnicity and distress] is consistent with a large body of literature showing that external control is a risk factor for poor psychological outcomes following stressful life events" (p. 39). These increased beliefs in fatalism also have effects on an individual's PTSD symptom severity following exposure to traumatic events.

It is theorized that the connection between fatalism and PTSD symptom severity may be accounted for by the type of coping styles that individuals use. "Research with Latino adults has pointed to how the relationship between coping style and *fatalismo* may contribute to [the] development of PTSD through increasing the use of passive coping mechanism[s] by Latinos compared to other ethnocultural groups…" (Vásquez et al., 2012, p. 9). It is possible that more passive forms of coping may influence the development of PTSD symptoms, such as negative religious coping.

PTSD symptoms have also been demonstrated to be significantly correlated with fatalism in previous research. For example, Belmar et al. (2012) found a significant positive correlation between fatalism and PTSD for adults who had experienced the February 2010 earthquake in Chile. This finding supports the inclusion of fatalism as a predictor of PTSD for this current study, indicating that it may uniquely contribute to PTSD symptom development for Latino adults that have experienced a natural disaster.

Support for Models

This study attempted to test whether positive and negative religious coping, worldview assumptions, and fatalism significantly predict PTSD symptoms. Due to limited sample size, however, only PTSD was examined as a dependent variable. There is partial support for the direct relationship between religious coping and PTSD symptoms, the relationship between religious coping and worldview, and the relationship between worldview and PTSD symptoms. However, the literature does not use standardized measures. To date, no study that the researcher is aware of has investigated the particular models tested in this study.

There is support in the literature for religious coping predicting worldview assumptions (Zukerman & Korn, 2014). Zukerman and Korn (2014) measure worldview assumptions through the world assumptions scale (WAS), which has three main categories: benevolence of the world, meaningfulness of the world, and worthiness of self. This finding lends support to the relationship between religious coping and worldview (which includes a category for worthiness of self). The specific scale used for positive and negative religious coping, however, was specifically designed for Jewish participants. For this study, a measure that is appropriate for Christian participants is

necessary. Likewise, the PTSD symptoms were measured with a scale based on the DSM-4. This study uses an updated measure that is modeled off the diagnostic criteria in the DSM-5.

While Zukerman and Korn (2014) found significant relationships between religious coping and worldview, they only found one significant relationship between worldview and PTSD symptoms (the relationship was between the benevolence of the world subscale of the world assumptions scale and avoidance-related PTSD symptoms). This study has one more cluster of PTSD symptoms, has a more specific population of study, and uses a four-step hierarchical linear regression (their study used two-step hierarchical linear regressions).

There is also support in the literature for the Meaning Assessment Scale's Appraised Violations subscales predicting PTSD symptoms through the mediating effects of negative cognitions about the world and negative cognitions about self (Park, Mills, & Edmondson, 2012). The mediators were measured using subscales of the Posttraumatic Cognitions Inventory. While the worldview assumptions used in this study only examine negative cognitions as mediators, the significant pathways for negative worldview and negative view of self to PTSD symptoms lends support to the argument that worldview and view of self may play a role in the development of PTSD symptoms. Specifically, negative cognitions about self were more strongly associated with PTSD symptoms than negative cognitions about the world.

Finally, there is partial support for a direct relationship between religious coping and PTSD symptoms. One study found that negative religiousness/spirituality coping (RS) was positively associated with PTSD symptoms in veterans (Park et al., 2017). This

study also used posttraumatic growth as a variable, finding an inverse association between negative RS coping and posttraumatic growth and a positive association between positive RS coping and posttraumatic growth.

Another study that shows how negative religious coping, specifically the measure of feeling punished by God, predicts higher levels of PTSD symptoms and negative emotions (Feder et al., 2013). While this study only found one item from the negative religious coping scale to have a significant relationship, and used a measure of PTSD symptoms that was specific for earthquake survivors, the results still partially support the hypothesized relationship between the variables of this study. These results also lend support for studying how religious coping affects PTSD symptoms for those who have experienced a natural disaster.

Finally, Berzengi et al. (2017) found negative religious coping to be significantly correlated with PTSD symptoms and to be a unique predictor of PTSD symptoms for Muslim trauma survivors. This study attempted to see if that relationship also applies to a Christian population that has experienced a natural disaster. Religious coping relates to many psychological health outcomes (McConnell, Pargament, Ellison, & Flannelly, 2006; Scandrett & Mitchell, 2009; Sherman, Simonton, Latif, Spohn, & Tricot, 2005), supporting the clinical relevance and necessity of this study.

CHAPTER THREE

Method

Participants

The participants for this study consist of 110 individuals sampled from Antillean Adventist University (Universidad Adventista de las Antillas) in Mayagüez, Puerto Rico, a Seventh-day Adventist university affected by the 2017 hurricane, Maria; the 2019 hurricane, Dorian; the 2020 earthquakes (including one that was 6.4 magnitude), and tropical storms/hurricanes during 2020. Students at Antillean Adventist University may be likely to engage in religious coping.

Geographic Area

Hurricane Maria touched land on the southeast shore of Puerto Rico. Due to the strength of the storm, trajectory, and sustained difficulties the island suffered after the hurricane, most of the residents in Puerto Rico at the time were likely impacted. Hurricane Dorian passed Puerto Rico sometime after, and the 2020 earthquakes have been the most recent natural disaster to affect the people that live in Puerto Rico. With multiple earthquakes over the span of weeks, the residents of Puerto Rico likely have experienced psychological and physical health effects following these natural disasters.

Materials

Demographic Variables

Participants were asked to self-report their age, gender, race/ethnicity, socioeconomic background, level of education, how long they have lived in the area, how long they have been affiliated with a church, whether they lived in the area during the hurricanes/earthquakes, whether they were evacuated due to the hurricanes/earthquakes,

whether they have relocated since the hurricane/earthquakes, and how the hurricanes/earthquakes may have affected them (physical injury, illness following the hurricanes/earthquakes, loss of property, death of someone close, loss of income, and being rescued). In addition, they were asked about their church attendance, amount of time per week spent reading the bible, religious identity, and amount of time per week spent praying.

RCOPE: Brief

The RCOPE: Brief is a short form of the religious coping scale and has both a positive subscale and a negative subscale. The items are measured in a four-point Likert style, from 0 (*not at all*) to 3 (*a great deal*). There are a total of 14 items for the entire scale. Some of the items from the positive subscale include "Focused on religion to stop worrying about my problems," "Sought God's love and care," and "Sought help from God in letting go of my anger." The negative subscale has items such as "Wondered what I did for God to punish me," "Wondered whether my church had abandoned me," and "Decided the devil made this happen."

For positive religious coping, a high score is indicative of "a sense of connectedness with a transcendent force, a secure relationship with a caring God, and a belief that life has a greater benevolent meaning" (Pargament, 2011, p. 51). A low score indicates less of these characteristics, but not necessarily the opposite of these characteristics. For negative religious coping, a high score is indicative of "signs of spiritual tension, conflict and struggle with God and others, as manifested by negative reappraisals of God's powers (e.g., feeling abandoned or punished by God), demonic reappraisals (i.e., feeling the devil is involved in the stressor), spiritual questioning and

doubting, and interpersonal religious discontent" (Pargament et al., 2011, p. 58). Like the positive subscale, a low score on the negative religious coping subscale indicates less struggle with God and similar characteristics. The overall scale for religious coping is composed of both subscales, with a higher score indicating more positive religious coping and a lower score indicating more negative religious coping.

The median alpha coefficient for internal consistency of the positive religious coping subscale, determined from several studies examined by Pargament (2011), was 0.92. The median alpha coefficient for the negative religious coping subscale was 0.81. For this study, Cronbach's alpha indicated positive religious coping was found to be highly reliable (7 items; $\alpha = .84$). Negative religious coping was also found to be highly reliable (7 items; $\alpha = .74$). On average, positive religious coping was found to have higher alpha coefficients than negative religious coping.

World Assumptions Scale

This scale, developed by Janoff-Bulman (1989), is a 32-item measure using three primary categories. These categories are worthiness of self, meaningfulness of the world, and benevolence of the world. Eight subscales constitute the three primary categories. Worthiness of self is made up of the subscales for self-controllability, luck, and self-worth. Meaningfulness of the world is made up of the subscales for randomness, controllability, and justice. Finally, benevolence of the world is made up of the subscales for benevolence of people and benevolence of the world. Each subscale has four items, which are measured using a 6-point Likert style, from 1 (*strongly disagree*) to 6 (*strongly agree*).

Some examples of items used in the worthiness of self category are “I take the actions necessary to protect myself from misfortune” (self-controllability), “Looking at my life, I realize that chance events have worked out well for me” (Luck), and “I often think that I am no good at all” (self-worth). Examples from the meaningfulness of the world category are “Bad events are distributed to people at random” (randomness), “If people took preventative actions, most misfortune could be avoided” (controllability), and “Generally, people deserve what they get in this world” (justice). Finally, some examples from the benevolence of the world category are “People don’t really care what happens to the next person” (benevolence of people) and “If you look closely enough, you will see the world is full of goodness” (benevolence of the world). It is important to note that these scales do not represent people believing that their lives are meaningful, examining instead the assumptions that people have about the world and themselves. Higher scores on each subtest indicate higher presence of the respective assumption. The alpha coefficients used to determine internal consistency from the original Janoff-Bulman study were between 0.68 and 0.86. In this study, Cronbach's alpha indicated WAS was found to be highly reliable (32 items, $\alpha = .79$). Benevolence of the world was also found to be highly reliable (8 items, $\alpha = .80$), while meaningfulness of the world was reasonably strong (12 items, $\alpha = .64$). Worthiness of self was highly reliable (12 items, $\alpha = .73$).

Value Orientation Scale for Fatalism

This measure is made up of two dimensions of fatalism: “unpredictability” (e.g., “Since life is unpredictable, it is better to take it one day at a time”) and “destiny” (e.g., “It is better for people to just go along with whatever comes their way in life”) with 6 items for each subscale. The 12 items are on a 7- point Likert scale from 1(*strongly*

disagree) to 7 (*strongly agree*). In a previous study, the language and response format of the scale were adapted, maintaining ten of the original 12 items, obtaining a Cronbach's alpha of 0.75 (Otzen et al., 2016). For this study, Cronbach's alpha indicated fatalism was highly reliable (12 items, $\alpha = .83$). Unpredictability had a reasonably strong reliability (6 items, $\alpha = .68$), while destiny was highly reliable (6 items, $\alpha = .75$).

Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5)

The PCL-5 is a 20-item measure of PTSD symptomatology designed to be up-to-date with the DSM-5 (Blevins, Weathers, Davis, Witte, & Domino, 2015). The items are clustered according to the symptom groups of intrusion (items 1-5), avoidance (items 6 & 7), changes in mood and cognition (items 8-14), and arousal and hyper-reactivity (items 15-20). These items are measured in a five-point Likert-style, with frequency and severity ranging from 0 (*Not at all*) to 4 (*Extremely*). The version of the measure used in this study includes a trauma screen, which is intended to identify the traumatic event that is most troubling to participants at the time of administration. After the trauma screen is a "yes" or "no" checklist of several life domains that may have been affected by the problems participants marked.

Some examples of items from each of the symptom groups in the PCL-5 include "Repeated, disturbing dreams of the stressful experience," "Avoiding memories, thoughts, or feelings related to the stressful experience," "Loss of interest in activities that you used to enjoy," and "Feeling jumpy or easily startled." A higher score for each item means a higher presence of the respective symptoms during the last month, while a lower score indicates less occurrence of the symptom during the last month. The measure can identify which individuals have probable diagnoses of PTSD, however further

assessment would be needed to confirm a diagnosis. In this way, the PCL-5 may be used as a screen for determining which individuals may likely benefit from seeking further psychological treatment (Blevins, Weathers, Davis, Witte, & Domino, 2015).

The internal consistency from Blevins, Weathers, Davis, Witte, and Domino (2015), examining the psychometric properties of the PCL-5, was high (α = .94). Test-retest reliability (*r* = .82), convergent validity (*r*s = .74 to .85), and discriminant validity (*r*s = .31 to .60) were also strong. In this study, Cronbach's alpha indicated the PCL-5 was highly reliable (20 items, α = .95). Intrusion was highly reliable (5 items, α = .90) as well as avoidance (2 items, α = .81). Changes in mood and cognition was highly reliable (7 items, α = .89) and so was hyperarousal (6 items, α = .84).

