

## RESEARCH ARTICLE

# (Non)Religious Coping with a Natural Disaster in a Rural U.S. Community

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Religious/spiritual (R/S) coping following natural disasters is associated with positive outcomes, leading to perceptions that the absence of R/S coping leads to negative outcomes among nonreligious individuals. However, little research explicitly explores the coping strategies of nonreligious individuals in response to natural disasters and traumatic events. The present study collected data from a sample of survivors of a natural disaster event (i.e., a tornado) to test the relationship between (non)religiosity/(non)spirituality, coping, psychological distress, and posttraumatic growth. Statistical models suggested that problem-focused coping facilitated posttraumatic growth and lower levels of psychological distress among people with lower levels of institutional religiousness and/or individual spirituality (consistent with predictions), but not among people at high levels of religiousness/spirituality (contrary to predictions). Participants with moderate levels of institutional religiousness reported more dysfunctional coping and higher levels of psychological distress, as predicted. Emotion-focused coping was associated with fewer depressive symptoms following trauma among participants with low levels of institutional religiousness. These data suggest a complex relationship between trauma, posttraumatic growth, distress, and coping among varying levels of (non)religiousness/(non)spirituality. This study is among the first to suggest that problem-focused coping in particular may promote positive psychological outcomes among nonreligious/nonspiritual people following a natural disaster or traumatic event. Implications of these data (i.e., for treatment of trauma) are discussed.

Much research related to individual coping following human-made and natural disasters suggests religious and spiritual coping is associated with positive outcomes (Aten et al., 2019). The presentation of this positive relationship may erroneously infer that nonreligious individuals' outcomes are negatively impacted by the absence of religious coping. Rather, studies of psychological well-being suggest a curvilinear relationship between (non)religiosity and well-being, such that low, as compared to high, levels of identification with a religious or nonreligious identity are associated with lower well-being (Galen & Kloet, 2011). Studies of the relationship between religiosity and mental health, including in the context of disaster, often exclude participation of nonreligious individuals through omission (Hwang et al., 2011) or utilize measures of religiousness that fail to capture nonreligious people (e.g., atheists, agnostics, religious nones; Cragun et al., 2015). Thus, studies of coping with natural disasters that are inclusive of a wide range of (non)religious orientations and examine differences, if any, among people of varying levels of reli-

giousness and spirituality, are needed, a problem the current investigation sought to address. Of note, the terms (non)religious and (non)spiritual are used throughout the manuscript to refer to the full spectrum of systems of belief and nonbelief, ranging from atheism to high religiosity, whereas nonreligious/nonspiritual are used to refer to people without a religious and/or spiritual orientation.

## Natural Disasters and Trauma

Natural disasters are sudden, potentially traumatic, often weather-related events (e.g. tornados, hurricanes) that generally occur locally but require national or international assistance due to the far-reaching impact of the resulting destruction (Kilmer et al., 2019). Much scholarship has focused on the psychological impact of natural disasters and the established link between exposure to disasters and the development of mental health problems, especially post-traumatic stress disorder (PTSD; Goldmann & Galea, 2014). However, a wide range in the prevalence of PTSD rates (i.e., 3% to 60%) after a natural disaster suggests that factors other than mere exposure to the traumatic aspects of a disaster determine whether mental health problems develop (Neria et al., 2008). Many such factors have been identified, including peri-traumatic distress, disruption distress, social support, and coping strategies (Baral & Bhagawati, 2019; McGuire et al., 2018).

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By contrast, posttraumatic growth (PTG) refers to individual-level positive change resulting from experience with a trauma or loss. Generally, PTG involves changes in one's sense of self, changes in relationships with others, and existential/spiritual growth (Calhoun & Tedeschi, 2001). Importantly, the absence of PTSD is not necessary to experience PTG; on the contrary, among survivors of Hurricane Sandy, higher PTSD symptoms were associated with greater PTG (Schneider et al., 2019). Similarly, in a sample of survivors of the Great East Japan Earthquake, reexaminations of core beliefs and rumination, deliberate or intrusive, predicted higher PTG (Taku et al., 2015). Therefore, distress may be necessary for growth to occur such that trauma-related symptoms and PTG occur concurrently (Tedeschi & Calhoun, 2004) and both are possible in the aftermath of a natural disaster.