Procedure

The data were collected through Qualtrics (Qualtrics, Provo, UT), an online survey software, by emailing an invitation to complete the survey on the participant's own computer. The participants were recruited by email from Antillean Adventist University (Universidad Adventista de las Antillas). All participants who voluntarily filled out the questionnaire were provided with information regarding how they may seek psychological services, should they so choose. After signing the informed consent, the participants filled out the questionnaire with as much time as they required. They were able to be entered into a raffle at the end of the survey and were free to skip questions or exit the questionnaire at any time. Participants were prevented from re-taking the survey using Qualtrics' Prevent Ballot Box Stuffing option, which uses cookies to identify participants and prevent them from re-taking the survey. In case the participants wished

to contact the researchers with any questions regarding the study, they were provided with separate emails for English or Spanish communication to answer any questions.

Data Analysis Plan

There is an increased risk of family-wise error when conducting several multiple linear regression analyses. Due to limited sample size after collection, however, linear regression was chosen to compare relationships between variables. Each model tested with multiple linear regression was distinct and examined different relations between the overall scales and subscales of the measures.

The analysis was conducted using IBM SPSS Statistics (Version 26) predictive analytics software. We examined a two-tailed *p*-value test for significance for each multiple linear regression and the proportion of variance in the dependent variable which was predicted by the combined model of independent variables. We also examined the data for outliers and violations of assumptions before running the analysis.

Screening criteria was determined to be 75% completion of the relevant survey questions and a 300 second minimum for completion of the survey. This would remove individuals with outliers who did not complete significant portions of the survey or give consideration to accuracy of responses. Further outliers were determined using Mahalanobis distances for multivariate outliers (Stevens, 1984). After using the screening criteria and testing for multivariate outliers, the remaining usable sample size was n = 110. A comparison of means was conducted to look for unintentional screening effects among the participants, but none were found.

None of the measures or subscales had a skewness greater than 2 or less than -2, so they were determined to be relatively normally distributed. Furthermore, each of the

independent variables had a linear relation with the dependent variables, if a relation was found, and the variance of residuals was normally distributed for each dependent variable. The observations were independent of each other. Thus, each of the four assumptions of the test were satisfied.

Little's MCAR test failed to reject the null hypothesis ($p > .05$) that the remaining missing data were missing completely at random, allowing the use of multiple imputation (MI) as a tool to replace the missing values (20 imputations were used). See Figure 7 for the distribution of missing values after removing outliers.

Multiple regression was used due to its ability to test for the prediction of a dependent variable based on two or more independent variables while controlling for other variables. For the complete breakdown of expected predictions, please see the hypotheses listed above.

An analysis was conducted to examine a mediation model using PROCESS v3.5 as described by Hayes (2018) to check for a mediation effect. The data used were from the pooled results of the imputations for handling missing data. The simple mediation analysis used 5,000 bootstrap samples for percentile bootstrap confidence intervals. For more information on the mediational model, please see the results below.

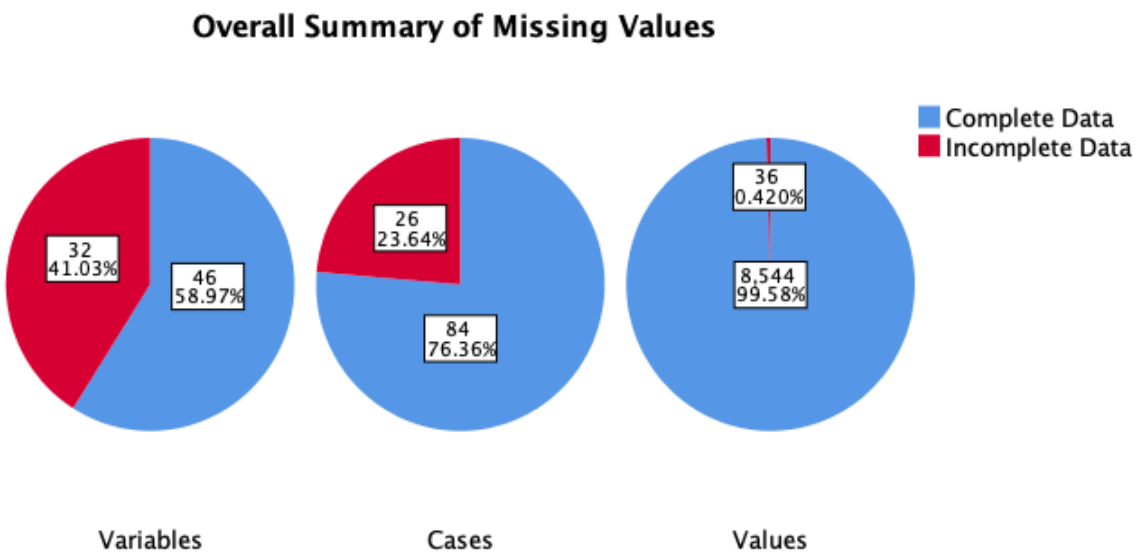


Figure 7. Overall Summary of Missing Values

Sample Size Justification

In order to have enough participants to study the models, the sample size has to be fairly large. Voorhis et. al. (2007) suggest a general rule of 50+8k where k is the number of predictors for setting a minimum sample for multiple regression. The model examining global scales has 4 predictors, thus a minimum sample size of 82, and our model examining subscales has 7 predictors, thus a minimum sample size of 106. For individual predictors, such as for a simple mediation analysis, the recommended minimum sample size is 104+k where k is the number of predictors. In our mediation analysis, we have the independent variable and the mediator, thus the recommended minimum sample size is 106 participants. Our sample size is 110, adequately meeting the requirements for the data analysis plan.

CHAPTER FOUR

Results

Frequencies

Demographic Data

Frequencies were calculated for each categorical variable in the study, as well as the exposure of the participants to Hurricane Maria, Hurricane Dorian, and the 2020 Earthquakes (See Table 1). The frequency percentages are calculated from the final sample (*n*=110). The survey was sent to students at Antillean Adventist University (Universidad Adventista de las Antillas) during three academic quarters of the school year, which have been labelled "Academic Quarters" throughout these results. In the third academic quarter, the high majority identified as female (86.5%) with the remaining 14% identifying as male. Further demographic variables identified included language, ethnicity, age, religion, education, social class, marital status, and length of time in Puerto Rico. The frequencies for these variables can be found in Table 1 below.

The first academic quarter of responses from the Spring 2020 class constituted approximately 42% of the final sample and the second academic quarter from the Summer 2020 class constituted 24% of the final sample, both were from a mixed population of students attending the university. The third academic quarter from the Fall 2020 class consisted exclusively of incoming Freshmen to prevent participants from re-taking the survey, and constituted 34% of the final sample. The majority of participants self-reported having Spanish as their primary language, being between the ages of 18 and 24, Seventh-day Adventist, and/or Hispanic/Latino ethnicity. In fact, since 96% of participants identified as Hispanic/Latino, this demographic was treated as a constant in

later regression tests. Since 59% of participants identified as Seventh-day Adventists, the other identified religions were combined into a single category and religious identity as a variable for testing was changed to consist of two categories: ‘Seventh-day Adventist’, and ‘Other’. All continuous demographic variables means and standard deviations can be seen in Table 3.

Table 1. Sociodemographic Characteristics of Participants in this Study

	Participant Frequencies and Percentages	
	n	*%*
Gender		
Female	32	29.1
Male	5	4.5
Unidentified	73	66.4
Marital status		
Married	32	29.1
Divorced	1	.9
Separated	1	.9
Never married	45	40.9
Not married, long term relationship	31	28.2
Highest educational level		
High school or equivalent	11	10
Some college	30	27.3
Associate's Degree	16	14.5
Bachelor's Degree	32	29.1
Master's Degree	18	16.4
Doctorate Degree or equivalent	3	2.7
Academic Quarters		
Spring Quarter	47	42.7
Summer Quarter	26	23.6
Fall Quarter	37	33.6
Primary Language		
English	41	37.3
Spanish	69	62.7

Table 1. Continued

	Participant Frequencies and Percentages	
	n	*%*
Age in Years		
18-24	69	62.7
25-34	19	17.3
65-74	1	.9
75-84	2	1.8
Race/Ethnicity		
Hispanic, Latino, or Spanish Origin	105	95.5
Asian	1	.9
White	1	.9
Mixed	3	2.7
Religious Identity		
Seventh-day Adventist	65	59.1
Other	45	40.9
Social Class		
Poor	14	12.7
Working class	40	36.4
Middle class	55	50
Affluent	1	.9
Time in Puerto Rico		
3 months or fewer	1	.9
1-2 years	5	4.5
3-5 years	9	8.2
6-10 years	8	7.3
11-20 years	37	33.6

Table 1. Continued

	Participant Frequencies and Percentages	
	n	*%*
21-40 years	40	36.4
41-50 years	4	3.6
51 years or more	6	5.5

Note. $N = 110$

Disaster Exposure

The majority of participants in the study reported living in Puerto Rico during Hurricane Maria, Hurricane Dorian, the 2020 earthquakes, or the 2020 Hurricanes and storms. Furthermore, many were evacuated, relocated, injured, or lost property or income due to one of these disasters. At least 17% of the participants lost contact with someone or knew someone personally who had died due to one of these natural disasters. 31% of participants reported being affected by all four disasters: Hurricane Maria, Hurricane Dorian, the 2020 Earthquakes, and the 2020 hurricanes and storms. 61% of participants were affected by three of the disasters, 6% by two of them, and only 2% by just one disaster. All participants were affected by at least one disaster. For the complete frequencies regarding disaster exposure, please see Table 2 below.

Table 2. Frequencies and Percentages for Experiences of Natural Disasters

Natural Disaster Experiences in Puerto Rico	2020 hurricanes and storms		2020 earthquakes		Hurricane Dorian		Hurricane Maria	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Lived in Puerto Rico	29	26.4	102	92.7	100	90.9	101	91.9
Has since relocated	2	1.8	2	1.8	5	4.5	6	5.5
Lost property	2	1.8	5	4.5	2	1.8	21	19.1
Lost income	1	.9	16	14.5	8	7.3	32	29.1
Lost contact or knew someone who died	2	1.8	6	5.5	5	4.5	19	17.3
Was evacuated			2	1.8			7	6.4
Physically injured			0	0			1	.9
Suffered an illness			6	5.5	1	.9	9	8.2
Required emergency rescue							1	.9

Note. $N = 110$. These experiences were ascribed by respondents as being causally linked to the disasters they indicated.

Univariate Analyses

Bivariate correlations were conducted to test the relationships between certain demographic variables and the continuous variables within the study. This tested both the relationships among the independent variables and an initial examination of the relationship between the independent and dependent variables. Table 3 below shows the correlations.

Testing for an interaction between positive religious coping and negative religious coping found no significant correlation between them, so it was determined that further tests should be conducted with positive religious coping and negative religious coping

being treated as independent scales rather than subscales of religious coping. All other subscales had significant correlations with at least one other subscale (See Table 3). For demographic variables, it was found that age, religion, education, academic quarter, and language did correlate with certain other variables, so all further tests controlled for these variables

Table 3. Descriptive Statistics and Correlations for Study Variables (N=110)

Variable	*M*	*SD*	1	2	3	4	5	6	7
1. Academic Quarters[a]	1.91	.87	—						
2. Language[b]	.63	.49	-.146	—					
3. Age[c]	2.8	1.35	-.070	-.003	—				
4. Education[d]	4.23	1.35	-.021	-.107	.511***	—			
5. Seventh-day Adventist[e]	.59	.49	.147	-.335***	.261**	.086	—		
6. Negative religious coping	10.31	3.51	.125	-.147	-.099	-.077	.128	—	
7. Positive religious coping	21.02	4.76	.073	-.072	.218*	.061	.214*	.031	—
8. World assumptions scale	128.75	18.31	-.323**	.357***	.252**	.270**	-.184	-.261**	.134
9. Meaningfulness of the world	44.19	8.87	-.354***	.247**	.154	.149	-.050	.007	.071
10. Benevolence of the world	30.88	7.52	.009	.189*	.000	.068	-.193*	-.231*	.050
11. Worthiness of self	53.68	9.11	-.312**	.321**	.357***	.342***	-.162	-.340***	.158
12. Fatalism	52.39	13.18	.014	-.010	-.392***	-.271**	-.306**	.054	-.150
13. Fatalism unpredictability	30.60	6.72	.024	-.046	-.340***	-.287**	-.193*	.032	-.120

Table 3. Continued

Variable	*M*	*SD*	1	2	3	4	5	6	7
14. Fatalism destiny	21.79	7.66	.004	.024	-.376***	-.214*	-.357***	.064	-.153
15. PLC-5	43.62	19.42	.036	-.155	-.252**	-.119	-.083	.388***	-.022
16. PLC-5 intrusion	10.43	5.79	.046	-.142	-.209*	-.085	-.176	.308**	.036
17. PLC-5 avoidance	4.47	2.66	-.056	-.068	-.084	-.119	.051	.256**	.022
18. PLC-5 changes in mood and cognition	14.30	7.43	.071	-.192*	-.244*	-.146	-.048	.424***	-.054
19. PLC-5 hyperarousal	14.41	6.04	.011	-.094	-.275**	-.070	-.061	.317**	-.050

Table 3. Continued

Variable	*M*	*SD*	8	9	10	11	12	13	14	15
8. World assumptions scale	128.75	18.31	—							
9. Meaningfulness of the world	44.19	8.87	.731***	—						
10. Benevolence of the world	30.88	7.52	.630***	.175	—					
11. Worthiness of self	53.68	9.11	.779***	.351***	.271**	—				
12. Fatalism	52.39	13.18	.045	-.071	.185	.006	—			
13. Fatalism unpredictability	30.60	6.72	.001	-.071	.163	-.064	.904***	—		
14. Fatalism destiny	21.79	7.66	.076	-.060	.175	.067	.927***	.678***	—	
15. PLC-5	43.62	19.42	-.349***	-.208*	-.194*	-.338***	.261**	.298**	.188*	—
16. PLC-5 intrusion	10.43	5.79	-.188*	-.162	-.041	-.187	.277**	.301**	.212*	.890***
17. PLC-5 avoidance	4.47	2.66	-.212*	-.109	-.184	-.167	.104	.154	.044	.677***
18. PLC-5 changes in mood and cognition	14.30	7.43	-.405***	-.187	-.247**	-.427***	.256**	.279**	.196*	.932***
19. PLC-5 hyperarousal	14.41	6.04	-.350***	-.236*	-.199*	-.309**	.213*	.258**	.140	.919***

Table 3. Continued

Variable	*M*	*SD*	16	17	18	19
16. PLC-5 intrusion	10.43	5.79	—			
17. PLC-5 avoidance	4.47	2.66	.890***	—		
18. PLC-5 changes in mood and cognition	14.30	7.43	.677***	.600***	—	
19. PLC-5 hyperarousal	14.41	6.04	.932***	.734***	.526***	—

Note: N=110. The various non-Seventh-day Adventist religions participants identified as were collapsed in a single category "Other". [a]Academic Quarters: 1 = *Spring Quarter*, 2 = *Summer Quarter*, 3 = *Fall Quarter*. [b]Language: 0 = *English*, 1 = *Spanish*. [c]Age: 1 = *18-24*, 2 = *25-34*, 3 = *35-44*, 4 = *45-54*, 5 = *55-64*, 6 = *65-74*, 7 = *75-84*. [d] Education: 1 = *High school diploma or equivalent*, 2 = *Some college*, 3 = *Associate's degree*, 4 = *Bachelor's degree*, 5 = *Master's degree*, 6 = *Doctorate degree or equivalent*. [e]Seventh-day Adventist: 0 = *Other*, 1 = *Seventh-day Adventist*. *$p < .05$. **$p < .01$. ***$p < .001$

Multivariate Regression Results

Global Scale Comparison

Table 4. Regression Table indicating model β between overall study variables and scales of PCL-5

		PCL-5 global scale				intrusion			
			95% CI				95% CI		
Model	Variable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
1	Academic Quarter	0.01	-4.07	4.35	.95	0.04	-1.01	1.49	.71
	Language	-0.19	-15.42	0.61	.07	-0.21	-4.89	-0.13	.04
	Age	-0.22	-6.42	0.08	.06	-0.14	-1.58	0.35	.21
	Education	-0.02	-3.40	2.87	.87	-0.02	-0.99	0.87	.89
	SDA[a]	-0.09	-11.56	4.75	.41	-0.21	-4.91	-0.07	.04
2	Academic Quarter	-0.03	-4.56	3.36	.76	0.00	-1.18	1.23	.97
	Language	-0.15	-13.43	1.65	.12	-0.18	-4.40	0.17	.07
	Age	-0.19	-5.83	0.38	.08	-0.14	-1.52	0.36	.23
	Education	0.00	-2.95	2.94	.99	0.01	-0.87	0.91	.96
	SDA[a]	-0.13	-12.90	2.57	.19	-0.26	-5.40	-0.70	.01
	NegCope[b]	0.37	1.05	3.02	<.001	0.30	0.19	0.79	.001
	PosCope[c]	0.03	-0.63	0.85	.77	0.10	-0.10	0.34	.29
3	Academic Quarter	-0.1	-6.20	1.80	.28	-0.02	-1.41	1.09	.80

Table 4. Continued

		PCL-5 global scale				intrusion			
			95% CI				95% CI		
Model	Variable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
3	Language	-0.06	-10.08	5.36	.55	-0.14	-4.13	0.71	.16
	Age	-0.16	-5.37	0.68	.13	-0.13	-1.48	0.41	.26
	Education	0.07	-1.94	3.93	.50	0.03	-0.78	1.06	.77
	SDA[a]	-0.16	-13.96	1.14	.10	-0.27	-5.56	-0.83	.009
	NegCope[b]	0.32	0.82	2.76	<.001	0.28	0.16	0.77	.003
	PosCope[c]	0.08	-0.42	1.04	.40	0.12	-.09	0.37	.22
	WAS[d]	-0.29	-0.53	-0.09	.006	-0.12	-.11	0.03	.30
4	Academic Quarter	-0.12	-6.51	1.33	.19	-0.04	-1.50	0.97	.67
	Language	-0.02	-8.35	6.98	.86	-0.11	-3.67	1.16	.31
	Age	-0.10	-4.49	1.58	.34	-0.07	-1.25	0.66	.55
	Education	0.11	-1.29	4.53	.27	0.07	-0.61	1.23	.51
	SDA[a]	-0.11	-11.78	3.40	.28	-0.22	-4.98	-0.20	.03
	NegCope[b]	0.31	0.74	2.64	.001	0.27	0.14	0.74	.004
	PosCope[c]	0.10	-0.33	1.10	.28	0.14	-0.06	0.39	.15
	WAS[d]	-0.35	-0.59	-0.15	.001	-0.17	-0.12	0.02	.14
	Fatalism	0.23	0.07	0.63	.02	0.22	0.01	0.18	.034

Table 4. Continued

		changes in mood and cognition				hyperarousal			
			95% CI				95% CI		
Model	Variable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
1	Academic Quarter	0.04	-1.31	1.90	.72	-0.02	-1.46	1.17	.83
	Language	-0.22	-6.39	-0.29	.03	-0.09	-3.67	1.32	.35
	Age	-0.19	-2.29	0.19	.10	-0.31	-2.42	-0.39	.007
	Education	-0.06	-1.55	0.84	.56	0.08	-0.61	1.34	.46
	SDA[a]	-0.07	-4.17	2.04	.50	-0.02	-2.73	2.36	.89
2	Academic Quarter	0.00	-1.47	1.50	.98	-0.05	-1.59	0.94	.61
	Language	-0.18	-5.56	0.10	.06	-0.06	-3.21	1.62	.52
	Age	-0.15	-1.98	0.36	.17	-0.29	-2.27	-0.28	.01
	Education	-0.05	-1.37	0.84	.64	0.10	-0.52	1.37	.37
	SDA[a]	-0.11	-4.59	1.22	.25	-0.05	-3.08	1.88	.63
	NegCope[b]	0.39	0.47	1.21	<.001	0.30	0.20	0.83	.002
	PosCope[c]	-0.02	-0.31	0.25	.82	0.01	-0.23	0.24	.94
3	Academic Quarter	-0.08	-2.14	0.84	.39	-0.13	-2.19	0.34	.15

Table 4. Continued

		changes in mood and cognition					hyperarousal		
			95% CI				95% CI		
Model	Variable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
3	Language	-0.08	-4.14	1.61	.38	0.04	-1.909	2.97	.67
	Age	-0.12	-1.77	0.47	.25	-0.25	-2.086	-0.18	.02
	Education	0.03	-0.94	1.24	.78	0.18	-.125	1.73	.09
	SDA[a]	-0.15	-5.01	0.61	.12	-0.09	-3.45	1.32	.376
	NegCope[b]	0.35	0.37	1.10	<.001	0.25	0.12	0.73	.007
	PosCope[c]	0.03	-0.22	0.32	.71	0.07	-0.15	0.31	.47
	WAS[d]	-0.32	-0.21	-0.05	.002	-0.35	-0.19	-0.05	.001
4	Academic Quarter	-0.09	-2.25	0.66	.28	-0.15	-2.28	0.22	.11
	Language	-0.04	-3.47	2.22	.66	0.08	-1.46	3.42	.43
	Age	-0.06	-1.44	0.82	.58	-0.20	-1.86	0.07	.07
	Education	0.07	-0.69	1.47	.48	0.22	0.04	1.90	.04
	SDA[a]	-0.09	-4.17	1.47	.34	-0.04	-2.89	1.94	.70
	NegCope[b]	0.33	0.35	1.05	<.001	0.23	0.10	0.70	.01
	PosCope[c]	0.05	-0.18	0.35	.55	0.08	-0.12	0.33	.37
	WAS[d]	-0.37	-0.23	-0.07	<.001	-0.40	-0.20	-0.06	<.001
	Fatalism	0.23	0.03	0.24	.01	0.20	0.00	0.18	.04

Note: Avoidance is not included in the table because the ANOVA for all 4 models was insignificant. [a]Seventh-Day Adventist.
[b]Negative religious coping. [c]Positive religious coping. [d]World Assumptions Scale.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, WAS, and fatalism on the PCL-5, while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of positive religious coping, negative religious coping, WAS, and fatalism explains 25.7% of the total variance in PCL-5. Overall, the regression model accounted for a significant proportion of the variance in PCL-5, $F(9, 100) = 5.19$, $p < .001$. Negative religious coping, WAS, and fatalism all significantly predicted PCL-5 overall (see Table 4 above). Positive religious coping was not a significant independent predictor of PCL-5.

Negative religious coping uniquely accounts for 8.5% of the total variance in PCL-5, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for 0.8% of the total variance in PCL-5. WAS uniquely accounts for 7.5% of the total variance in PCL-5. Fatalism uniquely accounts for 4.1% of the total variation in PCL-5.

Negative religious coping accounts for 11.1% of the variance in PCL-5 that is not explained by the other variables. Positive religious coping accounts for 1.1% of the variance in PCL-5 that is not explained by the other variables. WAS accounts for 9.9% of the variance in PCL-5 that is not explained by the other variables. Fatalism accounts for 5.6% of the variance in PCL-5 that is not explained by the other variables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, WAS, and fatalism on the PCL-5 subscale intrusion while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The

optimal linear combination of positive religious coping, negative religious coping, WAS, and fatalism explains 23.8% of the total variance in PCL-5 subscale intrusion. Overall, the regression model accounted for a significant proportion of the variance in PCL-5 subscale intrusion, $F(9, 100) = 3.46$, $p = .001$. Negative religious coping and fatalism significantly predicted PCL-5 subscale intrusion while WAS and positive religious coping did not significantly predict PCL-5 subscale intrusion.

Negative religious coping uniquely accounts for 6.5% of the total variance in PCL-5 subscale intrusion, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for 1.6% of the total variance in PCL-5 subscale intrusion. WAS uniquely accounts for 1.7% of the total variance in PCL-5 subscale intrusion. Fatalism uniquely accounts for 3.4% of the total variation in PCL-5 subscale intrusion.