Further, though responses to trauma generally vary (Green et al., 2000), such that traumatic symptoms can be nonexistent, short or long-term, and immediate or delayed (Bonanno, 2004), trajectory-based models used to explain trauma response over time are generally consistent despite differences in severity and type of trauma. In a review of studies of trauma response, the most common trajectory was resilience, and moderating variables, including coping flexibility, strategy, and style, were important in explaining individual differences across trajectories (Galatzer-Levy et al., 2018). Thus, exploration of the moderating role of coping in the relationship between natural disaster-related trauma, trauma-related symptoms, and posttraumatic growth is cogent.

### **Coping with Natural Disasters**

Coping refers to the process by which an individual manages the demands of their environment to reduce, master, or tolerate stress (Lazarus & Folkman, 1984). Substantial research has examined the association between coping behaviors and mental health outcomes across a wide variety of stressors and suggested, in general, that adaptive coping strategies (e.g., positive reframing, humor) are associated with more positive outcomes whereas maladaptive coping strategies (e.g., disengagement, self-blame) are associated with negative outcomes (Blashill et al., 2011; Lazarus & Folkman, 1984; Penley et al., 2002; Williams & Hasking, 2010). In a study of college students with a wide range of trauma histories, avoidant coping was associated with PTSD and problem-solving coping was associated with posttraumatic growth (Schuettler & Boals, 2011).

In response to natural disasters, specifically, the phases of the event and degree of associated loss likely determine the most advantageous coping strategies. For example, a temporary loss may benefit from problem-solving and a permanent loss may be better addressed through positive reappraisal (Shing et al., 2016). In a study of coping strategies used by survivors of flooding in Pakistan, self-distraction, denial, venting, humor, and self-blame were associated with psychological distress, and active coping, including planning, acceptance, positive reframing, and religious coping, was associated with posttraumatic growth (Aslam & Kamal, 2015). Cherry and colleagues (2017) suggested avoidant emotional coping was associated with

the development of PTSD and discovered that exposure to disasters can possibly alter an individual's coping styles in such a way as to decrease effective coping. Though coping is often examined as an individual process, communal coping, in which an event is understood and acted upon in a collaborative fashion by community members, may facilitate posttraumatic growth, particularly within collectivistic cultures and communities (Włodarczyk et al., 2016). Relatedly, after exposure to multiple wildfires in California, communal coping ameliorated the impact of uncertainty on psychological distress among survivors (Afifi et al., 2012). Therefore, coping appears to play an important role in the manifestation of trauma in response to natural disasters.

### **Religious Coping and Natural Disasters**

Examinations of religiousness and related coping in response to trauma have demonstrated the benefits of support from religious peers, making sense of trauma using a religious framework (Chapple et al., 2011), religious forgiveness, and spiritual connection (Pargament et al., 1998). Similar benefits of religious coping strategies are observed when employed in response to natural disasters. In a systematic review of empirical literature related to religion/spirituality (R/S) and disasters, R/S, including positive religious coping, served as a positive resource for recovery from disasters (Aten et al., 2019). However, the nature of the religious coping utilized appears to influence response to trauma. In a longitudinal examination of Chilean adults who experienced a recent stressful event, including but not limited to natural disasters, positive religious coping was related to posttraumatic symptoms whereas negative religious coping was related to posttraumatic growth (García et al., 2017). Baral and Bhagawati (2019) discovered that individuals who developed PTSD after an earthquake in Nepal were more likely to utilize passive coping, religious coping, and substance use coping; whereas, those who did not develop PTSD engaged in more active and self-distraction coping.