Negative religious coping accounts for 7.8% of the variance in PCL-5 subscale intrusion that is not explained by the other variables. Positive religious coping accounts for 2% of the variance in PCL-5 subscale intrusion that is not explained by the other variables. WAS accounts for 2.2% of the variance in PCL-5 subscale intrusion that is not explained by the other variables. Fatalism accounts for 4.3% of the variance in PCL-5 subscale intrusion that is not explained by the other variables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, WAS, and fatalism on the PCL-5 subscale avoidance while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of positive religious coping, negative religious coping, WAS,

and fatalism explains 12.7% of the total variance in PCL-5 subscale avoidance. Overall, the regression model did not account for a significant proportion of the variance in PCL-5 subscale avoidance, $F(9, 100) = 1.61$, $p = .12$. Since this model did not yield any results, we do not discuss it further and avoidance is not included in any of the tables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, WAS, and fatalism on the PCL-5 subscale changes in mood and cognition while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of negative religious coping, positive religious coping, WAS, and fatalism explains 35.7% of the total variance in PCL-5 subscale changes in mood and cognition. Overall, the regression model accounted for a significant proportion of the variance in PCL-5 subscale changes in mood and cognition, $F(9, 100) = 6.17$, $p < .001$. Negative religious coping, WAS, and fatalism significantly predicted PCL-5 subscale changes in mood and cognition. Positive religious coping was not a significant independent predictor of PCL-5 subscale changes in mood and cognition.

Negative religious coping uniquely accounts for 9.9% of the total variance in PCL-5 subscale changes in mood and cognition, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for 0.2% of the total variance in PCL-5 subscale changes in mood and cognition. WAS uniquely accounts for 8.6% of the total variance in PCL-5 subscale changes in mood and cognition. Fatalism uniquely accounts for 4% of the total variation in PCL-5 subscale changes in mood and cognition.

Negative religious coping accounts for 13.3% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Positive religious coping accounts for 0.4% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. WAS accounts for 11.8% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Fatalism accounts for 5.9% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, WAS, and fatalism on the PCL-5 subscale hyperarousal while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of positive religious coping, negative religious coping, WAS, and fatalism explains 22.1% of the total variance in PCL-5 subscale hyperarousal. Overall, the regression model accounted for a significant proportion of the variance in PCL-5 subscale hyperarousal, $F(9, 100) = 4.45$, $p < .001$. Negative religious coping, WAS, and fatalism significantly predicted PCL-5 subscale hyperarousal. Positive religious coping was not a significant independent predictor of PCL-5 subscale hyperarousal.

Negative religious coping uniquely accounts for 4.8% of the total variance in PCL-5 subscale hyperarousal, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for 0.6% of the total variance in PCL-5 subscale hyperarousal.

WAS uniquely accounts for 9.9% of the total variance in PCL-5 subscale hyperarousal. Fatalism uniquely accounts for 3% of the total variation in PCL-5 subscale hyperarousal.

Negative religious coping accounts for 6.4% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Positive religious coping accounts for 0.8% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables. WAS accounts for 12.2% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Fatalism accounts for 4% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables.

A variable was added and each multiple linear regression analysis was re-performed to test for interaction between positive and negative religious coping, while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist for all of the global scale analyses. The model for global scales including the interaction variable accounted for a significant amount of the variance in PCL-5, $F(10, 99) = 4.63$, $p < .001$, but the interaction variable was not a significant predictor of PCL-5 ($\beta = 0.03$, 95% CI[-0.24, 0.25], $p > .05$). The model including the interaction variable accounted for a significant amount of variance for subscale intrusion, $F(10, 99) = 3.12$, $p = .002$, but the interaction variable was not a significant predictor of intrusion ($\beta = 0.31$, 95% CI[-0.06, 0.10], $p > .05$). The model including the interaction variable did not account for a significant amount of variance in avoidance, $F(10, 99) = 1.48$, $p = .16$. The model with the interaction variable did account for a significant amount of variance in changes in mood and cognition, $F(10, 99) = 5.59$, $p < .001$, but the interaction variable was not a significant predictor of changes in mood and cognition ($\beta = -0.43$, 95% CI[-0.13, 0.06], p

> .05). The model with the interaction variable did account for a significant amount of variance in hyperarousal, $F(10, 99) = 3.97$, $p < .001$, but the interaction variable was not a significant predictor of hyperarousal ($\beta = 0.16$, 95% CI[-0.07, 0.09], $p > .05$). The interaction variable did not predict any global scales.

Subscale Comparison

Table 5. Regression Table indicating β relationships between subscales of study variables and scales of PCL-5

	PCL-5 global scale				intrusion			
		95% CI				95% CI		
ModelVariable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
3 Control								
Academic Quarter	-0.12	-6.87	1.64	.23	-0.06	-1.71	0.94	.57
Language	-0.05	-9.92	5.78	.60	-0.14	-4.06	0.82	.19
Age	-0.15	-5.31	0.89	.16	-0.12	-1.48	0.45	.29
Education	0.08	-1.90	4.09	.47	0.03	-0.79	1.08	.76
SDA[a]	-0.16	-13.95	1.45	.11	-0.26	-5.39	-0.60	.02
Religious Coping								
Negative	0.33	0.78	2.84	.001	0.31	0.19	0.83	.002
Positive	0.08	-0.42	1.06	.39	0.12	-0.09	0.37	.23
WAS[b]								
Meaning-fulness[c]	-0.17	-0.79	0.07	.10	-0.15	-0.23	0.04	.15
Benevolence[d]	-0.07	-0.66	0.30	.45	0.04	-0.12	0.18	.71
SelfWorth[e]	-0.18	-0.87	0.11	.13	-0.04	-0.18	0.13	.74

Table 5. Continued

		PCL-5 global scale				intrusion			
			95% CI				95% CI		
Model	Variable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
4 Control									
	Academic Quarter	-0.12	-6.80	1.42	.20	-0.06	-1.69	0.90	.54
	Language	-0.01	-8.02	7.36	.93	-0.10	-3.60	1.24	.34
	Age	-0.11	-4.64	1.56	.33	-0.09	-1.34	0.61	.46
	Education	0.14	-0.94	4.96	.18	0.09	-0.54	1.31	.41
	SDA[a]	-0.14	-13.17	2.22	.16	-0.25	-5.29	-0.45	.02
Religious Coping									
	Negative	0.32	0.75	2.77	.001	0.31	0.19	0.82	.002
	Positive	0.10	-0.32	1.11	.27	0.13	-0.07	0.38	.17
WAS[b]									
	Meaning-fulness[c]	-0.16	-0.77	0.06	.10	-0.15	-0.23	0.03	.15
	Benevolence[d]	-0.12	-0.77	0.16	.20	-0.00	-0.15	0.14	.96
	SelfWorth[e]	-0.20	-0.92	.065	.09	-0.05	-0.19	0.12	.68
Fatalism									
	Unpredict-ability	0.32	0.26	1.59	.007	0.31	0.05	0.47	.01
	Destiny	-0.07	-0.80	0.45	.57	-0.10	-0.27	0.12	.46

Table 5. Continued

	changes in mood and cognition				hyperarousal			
		95% CI				95% CI		
ModelVariable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
3 Control								
Academic Quarter	-0.08	-2.27	0.88	.39	-0.16	-2.42	0.27	.12
Language	-0.07	-4.02	1.79	.45	0.05	-1.88	3.08	.63
Age	-0.10	-1.69	0.61	.35	-0.25	-2.09	-0.13	.03
Education	0.04	-0.87	1.35	.66	0.18	-0.13	1.76	.09
SDA[a]	-0.16	-5.23	0.47	.10	-0.08	-3.38	1.48	.44
Religious Coping								
Negative	0.32	0.30	1.06	.001	0.26	0.13	0.78	.007
Positive	0.04	-0.20	0.34	.62	0.07	-0.15	0.32	.48
WAS[b]								
Meaning-fulness[c]	-0.09	-0.23	0.09	.36	-0.23	-0.29	-0.02	.03
Benevolence[d]	-0.11	-0.28	0.07	.24	-0.09	-0.22	0.08	.34
SelfWorth[e]	-0.27	-0.41	-0.04	.02	-0.18	-0.27	0.04	.14

Table 5. Continued

		changes in mood and cognition				hyperarousal			
			95% CI			95% CI			
Model	Variable	β	*LL*	*UL*	*p*	β	*LL*	*UL*	*p*
4	Control								
	Academic Quarter	-0.09	-2.27	0.78	.33	-0.16	-2.39	0.22	.10
	Language	-0.03	-3.25	2.46	.79	0.09	-1.39	3.50	.40
	Age	-0.04	-1.36	0.94	.72	-0.22	-1.95	0.02	.06
	Education	0.11	-0.51	1.68	.29	0.24	0.13	2.00	.03
	SDA[a]	-0.12	-4.69	1.02	.21	-0.07	-3.30	1.59	.49
	Religious Coping								
	Negative	0.30	0.26	1.01	.001	0.26	.124	0.77	.007
	Positive	0.07	-0.16	0.37	.44	0.08	-.127	0.33	.38
	WAS[b]								
	Meaningfulness[c]	-0.08	-0.22	0.09	.40	-0.22	-.284	-0.02	.03
	Benevolence[d]	-0.15	-0.33	0.02	.08	-0.13	-.253	0.04	.16
	SelfWorth[e]	-0.31	-0.44	-0.07	.006	-0.18	-.278	0.03	.12
	Fatalism								
	Unpredictability	0.26	0.04	0.53	.03	0.32	.076	0.50	.008
	Destiny	0.02	-0.21	0.25	.85	-0.12	-.289	0.11	.37

Note: Avoidance not included in the table because the ANOVA for all 4 models was insignificant. Models 1 and 2 not included because they are identical to models 1 and 2 in Table 4. [a]Seventh-Day Adventist. [b]World assumptions scale. [c]Meaningfulness of the world. [d]Benevolence of the world. [e]Worthiness of self.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny on the PCL-5 while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny explains 34.5% of the total variance in PCL-5. Overall, the regression model accounted for a significant proportion of the variance in PCL-5, $F(12, 97) = 4.27$, $p < .001$. Negative religious coping and unpredictability significantly predicted PCL-5 under this model. Positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, and destiny were not significant independent predictors of PCL-5.

Negative religious coping uniquely accounts for 8% of the total variance in PCL-5, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for 0.8% of the total variance in PCL-5. Meaningfulness of the world uniquely accounts for 1.9% of the total variance in PCL-5. Benevolence of the world uniquely accounts for 1.1% of the total variance in PCL-5. Worthiness of self uniquely accounts for 2% of the total variance in PCL-5. Unpredictability uniquely accounts for 5.2% of the total variance in PCL-5. Destiny uniquely accounts for .2% of the total variation in PCL-5.

Negative religious coping accounts for 10.9% of the variance in PCL-5 that is not explained by the other variables. Positive religious coping accounts for 1.2% of the variance in PCL-5 that is not explained by the other variables. Meaningfulness of the

world uniquely accounts for 2.8% of the total variance in PCL-5 that is not explained by the other variables. Benevolence of the world uniquely accounts for 1.7% of the total variance in PCL-5 that is not explained by the other variables. Worthiness of self uniquely accounts for 3% of the total variance in PCL-5 that is not explained by the other variables. Unpredictability uniquely accounts for 7.3% of the total variance in PCL-5 that is not explained by the other variables. Destiny accounts for .3% of the variance in PCL-5 that is not explained by the other variables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny on the PCL-5 subscale intrusion while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny explains 17.8% of the total variance in PCL-5 subscale intrusion. Overall, the regression model accounted for a significant proportion of the variance in PCL-5 subscale intrusion, $F(12, 97) = 2.97$, $p = .001$. Negative religious coping and unpredictability significantly predicted PCL-5 subscale intrusion. Positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, and destiny were not significant independent predictors of PCL-5 subscale intrusion. in unpredictability ($\beta = .306$, 95% CI[.054, .473], $p < .05$). Destiny did not significantly predict PCL-5 subscale intrus

Negative religious coping uniquely accounts for 7.5% of the total variance in PCL-5 subscale intrusion, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for 1.5% of the total variance in PCL-5 subscale intrusion. Meaningfulness of the world uniquely accounts for 1.6% of the total variance in PCL-5 subscale intrusion. Benevolence of the world uniquely accounts for 0% of the total variance in PCL-5 subscale intrusion. Worthiness of self uniquely accounts for .1% of the total variance in PCL-5 subscale intrusion. Unpredictability uniquely accounts for 4.7% of the total variance in PCL-5 subscale intrusion. Destiny uniquely accounts for .4% of the total variation in PCL-5 subscale intrusion.

Negative religious coping accounts for 9.3% of the variance in PCL-5 subscale intrusion that is not explained by the other variables. Positive religious coping accounts for 2% of the variance in PCL-5 subscale intrusion that is not explained by the other variables. Meaningfulness of the world uniquely accounts for 2.2% of the total variance in PCL-5 subscale intrusion that is not explained by the other variables. Benevolence of the world uniquely accounts for 0% of the total variance in PCL-5 subscale intrusion that is not explained by the other variables. Worthiness of self uniquely accounts for 0.2% of the total variance in PCL-5 subscale intrusion that is not explained by the other variables. Unpredictability uniquely accounts for 6.1% of the total variance in PCL-5 subscale intrusion that is not explained by the other variables. Destiny accounts for .6% of the variance in PCL-5 subscale intrusion that is not explained by the other variables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, meaningfulness of the world,

benevolence of the world, worthiness of self, unpredictability, and destiny on the PCL-5 subscale avoidance while controlling for the influence of age, language, education, academic quarter of participants, identification as Seventh-day Adventist. The optimal linear combination of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny explains 14.5% of the total variance in PCL-5 subscale avoidance. Overall, the regression model did not account for a significant proportion of the variance in PCL-5 subscale avoidance, $F(12, 97) = 1.37$, $p = .20$. Therefore, this model will not be discussed further.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny on the PCL-5 subscale changes in mood and cognition while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny explains 30.8% of the total variance in PCL-5 subscale changes in mood and cognition. Overall, the regression model accounted for a significant proportion of the variance in PCL-5 subscale intrusion, $F(12, 97) = 5.04$, $p < .001$. Negative religious coping, worthiness of self, and unpredictability significantly predicted PCL-5 subscale changes in mood and cognition. Positive religious coping, meaningfulness of the world, benevolence of the world, and destiny were not significant independent predictors of PCL-5 subscale changes in mood and cognition.

Negative religious coping uniquely accounts for 7.1% of the total variance in PCL-5 subscale changes in mood and cognition, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for .4% of the total variance in PCL-5 subscale changes in mood and cognition. Meaningfulness of the world uniquely accounts for .4% of the total variance in PCL-5 subscale changes in mood and cognition. Benevolence of the world uniquely accounts for 1.9% of the total variance in PCL-5 subscale changes in mood and cognition. Worthiness of self uniquely accounts for 5% of the total variance in PCL-5 subscale changes in mood and cognition. Unpredictability uniquely accounts for 3.3% of the total variance in PCL-5 subscale changes in mood and cognition. Destiny uniquely accounts for 0% of the total variation in PCL-5 subscale changes in mood and cognition.

Negative religious coping accounts for 10.3% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Positive religious coping accounts for .6% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Meaningfulness of the world uniquely accounts for .7% of the total variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Benevolence of the world uniquely accounts for 3% of the total variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Worthiness of self uniquely accounts for 7.5% of the total variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables. Unpredictability uniquely accounts for 5.1% of the total variance in PCL-5 subscale changes in mood and cognition that is not explained by the

other variables. Destiny accounts for 0% of the variance in PCL-5 subscale changes in mood and cognition that is not explained by the other variables.

A multiple linear regression analysis was used to determine the influence of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny on the PCL-5 subscale hyperarousal while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. The optimal linear combination of negative religious coping, positive religious coping, meaningfulness of the world, benevolence of the world, worthiness of self, unpredictability, and destiny explains 31.7% of the total variance in PCL-5 subscale hyperarousal. Overall, the regression model accounted for a significant proportion of the variance in PCL-5 subscale intrusion, $F(12, 97) = 3.75$, $p < .001$. Negative religious coping, meaningfulness of the world, and unpredictability significantly predicted PCL-5 subscale hyperarousal. Positive religious coping, benevolence of the world, worthiness of self, and destiny were not significant independent predictors of PCL-5 subscale hyperarousal.

Negative religious coping uniquely accounts for 5.3% of the total variance in PCL-5 subscale hyperarousal, after controlling for age, language, education, academic quarter of participants, and identification as Seventh-day Adventist. Positive religious coping uniquely accounts for .5% of the total variance in PCL-5 subscale hyperarousal. Meaningfulness of the world uniquely accounts for 3.7% of the total variance in PCL-5 subscale hyperarousal. Benevolence of the world uniquely accounts for 1.4% of the total variance in PCL-5 subscale hyperarousal. Worthiness of self uniquely accounts for 1.7%

of the total variance in PCL-5 subscale hyperarousal. Unpredictability uniquely accounts for 5.2% of the total variance in PCL-5 subscale hyperarousal. Destiny uniquely accounts for .6% of the total variation in PCL-5 subscale hyperarousal.

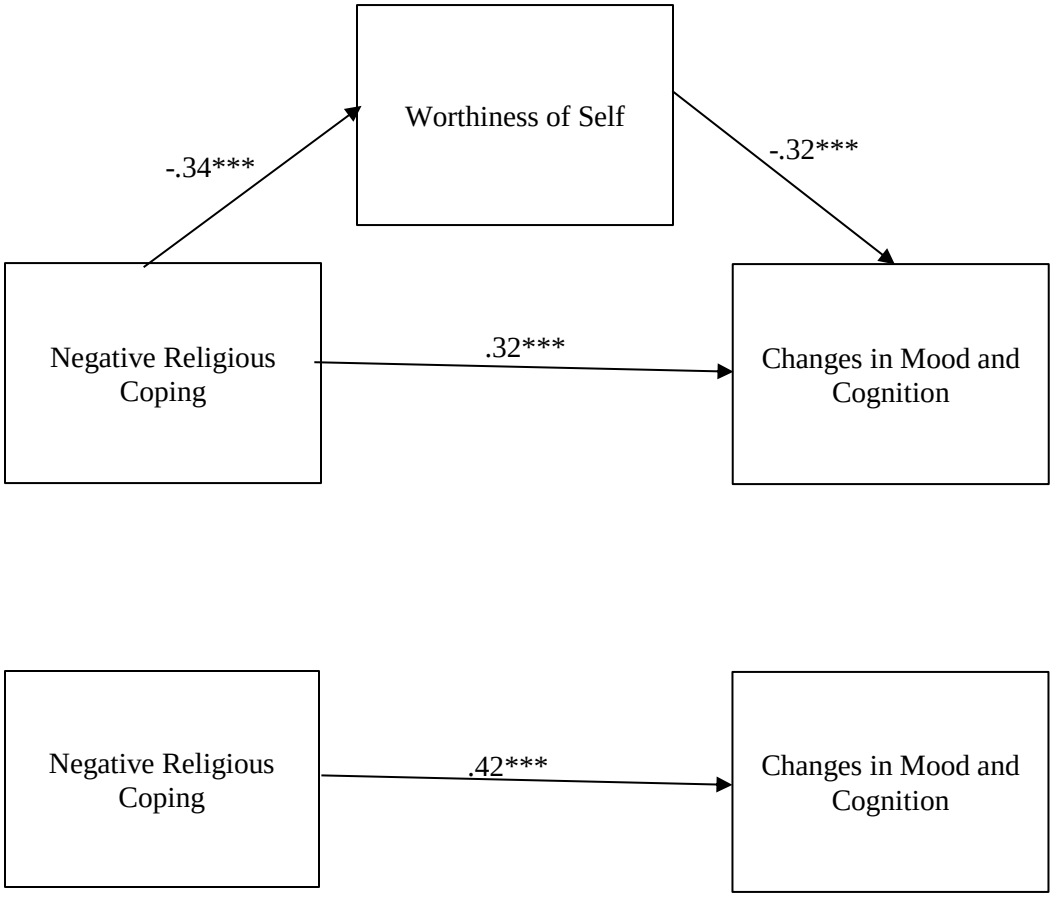
Negative religious coping accounts for 7.2% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Positive religious coping accounts for .8% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Meaningfulness of the world uniquely accounts for 5.1% of the total variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Benevolence of the world uniquely accounts for 2% of the total variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Worthiness of self uniquely accounts for 2.4% of the total variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Unpredictability uniquely accounts for 7% of the total variance in PCL-5 subscale hyperarousal that is not explained by the other variables. Destiny accounts for .8% of the variance in PCL-5 subscale hyperarousal that is not explained by the other variables.

The multiple linear regressions were also re-performed for the subscale analyses, adding the same interaction variable while controlling for the influence of age, language, education, academic quarter of participants, and identification as Seventh-day Adventist for all of the subscale analyses. The first model including the interaction variable accounted for a significant amount of variation in PCL-5, $F(13, 96) = 3.90$, $p < .001$, but the interaction variable was not a significant predictor of PCL-5 ($\beta = 0.04$, 95% CI[-0.23, 0.25], $p > .05$). The model including the interaction variable did account for a significant amount of variance in intrusion, $F(13, 96) = 2.74$, $p = .002$, but the interaction variable

was not a significant predictor of intrusion (β = 0.28, 95% CI[-0.06, 0.09], $p > .05$). The model including the interaction variable did not account for a significant amount of variance in the subscale avoidance, $F(13, 96) = 1.28$, $p = .24$. The model including the interaction variable did account for a significant amount of variance in changes in mood and cognition, $F(13, 96) = 4.66$, $p < .001$, but the interaction variable did not significantly predict changes in mood and cognition (β = -0.37, 95% CI[-0.12, 0.06], $p > .05$). The model accounted for a significant amount of variance in hyperarousal, $F(13, 96) = 3.43$, $p < .001$, but the interaction variable did not predict hyperarousal (β = 0.15, 95% CI[-0.07, 0.09], $p > .05$). The interaction variable did not significantly predict any subscales.

Mediational Model

This study found a significant relationship between negative religious coping and changes in mood and cognition and was mediated by the effect of worthiness of self (*ab* = .2304, *ab'* = .1088, 95%CI [.0487, .5360], 95%CI [.0239, .2334]). As negative religious coping increases by one unit, changes in mood and cognition increase by .2304 units. Likewise, as negative religious coping increased by one standard deviation, changes in mood and cognition also increases by .1088 standard deviations via the effect of worthiness of self (See Figure 8 below).



*p < .05. **p < .01. ***p < .001

Figure 8. Standardized Regression Coefficients for the Relationship Between Negative Religious Coping and Changes in Mood and Cognition as Mediated by Worthiness of Self

CHAPTER FIVE

Discussion

Effects of Religious Coping on Outcomes

Positive religious coping was not found to significantly predict any PTSD symptoms or clusters therein, disconfirming the first hypothesis. However, as this study has not examined PTSD outcomes such as post-traumatic growth, it is entirely possible that it may still influence other outcome-based measures. Its influence on measures of PTSD symptoms, however, has been shown to be negligible.

For negative religious coping, on the other hand, our hypotheses were confirmed. Negative religious coping significantly predicted general PTSD symptoms, changes in mood and cognition, intrusive symptoms, and hyperarousal.

The PTSD symptom avoidance was not significantly related to any independent variables. As a result, all analyses with the avoidance as a dependent variable were not supported. The limited sample size might account for the non-significant finding, or avoidance as a subscale might not correlate well enough with the measures from the model. The results of Zukerman and Korn (2014) indicate that lower belief in benevolence of the world predicts avoidance, so further study of avoidance in the context of religious coping is warranted.

The results indicate that one's beliefs about God, their church, and the devil may influence their intrusive symptoms (e.g., repeated and disturbing dreams and thoughts or feeling like they are re-experiencing the traumatic event), changes in mood and cognition (e.g., having strong negative emotions such as fear, guilt, or shame and difficulty

remembering important parts of the stressful experience), and hyperarousal (e.g., irritable behavior, taking too many risks, or being easily startled). When one believes that God is punishing the individual, that their church has abandoned them, or that the devil made the traumatic event happen, PTSD symptoms may increase in severity. As a result, these beliefs make important targets for clinical intervention.

Effects of World Assumptions on Outcomes

The results disconfirmed our hypothesis that world assumptions would not significantly predict PTSD symptoms. Instead, overall world assumptions were moderately related to PTSD symptoms. This means that even though we hypothesized that many of the subscales would be non-significant like the literature suggests (Zukerman & Korn, 2014), the overall scale appears to play a role in PTSD symptomatology. The results also disconfirmed our hypothesis that the global scale for world assumptions would not significantly predict changes in mood and cognition and hyperarousal. Again, the avoidance model was not significant, so no more may be commented on the relationship between world assumptions and PTSD symptoms of avoidance. The results show that as one has more positive assumptions regarding the world (e.g. greater belief in worthiness of self, benevolence of the world, and meaningfulness of the world), one may experience reduced symptoms of changes in mood and cognition and hyperarousal.