Residents of Mississippi during Hurricane Katrina who reported utilizing positive religious coping were at less risk for trauma and depressive symptoms, alcohol misuse, and damage to quality of life, whereas negative religious coping was associated with depressive symptoms and poorer quality of life following the disaster (Henslee et al., 2015). Similarly, evacuees surveyed in the immediate aftermath of Hurricane Katrina reported more acute stress symptoms and functional impairment when using negative religious coping strategies. Contrary to hypotheses, positive religious coping and other dimensions of religious engagement (e.g. prayer, service attendance) were not significantly related to acute stress symptoms or functional impairment (Park et al., 2019). Further, among U.S.-based college students with a variety of traumatic event exposure, including but not limited to natural disasters, negative religious coping appeared to be a barrier to posttraumatic growth (Thomas & Savoy, 2014). Therefore, the relationship between religious coping and trauma related to experiences of natural disaster varies; but, negative religious coping appears to be more consistently associated

with outcomes than positive religious coping or engagement. Therefore, nonreligious people may experience trauma after natural disasters at similar, or lower, rates as compared to religious people as they are unlikely to employ negative religious coping strategies.

Notably, religious and spiritual coping in response to natural disasters is often explored without examination of the (non)religiousness of participants beyond self-identification (e.g., Christian, Muslim, agnostic). Further, nonreligious people are underrepresented in coping studies, broadly, such that little is known about how religiously unaffiliated people cope, in general. In an exploration of coping among atheist, agnostic, and religious adults 55 years of age or older, Horning and colleagues (2011) found no significant differences between groups with regard to well-being and few differences in employment of coping strategies. As expected, theists were more likely to use religious practices (e.g. prayer and meditation); whereas, atheists were more likely than other groups to use substances and more likely to use humor than religious participants, though these differences only approached significance (Horning et al., 2011).

Although religiosity may buffer the adverse impact of stress (Lawler-Row & Elliott, 2009; Koenig, 2012; Moore & Leach, 2016) and religiosity and well-being are positively associated (Jackson & Bergeman, 2014; Nichols & Hunt, 2011; Reed & Neville, 2014), few, if any, religiously unaffiliated people are included in such studies. In a study of church and secular group members, Galen and Kloet (2011) found high certainty in participants' belief or nonbelief in god(s) was associated with higher emotional stability and life satisfaction as compared to participants' with less certainty in their (non)belief, even when controlling for demographic (e.g., age, gender) and social (social support) variables. Indeed, social support appears to confound the relationship between religiousness and well-being, such that organized nonbelief can offer similar benefits to health and eliminate differences between the well-being of religious and nonreligious people (Galen, 2015; McCaffree, 2019). Therefore, examinations of associations between aspects of religiousness and psychological well-being, broadly, and trauma response to natural disasters, specifically, must include nonreligious people and use measures of (non)religiosity that capture the nonreligious experience.

### The Present Study

Given there are few studies of (non)religious people's use of broad coping strategies, rather than religious coping specifically, in response to natural disasters, and nonreligious people are underrepresented in related extant literature, little is known about differences, if any, in coping and posttraumatic adjustment among people of varying (non)religious orientations. The present study sought to examine the relationships between (non)religiosity/(non)spirituality, coping, psychological distress, and posttraumatic growth among survivors of a tornado event in the Southeastern United States (U.S.). Specifically, it was hypothesized that the self-reported intensity of the natural disaster would be positively related to psychological

distress and posttraumatic growth indirectly through coping style and as moderated by (non)religiosity/(non)spirituality. It was expected that these relationships would be significant at high levels of religiousness/spirituality and high levels of nonreligiousness/nonspirituality as compared to low levels of (non)religiousness/(non)spirituality. Similarly, we expected people with high levels of (non)religion/(non)spirituality would be more likely to engage in adaptive coping (emotion-focused and problem-focused) as compared to dysfunctional coping strategies which would, in turn, be associated with lower levels of psychological distress and higher levels of posttraumatic growth.