Meaningfulness of the world did not significantly predict PTSD symptoms, intrusive symptoms, or changes in mood and cognition as was hypothesized. Contrary to

our hypothesis that meaningfulness of the world would not significantly predict hyperarousal, this study supported that meaningfulness of the world did have an influence on hyperarousal, as our review of the literature suggested. This would make sense considering that high meaningfulness of the world indicates belief in some sort of controllability, randomness, or justice. If traumatic events are highly controllable or just, then perhaps one would not need to remain on guard. Likewise, one's integration of the past traumatic event into memory could be greater, reducing the individual's fight-or-flight response in the present. Therapies such as narrative exposure therapy (NET) suggest that greater integration of the memory reduces PTSD symptoms through finding or constructing meaning for the traumatic event.

There are several possible explanations for why our results did not turn out the same as the literature. One possibility is that the population sampled may have cultural differences in interpretation of the meaningfulness of the world items. Another possibility is that the changes between the PCL-4 and PCL-5 could have influenced the results (changes in the rating scale, rewording of items, and increasing from 17 to 20 items means that the two measures are not compatible with each other). Finally, it is possible that the finding is indicative of Type I error.

The results confirmed our hypotheses that benevolence of the world would not significantly predict the PCL-5 global scale, intrusive symptoms, and hyperarousal, but disconfirmed our hypothesis that benevolence of the world would significantly predict changes in mood and cognition. This means that benevolence of the world was not a good

predictor for PTSD symptoms. This finding is also similar to the previously reported results that suggest positive religious coping does not predict PTSD symptoms well.

Finally, the results supported our hypotheses that worthiness of self would not significantly predict overall PTSD symptoms, intrusive symptoms, or hyperarousal. Worthiness of self was, however, related to changes in mood and cognition, as expected. The literature did not indicate worthiness of self to be significantly predictive of PTSD symptoms, but with the inclusion of changes in mood and cognition in the latest version of the PCL-5, it was logical that as beliefs in the worthiness of self increase, PTSD-related changes in mood and cognition might be influenced. Other literature has previously highlighted the importance of cognitions about self in predicting PTSD-related symptoms (Park, Mills, & Edmondson, 2012). These results would suggest that cognitions about self are highly related to PTSD-related changes in mood and cognition.

Effects of General Fatalism on Outcomes

The results suggested that general fatalism is a good predictor of PTSD symptoms and the clusters included. However, the subscales of general fatalism do not have equal predictive ability. While our hypotheses concerning unpredictability were confirmed, our hypotheses for fate or destiny were not confirmed. This means that unpredictability is associated with overall PTSD symptoms, changes in mood and cognition, intrusive symptoms, and hyperarousal but fate or destiny is not associated with the same dependent variables. Due to this, the results for general fatalism appear to mostly be driven by the predictive ability of unpredictability, meaning that as one agrees more with the belief that life is unpredictable, they will experience greater increases in overall PTSD-related

symptoms following exposure to a natural disaster, increased changes in mood and cognition, increased intrusive symptoms, and increased hyperarousal. This makes sense, since much of the trauma-related reaction is to protect an individual from a possible threat. With greater belief in unpredictability, one's perceived need to scan for threats would increase, as well as their experience of fear, intrusive negative thoughts of what could or did happen, and other overall increases in PTSD-related symptoms.

Summary of Contributions

The current study expands upon the literature by investigating the relationships among religious coping, worldview assumptions, general fatalism, and PTSD-related symptoms. Previous studies have examined these factors, but not in this unique combination. Likewise, this study expands upon those previous studies by sampling from individuals that have experienced one or more natural disasters. By examining the worldviews, religious coping strategies, beliefs of fatalism, and subsequent PTSD symptom severities of individuals who have experienced Hurricane Maria, Hurricane Dorian, or the 2020 earthquakes/tropical storms in Puerto Rico, this study extends better insight into the reactions of religious individuals to natural disasters and how those reactions may influence subsequent well-being.

This study contributes to the literature by providing a novel examination of the effects of religious coping, fatalism, and worldview assumptions on PTSD symptom severity. By examining fatalism, this study provides new information on the effects of one's perspectives on destiny and the unpredictability of the world on PTSD symptoms, following exposure to a natural disaster. This study also expands upon previous research

in religious coping by sampling from a Seventh-day Adventist university in Puerto Rico following multiple natural disasters. Whereas other studies have examined the effects of religious coping on PTSD symptoms for samples with multiple types of trauma exposure, this study specifically provides greater insight into thought processes which maintain or increase PTSD symptom severity for those who have experienced one or more natural disasters.

Limitations and Future Directions

The current study is limited due to its lack of experimental control. The measures were collected by self-report with a convenience-sample of university students from Puerto Rico. As a result, social-desirability may bias the results of the self-report instruments and might have played a role in influencing the results of this study.

It is important to note that the current study took place during a pandemic of coronavirus disease 2019 (COVID-19). As a result, it is expected that the severity of PTSD symptoms were influenced by variables unaccounted for in the current study. Through qualitative reporting in this study, some participants identified the pandemic as a primary source of stress. As this pandemic was not localized but widespread, and was present from the beginning to the end of the data collection period, it is considered a constant in this study.

Future studies could improve upon the results of this study by examining gender more thoroughly as a variable in future research of reactions to natural disasters. Likewise, future research may examine these factors using an approach less dependent on self-report, such as naturalistic observation. Due to a limited sample size, and since

structural equation modeling is a large-samples analysis, the researchers did not construct and test a full structural equation model to gain better insight into how these variables may be organized to best optimize fit with the data and test varying organizations of pathways. Future research may expand upon these findings by examining the arrangement of predictive pathways for these variables as well as testing alternate hypotheses to determine a model of best-fit with the data. Future research may also examine these variables with a more heterogeneous sample to ensure generalizability or compare across different types of trauma. Likewise, researchers may examine the effects of multiple experiences of natural disasters. Finally, future research may contribute to the study of natural disaster survivors by longitudinally measuring changes in these variables over time.

While religious identification was not a main variable of interest for this study, having been controlled for in the models tested, we were surprised to see that it had significantly predicted the PCL-5 subscale of intrusive symptoms. This effect suggests that those who identify as Seventh-day Adventist, compared with all other respondents, exhibit lower levels of intrusive symptoms. While this study lacked the sample size and variability to report a more conclusive general finding, it suggests that future research may examine this effect more thoroughly. It is unclear from these results whether those who identified as Seventh-day Adventist had reduced intrusive symptoms due to cultural beliefs, religious practices, social desirability bias, or other causes.

Strengths of this study include sampling from a population that was appropriate for the research questions, including participants that predominantly experienced natural disasters and identified as being Seventh-day Adventist. With the existence of alternate measures of religious coping for different religious identifications, a mostly uniform population was necessary for appropriately studying the effects of religious coping on PTSD symptom severity. Since the research question also pertained to natural disaster trauma specifically, it was important to recruit participants who had experienced that type of traumatic event.

This study also examined the effects of subscales, ensuring that effects were not overlooked by examining solely the factors they comprised. Other strengths of the study include using multiple imputation as a data replacement strategy and controlling for the effects of age, time of recruitment, language, education, and Seventh-day Adventism. Finally, the hypotheses for this study were determined based on existing literature, theory, and logic. The results of this study independently verified the theories other studies suggested.

Clinical Implications

These results have implications for therapeutic practice, highlighting the importance of attending to the biopsychosocial-spiritual needs of the individual. Many of the measures used in this study indicate the relevance of religious coping in processing trauma as well as how increased belief about fatalism may increase the severity for symptoms of PTSD. With the results provided by this study, practitioners may be able to better meet the needs of their clients by attending more to the religious coping strategies

of their clients and their clients' beliefs about fatalism and unpredictability of the world following a natural disaster. One way of addressing unpredictability may be through simple modeling of predictability, such as maintaining consistent scheduling for sessions. Similarly, some worldview assumptions such as worthiness of self and meaningfulness of the world may be examined more thoroughly during therapeutic intervention due to their influences on mood, cognitions, and hyperarousal, respectively. By finding ways to reinforce these beliefs with clients through experience (increasing beliefs in worthiness of the self and meaningfulness of the world), clients may effect change in their hyperarousal response, affect, and cognition following exposure to a natural disaster.

This study demonstrates that religious coping plays an important role in PTSD symptom severity for those that have experienced a natural disaster. The results suggest that individuals who have survived a natural disaster, believe that God is punishing them, do not take actions to protect themselves from misfortune, or think that life is unpredictable tend to have higher PTSD symptom severity. On the other hand, those who believe that the world is predictable, take actions to protect themselves from misfortune, and do not believe that God is punishing them will tend to experience lessened PTSD symptom severity.

In particular, clinicians with clients who are engaging in negative religious coping may encourage their clients to get involved in social church activities, to speak with trusted religious leaders, or to examine how beliefs may be influencing the client's processing of the natural disaster (both directly and through the client's view of self). The

mediating effect of worthiness of self on the relationship between negative religious coping and PTSD-related changes in mood and cognition suggests that one's view of self is a strong influence on PTSD symptom development. As individuals begin to believe that God has punished them or that the church has abandoned them, they may subsequently develop lowered opinions of themselves, which might cause heightened emotional changes and dissociation. The mediation contributes to the literature by demonstrating how negative religious coping may adversely influence the client's view of self and increase PTSD-related changes in mood and cognition. It also contributes to clinical practice by showing the relevance of religious coping to PTSD symptom development. By only examining the client's view of self, a clinician may miss the influence of negative religious coping for religious clients.

CHAPTER SIX

Example Article for Mediation Model

Religion and PTSD in Puerto Rico Natural Disaster Survivors

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Declarations

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Conflicts of interest/Competing Interests

The authors declare they have no financial interests. Dr. Kendal Boyd, Dr. Jerry Lee, and Dr. Susanne Montgomery were on the dissertation committee for Abraham Reynolds.

Availability of Data and Material

The data supporting the findings of this study are available on reasonable request from the corresponding author, Abraham Reynolds. The data are not publicly available in any repository currently due to concerns about protecting the confidentiality of participants and informed consent of participants with regard to having their data uploaded to a data repository. The data may be uploaded at a future date, pending Loma Linda University IRB approval and with acceptable precautions to protect PHI of participants.

Code Availability

Not applicable.

Authors' Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Abraham Reynolds, with support from Dr. Kendal C. Boyd. The first draft of the manuscript was written by Abraham Reynolds,

and all authors commented on subsequent versions. All authors read and approved the final manuscript.

Ethics Approval

This study was approved by the Loma Linda University Institutional Review Board (#5200054) and the administration at Antillean Adventist University, in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all participants before inclusion in the study.

Religion and PTSD in Puerto Rico Natural Disaster Survivors

Natural disasters, such as earthquakes, hurricanes, and floods, are well-known causes of PTSD (Beaglehole et al., 2018). Survivors often turn to religion in an effort to cope in the aftermath, but the disasters also challenge survivors' worldviews and religious beliefs.

Park, Mills, & Edmondson (2012) found that a sense of being violated predicted PTSD symptoms through the mediating effects of negative cognitions about the world and negative cognitions about self. While the worldview assumptions used in their study only examined negative cognitions as mediators, the significant pathways for negative worldview and negative view of self to PTSD symptoms lends support to the argument that worldview and view of self may play a role in the development of PTSD symptoms. Specifically, negative cognitions about self were more strongly associated with PTSD symptoms than negative cognitions about the world.

Religious coping relates to many psychological health outcomes (McConnell et al., 2006; Scandrett & Mitchell, 2009; Sherman et al., 2005), making it a clinically relevant construct that should be further explored. It has been shown to predict one's worldview assumptions of benevolence of the world, meaningfulness of the world, and worthiness of self (Zukerman & Korn, 2014).

There is also partial support for a direct relationship between religious coping and PTSD symptoms. Feder et al. (2013) showed that negative religious coping, specifically the measure of feeling punished by God, predicts higher levels of PTSD symptoms and negative emotions. While their study only found one item from the negative religious coping scale to have a significant relationship with PTSD and used a measure of PTSD

symptoms that was specific for earthquake survivors, the results still partially support a relationship between negative religious coping and PTSD-related changes in mood and cognition. Their results also lend support for studying how religious coping affects PTSD symptoms for those who have experienced a natural disaster. Similarly, Berzengi et al. (2017) found negative religious coping to be significantly correlated with increased PTSD symptoms and to be a unique predictor of PTSD symptoms for Muslim trauma survivors.