## Method

### Participants

Residents of a small, rural community in the Southeastern U.S. who experienced a local tornado event in April 2019 were eligible to participate in the study. Participants were recruited via email, social media, locally posted flyers, the local newspaper, in-person communication, and snowball sampling. Initially, 181 adults participated in the survey; there was a 57% attrition rate (the majority of that attrition occurred before completion of the first administered scale). Analyses only include individuals who completed the survey ( $N = 88$ ). Christian (67%), Protestant (14.8%), and Catholic (10.2%) were the most commonly endorsed current religious identities. Remaining participants identified as nonreligious (10.2%), atheist (5.7%), and agnostic (4.5%); one participant identified as Jewish, one as Muslim, and one as Other. The vast majority of respondents were raised in a Christian faith and some with other faith systems, but very few (4.5%) were raised without religion.

Participants identified their gender as female (64.8%), male (33.0%), transgender (1.1%), and queer (1.1%). Most participants identified as White (92.0%), followed by Black (3.4%), Latinx (2.3%), and Native American (1.1%), Asian American (1.1%), and Arab/Persian/Middle Eastern (1.1%). In terms of sexuality, 89.8% of respondents identified as heterosexual, 6.8% bisexual, and 1.1% each gay/lesbian, pansexual, and "leaning pansexual". Roughly half of the sample (49.9%) earned a bachelor's degree or higher, 37.0% reported some college without earning a degree, 10.2% an associate or trade school degree, and 2.3% a high school diploma or equivalent. A small portion of respondents (15.9%) endorsed a sensory, mobility, learning, or mental health-related disability. The majority of participants (70.5%) were financially independent and earned more than \$32,000 annually.

### Procedure

After institutional review board approval, data were collected via Qualtrics, an online survey platform. Adult participants who consented to participation and confirmed their presence in the community studied during the April 2019 tornado event were invited to complete a demographics questionnaire and (5) measures in the order they are presented below. Data was collected between November 2019 and January 2020, approximately 7 to 9 months following the local tornado event.

## Measures

### Coping Strategies

Coping in response to the tornado event was assessed by the B-COPE (Carver, 1997), a 14-item measure of adaptive and maladaptive coping strategies employed by participants. The scale is comprised of 14 subscales that may be organized into three composite subscales: acceptance, emotional support, humor, positive reframing, and religion (Emotion-Focused); active coping, instrumental support, and planning (Problem-Focused); behavioral disengagement, denial, self-distraction, self-blame, substance use, and venting (Dysfunctional; Carver et al., 1989; Coolidge, et al., 2000). Endorsement of use of coping strategies was provided on a 4-point Likert scale in which 1 indicated "I have not been doing this at all" and 4 indicated "I have been doing this a lot". Descriptive statistics for each subscale are as follows: Emotion-Focused,  $M = 2.17$ ,  $SD = 0.64$ , Range 1–3.67; Problem-Focused,  $M = 1.87$ ,  $SD = 0.76$ , Range 1–3.63; Dysfunctional,  $M = 1.30$ ,  $SD = 0.47$ , Range 1–3.30. Initial reliabilities were good (Emotion-Focused = .72; Problem-Focused = .84; Dysfunctional = .75) and construct validity was evidenced (Cooper et al., 2008). In the present study, internal consistency for each broad type of coping were as follows: Problem-Focused Coping,  $\alpha = .80$ ; Emotion-Focused Coping,  $\alpha = .79$ , and Dysfunctional Coping,  $\alpha = .88$ .

### Depressive Symptoms

To assess symptoms of psychological distress related to the tornado event, participants were asked to complete the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D was developed to screen for depressive symptoms among the general public and not for diagnosing depression in clinical settings (Radloff, 1977) and is one of the most commonly used self-report depression measures (Santor et al., 2006). The CES-D is a 20-item measure to which participants indicated the frequency with which they experienced each statement in the time period between the tornado event and completing the survey. Items include, "I felt depressed" and "I felt hopeful about the future." Participants indicated the frequency of their symptoms on a 4-point Likert scale on which 1 corresponded with "Rarely or none of the time (less than once per week)" and 4 corresponded with "Most or all of the time (5–7 days per week)". Composite scores were calculated by adding up responses to all items on the scale and then dividing by the number of items creating a possible range of scores from 1 to 4. Descriptive statistics for the scale were as follows,  $M = 1.72$ ,  $SD = 0.61$ , Range 1–3.74. Tests across gender, race, education, and age subgroups indicated strong reliability ( $\alpha > .80$ ) and strong correlation with other self-report depression scales (Radloff, 1977) and internal consistency was strong in the present study ( $\alpha = .93$ ).

### Posttraumatic Growth

The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) was used to measure how well participants were able to reorganize and strengthen their perception of self, others, and meaning in the aftermath of

the tornado event. The PTGI is a 21-item scale to which participants respond to items such as "I have a greater feeling of self-reliance" and "I better accept needing others" on a 6-point Likert scale ranging from 0 (I did not experience this change as a result of my crisis) to 5 (I experienced this change to a very great degree as a result of my crisis). Composite scores were calculated by adding up responses to all items on the scale and then dividing by the number of items creating a possible range of scores from 1 to 6. Descriptive statistics for the scale were as follows,  $M = 2.65$ ,  $SD = 1.31$ , Range 1–5.90. Total scores may be calculated, as well as individual factor scores for five factors: Relating to Others, New Possibilities, Personal Strength, Spiritual Change, and Appreciation of Life. In initial testing, among undergraduate students who had experienced a recent significant and negative life event, internal consistency was  $\alpha = .90$ ; the present study demonstrated an  $\alpha$  of .97.

### (Non)religion & (Non)spirituality

Studies have historically examined (non)religiosity and (non)spirituality as discrete identifications rather than a spectrum ranging from nonreligious and nonspiritual to religious and spiritual. The current study measured (non)religiosity and (non)spirituality via the NRNSS (Cragun et al., 2015), a 14-item measure consisting of two subscales: institutional religiousness and individual spirituality. Participants responded to items including "I would describe myself as a religious person" and "Spirituality is important to me" using a 5-point Likert scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). High scores suggest low institutional religiousness (nonreligiosity) and low individual spirituality (nonspirituality) and, inversely, low scores indicate religiosity and spirituality. Composite scores were calculated by adding up responses to all items on the subscale and then dividing by the number of items creating a possible range of scores from 1 to 5. Descriptive statistics for each subscale were as follows: nonreligiosity,  $M = 2.81$ ,  $SD = 0.53$ , Range 1–4.00; nonspirituality,  $M = 2.40$ ,  $SD = 0.95$ , Range 1–5.00. Initial testing demonstrated strong internal consistency ( $\alpha = .95$ ). In the present study, the  $\alpha$  was .94 for the nonreligion subscale and .89 for the nonspirituality subscale.

### Trauma

Subjective trauma was measured using a single item, "Overall, how traumatic was the tornado event in Ruston, Louisiana on April 25, 2019 for you?". Participants indicated their self-perception of their trauma response following the tornado event on scale of 1 ("Not at all traumatic") to 7 ("Intolerably traumatic"). Descriptive statistics for the item were as follows,  $M = 3.27$ ,  $SD = 1.59$ , Range 1–7.

## Results

The moderated direct and indirect relationships were tested using PROCESS model 59 (Hayes, 2013). All effects were computed for each of 10,000 bootstrapped samples and were considered significant if their 95% confidence intervals did not include zero. For these analyses,

self-reported trauma was treated as the independent variable, while each of the three coping styles (problem-focused, emotion-focused, dysfunctional) served as mediators in every version of the model. Models 1 and 3 below use the institutional (non)religiousness component of the NRNSS scale as the moderating variable, while Models 2 and 4 included individual (non) spirituality as a moderator. Similarly, Models 1 and 2 included posttraumatic growth as the outcome measure, while Models 3 and 4 used posttraumatic depressive symptoms as the outcome. For each model, statistical reporting of full model statistics is presented both in main text and tables, while values for unique main and interaction effects are reported in tables only. The analytical plan was designed to examine the most complex relationships possible given expected power limitations. The analytical plan was also pre-registered at <https://osf.io/8a234/>.