This study attempted to test whether negative religious coping significantly predicts PTSD-related alterations in mood and cognition through worthiness of self in a Christian population that has experienced a natural disaster. There is partial support for the direct relationship between religious coping and PTSD symptoms, the relationship between religious coping and worldview, and the relationship between worldview and PTSD symptoms. However, the literature does not use standardized measures. To date, no study that we are aware of has investigated the mediational effect of worthiness of self on the relationship between negative religious coping and PTSD-related changes in mood and cognition for survivors of natural disasters.

Hypotheses

We hypothesized that negative religious coping would predict PTSD-related changes in mood and cognition through the mediating effect of worthiness of self. Negative religious coping was expected to have a significant inverse relationship with worthiness of self, and worthiness of self was expected to have a significant inverse relationship with PTSD-related changes in mood and cognition. We also hypothesized that the direct effect would be significant, with negative religious coping predicting

PTSD-related changes in mood and cognition, such that as negative religious coping increased, PTSD-related changes in mood and cognition would increase as well.

Method

Participants

The participants for this study consisted of 110 individuals recruited in 2020 from Antillean Adventist University (Universidad Adventista de las Antillas) in Mayagüez, Puerto Rico (PR), a Seventh-day Adventist university affected by multiple disasters: the 2017 hurricane, Maria; the 2019 hurricane, Dorian; the 2020 earthquakes (including one that was 6.4 magnitude), and tropical storms/hurricanes during 2020.

Geographic Area

Hurricane Maria touched land on the southeast shore of PR. Due to the strength of the storm, trajectory, and sustained difficulties the island suffered after the hurricane, most of the residents in PR at the time were likely impacted. Hurricane Dorian passed the island sometime after and was soon followed by the 2020 earthquakes to affect the people living in PR. With multiple earthquakes over the span of weeks, all residents of PR have likely experienced psychological and physical health effects following these natural disasters.

Materials

Demographic Variables

Participants were asked to self-report their age, gender, race/ethnicity, socioeconomic background, level of education, how long they lived in the area, religious affiliation, whether they lived in the area during the hurricanes/earthquakes, whether they were evacuated due to the hurricanes/earthquakes, whether they have relocated since the

hurricane/earthquakes, and how the hurricanes/earthquakes may have affected them (physical injury, illness following the hurricanes/earthquakes, loss of property, death of someone close, loss of income, and being rescued).

RCOPE*:* Brief

The RCOPE: Brief is a short form of the religious coping scale and has both a negative subscale and a positive subscale, each composed of seven items. The items are measured in a four-point Likert style, from 0 (*not at all*) to 3 (*a great deal*). Only the negative subscale was used in this study and has items such as "Wondered what I did for God to punish me," "Wondered whether my church had abandoned me," and "Decided the devil made this happen."

A high score for negative religious coping is indicative of "signs of spiritual tension, conflict and struggle with God and others, as manifested by negative reappraisals of God's powers (e.g., feeling abandoned or punished by God), demonic reappraisals (i.e., feeling the devil is involved in the stressor), spiritual questioning and doubting, and interpersonal religious discontent" (Pargament et al., 2011, p. 58). A low score on the negative religious coping subscale indicates less struggle with God and similar characteristics.

The median alpha coefficient for internal consistency of the positive religious coping subscale, determined from several studies examined by Pargament (2011), was 0.81. For this study, Cronbach's alpha was .74, which is still in the acceptable range.

World Assumptions Scale

This scale, developed by Janoff-Bulman (1989), is a 32-item measure with three primary categories. These categories are Worthiness of Self, Meaningfulness of the

World, and Benevolence of the World. For this study, only the Worthiness of Self scale was used, which is composed of 12 items measuring controllability, luck, and self-worth with a 6-point Likert style, from 1 (*strongly disagree*) to 6 (*strongly agree*).

Some examples of items used in the Worthiness of Self category are "I take the actions necessary to protect myself from misfortune" (self-controllability), "Looking at my life, I realize that chance events have worked out well for me" (Luck), and "I often think that I am no good at all" (low self-worth). It is important to note that this scale does not represent people believing that their lives are meaningful, examining instead the assumptions that people have about the world and themselves. Higher scores indicate higher presence of the respective assumption. In this study, Cronbach's alpha for Worthiness of Self was .73.

Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5)

The PCL-5 is a 20-item measure of PTSD symptomatology designed to be up to date with the DSM-5 (Blevins, Weathers, Davis, Witte, & Domino, 2015). The subscales are clustered according to the symptom groups of intrusion, avoidance, changes in mood and cognition, and arousal and hyper-reactivity. These items are measured with a five-point Likert scale, with frequency and severity ranging from 0 (*Not at all*) to 4 (*Extremely*). An example item is "Loss of interest in activities that you used to enjoy." A higher score for each item means a higher presence of the respective symptoms during the last month, while a lower score indicates less occurrence of the symptom during the last month.

Blevins, Weathers, Davis, Witte, and Domino (2015) examined the psychometric properties of the PCL-5 and found that its reliability, convergent validity, and

discriminant validity were strong. In this study, Changes in Mood and Cognition had good reliability (7 items, $\alpha = .89$).

Compliance with Ethical Standards

The authors have no potential conflicts relevant to this manuscript. This study was approved by the Loma Linda University Institutional Review Board (#5200054) and the administration at Antillean Adventist University and was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all participants included in the study.

Procedure

After approval through Loma Linda University's IRB and the administration at Antillean Adventist University, data were collected using Qualtrics (Qualtrics, Provo, UT), an online survey software. Participants were recruited using the Antillean Adventist University (Universidad Adventista de las Antillas) email system. Emails inviting participation in the study were sent in Spanish and English and respondents who completed the informed consent completed the online survey using their own electronic devices, choosing the survey in their preferred language. All participants were provided with information regarding how they might seek psychological services, should they so choose. They were able to enter a raffle at the end of the survey and were free to skip questions or exit the questionnaire at any time. Participants were prevented from re-taking the survey using Qualtrics' Prevent Ballot Box Stuffing option, which uses cookies to identify participants and prevents them from re-taking the survey. In case the participants wished to contact the researchers with any questions regarding the study, they were provided with separate emails for English or Spanish communication to answer

any questions. Data were collected during the Spring, Summer, and Fall academic quarters of 2020, with emails sent to recruit participants each quarter.

Data Analysis Plan

We examined the data for outliers and violations of assumptions before running the analysis. The screening criteria were 75% completion of the relevant survey questions and a 300 second minimum time for completion of the survey. Further outliers were determined using Mahalanobis distances for multivariate outliers (Stevens, 1984). After using the screening criteria and testing for multivariate outliers, the remaining usable sample size was 110 participants.

None of the measures or subscales had a skewness greater than 2 or less than -2, so they were determined to be relatively normally distributed. Furthermore, each of the independent variables had a linear relationship with the dependent variables, if a relationship was found, and the variance of residuals was normally distributed for each dependent variable. The observations were independent of each other. Little's MCAR test failed to reject the null hypothesis ($p > .05$) that the remaining data were missing completely at random, allowing the use of multiple imputation (MI) as a tool to replace the missing values (20 imputations were used).

An analysis was conducted to examine a mediation model using PROCESS v3.5 as described by Hayes (2018) to check for a mediation effect. The data used were from the pooled results of the imputations for handling missing data. The simple mediation analysis used 5,000 bootstrap samples for percentile bootstrap confidence intervals. For more information on the mediational model, please see the results below.

Sample Size Justification

To have enough participants to study the models, the sample size must be fairly large. For individual predictors, such as for a simple mediation analysis, Voorhis et. al. (2007) suggests the recommended minimum sample size is 104+k where k is the number of predictors. In our mediation analysis, we have the independent variable and the mediator, thus the recommended minimum sample size is 106 participants. Our sample size is 110, adequately meeting the requirements for the data analysis plan.

Results

Frequencies

Demographic Data

Frequencies were calculated from the final sample (n = 110) for each categorical demographic study variable, including participant's exposure to Hurricane Maria, Hurricane Dorian, and the 2020 Earthquakes (See Table 3). Of the remaining third academic quarter, the high majority identified as female (86.5%) with the remaining 14% identifying as male. Of the total 110 participants, 29.1% identified as female, 4.5% as male, and 66.4% were unidentified. To help understand the amount of exposure participants may have had to these series of natural disasters, participants were asked how long they had been living in Puerto Rico (PR). While 0.9% of the participants were relatively new to PR and had lived there 3 months or fewer, most had lived there longer (thus experienced some or multiple disasters: 4.5% had lived in PR for 1-2 years, 8.2% for 3-5 years, 7.3% for 6-10 years, 33.6% for 11-20 years, 36.4% for 21-40 years, 3.6% for 41-50 years, and 5.5% for 51 years or more.

The largest percentage of participants (40.9%) were never married, 29.1% were married, 28.2% were in a long-term relationship and 1.8% were divorced or separated. Participants' education levels were diverse: 10% of participants had only a high school degree or the equivalent, 27.3% had some college, 14.5% had an associate degree, 29.1% had a bachelor's degree, 16.4% had a master's degree, and 2.7% had a doctoral degree or the equivalent. When asked to self-identify their social class, 12.7% of participants identified as poor, 36.4% identified as belonging to the working class, 50% as belonging to the middle class, and 0.9% as affluent.

The first academic quarter of responses from the Spring 2020 class constituted 42.7% of the final sample and the second academic quarter from the Summer 2020 class constituted 23.6% of the final sample, both were from a mixed population of students attending the university. The third academic quarter from the Fall 2020 class consisted exclusively of incoming Freshmen to prevent participants from re-taking the survey and constituted 33.6% of the final sample. Further demographic variables and details including language, age, race/ethnicity, and religion can be seen in Table 1. For descriptive statistics and correlations for study variables, please see Table 2.

Table 1. Sociodemographic Characteristics of Participants in this Study

	Participant Frequencies and Percentages	
	n	*%*
Primary Language		
English	41	37.3
Spanish	69	62.7
Age in Years		
18-24	69	62.7
25-34	19	17.3
35-44	9	8.2
45 and older	13	11.8
Race/Ethnicity		
Hispanic, Latino, or Spanish Origin	105	95.5
Other	5	4.5
Religious Identity		
Seventh-day Adventist	65	59.1
Other	45	40.9

Note. $N = 110$

Table 2. Descriptive Statistics and Correlations for Study Variables (N=110)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1.Academic Quarter[a]	1.91	.87	—							
2. Language[b]	.63	.49	-.146	—						
3. Age[c]	2.8	1.35	-.070	-.003	—					
4. Education[d]	4.23	1.35	-.021	-.107	.511***	—				
5. Seventh-Day Adventist[e]	.59	.49	.147	-.335***	.261**	.086	—			
6. Negative religious coping	10.31	3.51	.125	-.147	-.099	-.077	.128	—		
7. Worthiness of self	53.68	9.11	-.312**	.321**	.357***	.342***	-.162	-.340***	—	
8. PCL-5 changes in mood and cognition	14.30	7.43	.071	-.192*	-.244*	-.146	-.048	.424***	-.427***	—

Note: N = 110. The various non-Seventh-day Adventist religions participants identified as were collapsed in a single category "Other".
[a]Academic Quarter: 1 = *Spring Quarter*, 2 = *Summer Quarter*, 3 = *Fall Quarter*. [b]Language: 0 = *English*, 1 = *Spanish*. [c]Age: 1 = *18-24*, 2 = *25-34*, 3 = *35-44*, 4 = *45-54*, 5 = *55-64*, 6 = *65-74*, 7 = *75-84*. [d] Education: 1 = *High school diploma or equivalent*, 2 = *Some college*, 3 = *Associate degree*, 4 = *Bachelor's degree*, 5 = *Master's degree*, 6 = *Doctoral degree or equivalent*. [e]Seventh-Day Adventist: 0 = *Other*, 1 = *Seventh-day Adventist*
*$p < .05$. **$p < .01$. ***$p < .001$

Disaster Exposure

All participants were affected by at least one disaster. For the complete frequencies regarding disaster exposure, please see Table 3. Briefly, 31% of participants reported being affected by all four disasters: Hurricane Maria, Hurricane Dorian, the 2020 Earthquakes, and the 2020 hurricanes and storms. Sixty-one percent of participants were affected by three of the disasters, 6% by two of them, and only 2% by just one disaster. Furthermore, participants reported whether they had been evacuated, relocated, injured, or lost property or income due to one of these disasters. At least 17% of the participants lost contact with someone or knew someone personally who had died due to one of these natural disasters.