### Model 1

The combination of trauma, (non)religiousness, and the Trauma  $\times$  (Non)religiousness interaction predicted significant variance in each type of coping: Problem-focused coping,  $R^2 = .19$ ,  $F(3, 80) = 6.29$ ,  $p < .001$ , emotion-focused coping,  $R^2 = .15$ ,  $F(3, 80) = 4.89$ ,  $p = .003$ , dysfunctional coping,  $R^2 = .25$ ,  $F(3, 80) = 8.85$ ,  $p < .001$ . There were no unique significant predictors for any of the mediators.

The combination of trauma, (non)religiousness, problem-focused coping, emotion-focused coping, dysfunctional coping, Trauma  $\times$  (Non)religiousness, Problem-focused Coping  $\times$  (Non)religiousness, Emotion-focused Coping  $\times$  (Non)religiousness, and Dysfunctional Coping  $\times$  (Non)religiousness predicted significant variance in posttraumatic growth,  $R^2 = .50$ ,  $F(9, 74) = 8.08$ ,  $p < .001$ . However, none of the unique effects were significant.

The direct effect of trauma on posttraumatic growth was significant among participants with high (i.e., at the 16<sup>th</sup> percentile for (non)religiousness) to moderate (i.e., at the 50<sup>th</sup> percentile) institutional religiousness but the direct effect was not significant at low levels (i.e., at the 84<sup>th</sup> percentile)

of institutional religiousness. This might indicate that non-religious people experience less growth in the aftermath of trauma as compared to religious people. However, the indirect effect of trauma on posttraumatic growth via problem-focused coping was significant at low to moderate levels of institutional religiousness, but not at higher levels of institutional religiousness, which would instead indicate that both religious and nonreligious individuals experienced growth in the aftermath of trauma but that nonreligious individuals experienced such growth in large part due to utilizing problem-focused coping strategies. Indirect effects were not significant at any level of (non) religiousness for either of the other coping styles. Effect sizes, confidence intervals, and significance values (exact where available) for all unique effects in this model are summarized in **Tables 1a** (effects of trauma and (non)religiousness on mediators) and **1b** (effects of trauma, (non) religiousness, and coping styles on posttraumatic growth) while the Model Diagram is illustrated in **Figure 1**.

### Model 2

The combination of trauma, (non)spirituality, and the Trauma  $\times$  (Non)spirituality interaction predicted significant variance in each type of coping: problem-focused coping,  $R^2 = .19$ ,  $F(3, 76) = 6.29$ ,  $p < .001$ , emotion-focused coping,  $R^2 = .15$ ,  $F(3, 76) = 4.89$ ,  $p = .003$ , dysfunctional coping,  $R^2 = .25$ ,  $F(3, 76) = 8.85$ ,  $p < .001$ . The only unique predictor of the coping styles was trauma, higher levels of which predicted increases in both emotion-focused coping,  $b = 0.21$ ,  $p < .001$ , and dysfunctional coping,  $b = 0.17$ ,  $p = .008$ .

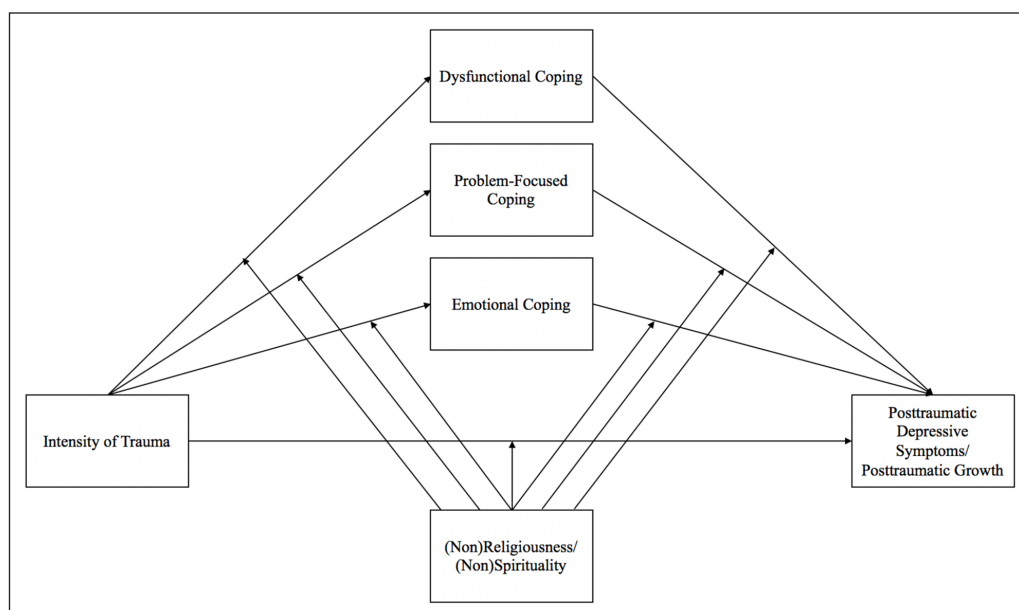
The combination of trauma, (non)spirituality, problem-focused coping, emotion-focused coping, dysfunctional coping, Trauma  $\times$  (Non)spirituality, Problem-focused Coping  $\times$  (Non)spirituality, Emotion-focused Coping  $\times$  (Non)spirituality, and Dysfunctional Coping  $\times$  (Non)spirituality predicted significant variance in Posttraumatic Growth,  $R^2 = .47$ ,  $F(9, 70) = 6.88$ ,  $p < .001$ . However, none of the unique effects were significant.

**Table 1a:** Effects of Trauma and Non-Religion on Coping Styles.

<b>M1: Problem Focused Coping</b> $R^2 = .19$ $F = 6.29$ $p < .001$					
Variable	<i>t</i>	<i>b</i>	95% CI Low	95% CI Upper	<i>p</i>
Trauma	-0.91	-0.23	-0.75	0.28	.368
Non-Religion	-1.68	-0.54	-1.18	0.10	.096
Trauma $\times$ Non-Relig	1.66	0.15	-0.03	0.32	.099
<b>M2: Emotion Focused Coping</b> $R^2 = .15$ $F = 4.89$ $p = .004$					
Trauma	-0.28	-0.06	-0.75	0.28	.780
Non-Religion	-1.76	-0.48	-1.18	0.10	.082
Trauma $\times$ Non-Relig	0.81	0.06	-0.09	0.21	.420
<b>M3: Dysfunctional Coping</b> $R^2 = .25$ $F = 8.86$ $p < .001$					
Trauma	0.80	0.10	-0.15	0.36	.428
Non-Religion	-0.46	-0.07	-0.39	0.24	.643
Trauma $\times$ Non-Relig	0.14	0.01	-0.08	0.09	.890

**Table 1b:** Moderated-Mediation Effects of Trauma, Non-Religion, and Coping on Posttraumatic Growth.

<i>Y: Posttraumatic Growth</i>					
	<i>R<sup>2</sup> = .50</i>		<i>F = 8.08</i>		<i>p &lt; .001</i>
<b>Variable</b>	<b>t</b>	<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Prob-Focused Cope	-0.48	-0.63	-3.27	2.01	.552
Emo-Focused Cope	0.41	0.56	-2.17	3.29	.636
Dysfunctional Cope	1.09	2.39	-1.99	6.77	.682
Trauma	1.59	0.74	-0.19	1.67	.280
PFCope × NonRel	1.05	0.51	-0.45	1.46	.117
EmoCope × NonRel	-0.20	-0.10	-1.09	0.89	.297
Dysfnct × NonRel	-1.23	-1.03	-2.69	0.63	.222
Non-Religion	0.76	0.72	-1.17	2.59	.452
Trauma × NonRel	-1.14	-0.19	-0.53	0.14	.260
<i>Conditional Direct Effects of X on Y</i>					
	<b>t</b>	<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Religion Low	2.74	0.31	0.08	0.54	.008
Non-Religion Med	2.92	0.24	0.08	0.40	.005
Non-Religion High	0.27	0.04	-0.30	0.38	.787
<i>Indirect – Problem Focused Coping</i>					
		<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Religion Low		0.05	-0.04	0.18	>.05
Non-Religion Med		0.11	0.01	0.23	<.05
Non-Religion High		0.36	0.01	0.79	<.05
<i>Indirect – Emotion Focused Coping</i>					
		<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Religion Low		0.03	-0.04	0.14	>.05
Non-Religion Med		0.03	-0.03	0.12	>.05
Non-Religion High		0.03	-0.11	0.26	>.05
<i>Indirect – Dysfnctinal Coping</i>					
		<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Religion Low		0.01	-0.08	0.27	>.05
Non-Religion Med		-0.04	-0.11	0.18	>.05
Non-Religion High		-0.17	-0.61	0.09	>.05