Table 3. Frequencies and Percentages for Experiences of Natural Disasters

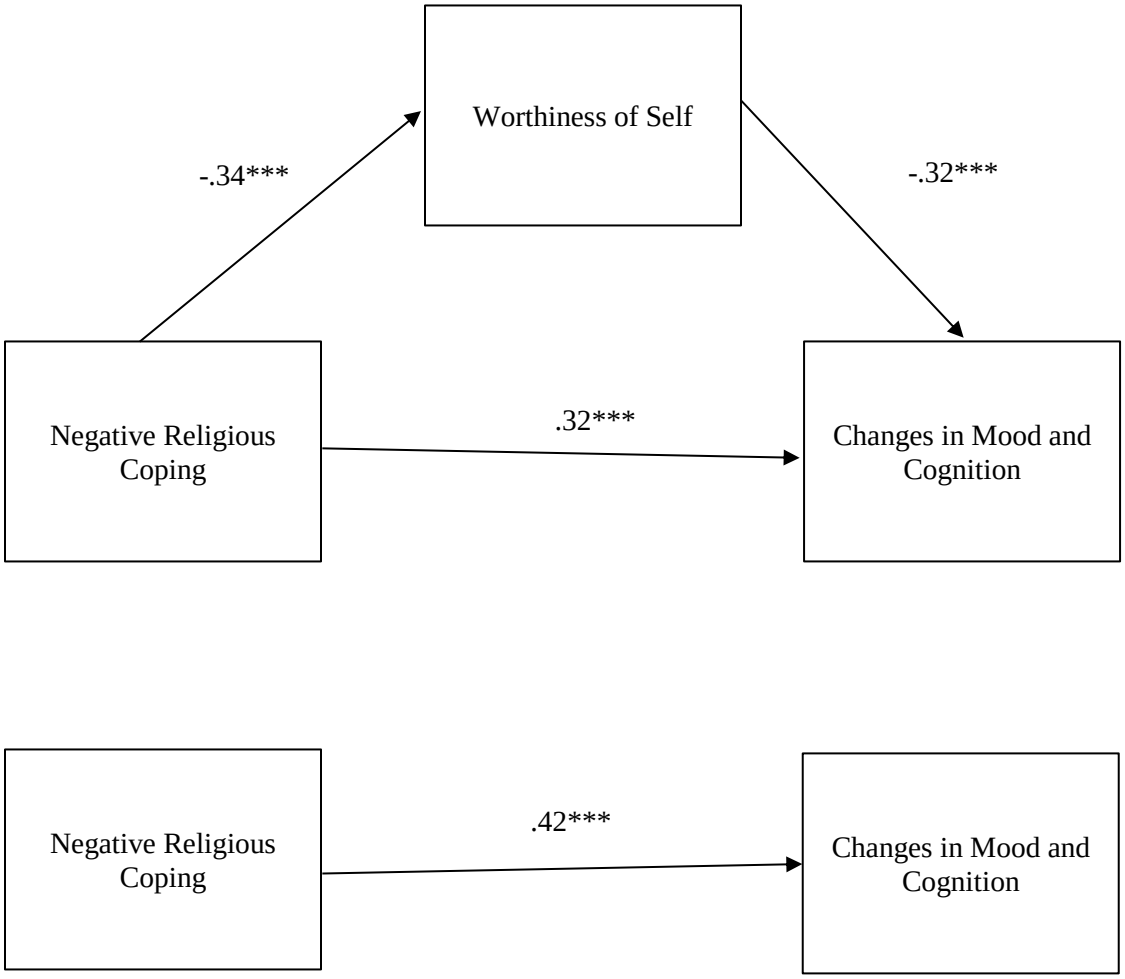
Natural Disaster Experiences in Puerto Rico	2020 hurricanes and storms		2020 earthquakes		Hurricane Dorian		Hurricane Maria	
	n	%	*n*	%	*n*	%	*n*	%
Lived in Puerto Rico	29	26.4	102	92.7	100	90.9	101	91.9
Has since relocated	2	1.8	2	1.8	5	4.5	6	5.5
Lost property	2	1.8	5	4.5	2	1.8	21	19.1
Lost income	1	.9	16	14.5	8	7.3	32	29.1
Lost contact or knew someone who died	2	1.8	6	5.5	5	4.5	19	17.3
Was evacuated			2	1.8			7	6.4
Physically injured			0	0			1	.9
Suffered an illness			6	5.5	1	.9	9	8.2
Required emergency rescue							1	.9

Note. $N = 110$. These experiences were ascribed by respondents as being causally linked to the disasters they indicated.

Mediational Model

As hypothesized, we found a significant relationship between Negative Religious Coping and Changes in Mood and Cognition, mediated by Worthiness of Self (*ab* = .23, *ab'* = .11, 95%CI [.05, .54], 95%CI [.02, .23]). The standardized indirect effect was (-.34)(-.32) = .11. The standardized total effect was .42 (see Figure 1). As Negative Religious Coping increases, Changes in Mood and Cognition shows a moderate increase through a direct effect. Likewise, it also shows a small increase via the mediated effect of Worthiness of Self.

Figure 1. Standardized Regression Coefficients for the Relationship Between Negative Religious Coping and Changes in Mood and Cognition as Mediated by Worthiness of Self



*p < .05. **p < .01. ***p < .001

Discussion

Effects of Religious Coping on Outcomes

Our results indicate that one's religious beliefs influence one's changes in mood and cognition (e.g., having strong negative emotions such as fear, guilt, or shame and difficulty remembering important parts of the stressful experience). When one believes

that God is punishing the individual, that their church has abandoned them, or that the devil made the traumatic event happen, PTSD-related changes in mood and cognition increase in severity. This effect was found both directly and through mediation by worthiness of self. As a result, these beliefs make important targets for clinical intervention.

Effects of World Assumptions on Outcomes

Worthiness of self was related to changes in mood and cognition, as hypothesized. The literature did not indicate worthiness of self to be significantly predictive of PTSD symptoms, but with the inclusion of changes in mood and cognition in the latest version of the PCL-5, it was logical that as beliefs in the worthiness of self decreased, PTSD-related changes in mood and cognition increased. Other literature has previously highlighted the importance of cognitions about self in predicting PTSD-related symptoms (Park, Mills, & Edmondson, 2012) and our results validate that cognitions about self are indeed associated with PTSD-related changes in mood and cognition.

Summary of Contributions

The current study expands upon the literature by investigating the relationships between negative religious coping, worthiness of self, and PTSD-related changes in mood and cognition. Likewise, this study expands upon previous studies by sampling from individuals that have experienced one or more natural disasters. By examining negative religious coping, worthiness of self, and subsequent PTSD-related changes in mood and cognition of individuals who have experienced Hurricane Maria, Hurricane Dorian, or the 2020 earthquakes/tropical storms in Puerto Rico, this study has gained

better insight into how religious individuals may interpret and process their experiences of natural disasters and how their coping strategies may affect self-concept and PTSD symptoms.

This study contributes to the literature by providing a novel examination of the effects of religious coping and worthiness of self on PTSD-related changes in mood and cognition. The study expands upon previous research in religious coping by sampling from a Seventh-day Adventist university in Puerto Rico following multiple natural disasters. Whereas other studies have examined the effects of religious coping on PTSD symptoms for samples with multiple types of trauma exposure, this study specifically provides greater insight into thought processes which maintain or increase PTSD-related changes in mood and cognition for those who have experienced one or more natural disasters.

Limitations and Future Directions

The current study is limited due to its cross-sectional nature and the lack of a comparison group. The measures were collected by self-report with a volunteer sample of university students from Puerto Rico. As a result, social desirability may bias the results of the self-report instruments and may play an important role in influencing the results of this study. Also, we could not control for gender due to unforeseen omissions for collecting this data in two of the three quarters.

It is important to note that the study took place during a pandemic of coronavirus disease 2019 (COVID-19). As a result, it is expected that the severity of PTSD symptoms may be influenced by variables unaccounted for in the current study. Indeed, through

qualitative feedback, some participants identified the pandemic as a primary source of stress. However, as this pandemic was not localized but widespread, and was present from the beginning to the end of the data collection period, we consider it a constant in this study, allowing us to nevertheless explore the remnant effect of natural disasters.

Future studies could improve upon the results of this study by examining gender more thoroughly as a variable in future research of reactions to natural disasters. Likewise, examination of these factors using a longitudinal approach or with comparison to a similar group without natural disaster exposure would be helpful. Due to a limited sample size, and since structural equation modeling is a large-samples analysis, the researchers did not construct and test a full structural equation model to gain better insight into how these variables may be organized to best optimize fit with the data and test varying organizations of pathways. Future research may expand upon these findings by examining the arrangement of predictive pathways for these variables as well as testing alternate hypotheses to determine a model of best-fit with the data. Also, these variables could be examined with a more heterogeneous sample to ensure generalizability or with different types of traumas. Likewise, researchers may examine the effects of multiple experiences of natural disasters. While we did not examine other PTSD outcomes such as post-traumatic growth, it is also entirely possible that these beliefs (and positive religious coping) may influence other outcome-based measures.

Strengths of this study include sampling from a population that was appropriate for the research questions, and had not previously been studied, namely persons of

Christian faith who had experienced natural disasters. With the existence of alternate measures of religious coping for different religious identifications, recruitment of a sample with individuals from a suitable monotheistic religion as well as non-religious individuals was necessary for appropriately studying the effects of religious coping on PTSD symptom severity, which a religiously affiliated university setting may provide. Since the research question also pertained to natural disaster trauma specifically, it was important to recruit participants who had varying experiences with that type of traumatic event. Finally, the hypotheses for this study were largely determined based on existing literature and the results of this study independently verify theories that other studies have suggested.

Clinical Implications

These results have implications for therapeutic practice, highlighting the importance of attending to the biopsychosocial-spiritual needs of the individual. Many of the measures used in this study indicate the relevance of negative religious coping in processing trauma and increasing the severity for symptoms of PTSD. Our results could help guide practitioners to better meet the needs of their Christian-identifying clients by attending to the religious coping strategies observed clinically, especially after exposure to a natural disaster. Worldview assumptions such as worthiness of self may be examined more thoroughly during therapeutic intervention due to its influence on mood and cognitions. By finding ways for the therapist to help reinforce client beliefs in worthiness of the self, therapists will be better able to help effect change in client affect and cognition following exposure to a natural disaster.

This study demonstrates that negative religious coping plays an important role in PTSD symptom severity for those that have experienced a natural disaster. The results suggest that individuals who have survived a natural disaster and believe that God is punishing them, that God or their church has abandoned them, or have low opinions of themselves tend to experience greater PTSD-related changes in mood and cognition. On the other hand, those who believe that they are generally lucky, take actions to protect themselves from misfortune, and do not believe that God is punishing them will tend to experience lessened PTSD symptom severity.

Specifically, clinicians with clients who engage in negative religious coping may provide a space for their clients to discuss their experiences and beliefs in a safe and empathic environment. Clients may be able to explore how their religious coping strategies affect both view of self and symptom development. Participation in social church activities could provide social support and opportunities which may encourage engagement with alternate religious coping strategies that would be culturally appropriate. Clients may be encouraged to speak with religious leaders that they trust if they feel uncomfortable with discussing these matters with the clinician or in addition to their work with the clinician.

The mediating effect of worthiness of self on the relationship between negative religious coping and PTSD-related changes in mood and cognition suggests that one's view of self is a strong influence on PTSD symptom development. As individuals begin to believe that God has punished them or that the church has abandoned them, they may

subsequently develop lowered opinions of themselves, which might cause heightened emotional changes and emotional dissociation. The mediation analysis contributes to the literature by demonstrating how negative religious coping may not only directly affect mental health and functioning but may also indirectly influence PTSD-related changes in mood and cognition through the client's view of self. It also contributes to clinical practice by showing the relevance of negative religious coping to PTSD symptom development. By only examining the client's view of self, a clinician may miss the influence of negative religious coping for religious clients.

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