**Figure 1:** Hypothesized Moderated-Mediation Model.

Examination of the conditional direct effects showed that the direct effect of trauma on posttraumatic growth was significant at high levels of individual spirituality, but not at moderate to low levels of individual spirituality. This might indicate that nonspiritual people experience less growth in the aftermath of trauma as compared to spiritual people. However, the indirect effect of trauma on posttraumatic growth via problem-focused coping was significant at low levels of individual spirituality, but not at higher levels of individual spirituality, which would similarly indicate that both spiritual and nonspiritual individuals experienced growth in the aftermath of trauma but that nonspiritual individuals experienced such growth in large part due to utilizing problem-focused coping strategies. Indirect effects were not significant at any level of (non)spirituality for either of the other two coping styles (see **Tables 2a** and **2b**).

### Model 3

The combination of trauma, (non)religiousness, and the Trauma  $\times$  (Non)religiousness interaction predicted significant variance in each type of coping: Problem-focused coping,  $R^2 = .20$ ,  $F(3, 80) = 6.69$ ,  $p < .001$ , emotion-focused coping,  $R^2 = .17$ ,  $F(3, 80) = 5.32$ ,  $p = .002$ , Dysfunctional coping,  $R^2 = .24$ ,  $F(3, 80) = 8.29$ ,  $p < .001$ . There were no unique significant predictors for any of the mediators.

The combination of trauma, (non)religiousness, problem-focused coping, emotion-focused coping, dysfunctional coping, Trauma  $\times$  (Non)religiousness, Problem-focused Coping  $\times$  (Non)religiousness, Emotion-focused Coping  $\times$  (Non)religiousness, and Dysfunctional Coping  $\times$  (Non)religiousness predicted significant variance in Posttraumatic Depressive Symptoms,  $R^2 = .50$ ,  $F(9, 74) = 8.08$ ,  $p < .001$ . Unique variance was predicted only by trauma,  $b = 0.47$ ,  $p = .021$ , and by non-religion,  $b = 0.91$ ,  $p = .029$ .

Examination of the conditional direct effects showed that the direct effect of trauma on posttraumatic

depressive symptoms was significant at high levels of institutional religiousness, but not at moderate to low levels of institutional religiousness. This might indicate that religiousness may protect against depressive symptoms in the aftermath of trauma. However, the indirect effect of trauma on posttraumatic depressive symptoms via problem-focused coping was significant at low levels of institutional religiousness, but not at higher levels of institutional religiousness, which would perhaps indicate that both religious and nonreligious individuals experienced depressive symptoms in the aftermath of trauma but that nonreligious individuals were especially likely to attempt problem-focused coping strategies in response. In addition, at low levels of institutional religiousness trauma predicted reduced depressive symptoms through emotion-focused coping and, at moderate levels of institutional religiousness, trauma predicted increased depressive symptoms through dysfunctional coping. These effects suggest a nuanced pattern of coping styles and associated effectiveness for individuals at varying levels of institutional religiousness (see **Tables 3a** and **3b**).

### Model 4

The combination of trauma, (non)spirituality, and the Trauma  $\times$  (Non)spirituality interaction predicted significant variance in each type of coping: problem-focused coping,  $R^2 = .21$ ,  $F(3, 76) = 6.75$ ,  $p < .001$ , emotion-focused coping,  $R^2 = .20$ ,  $F(3, 76) = 6.35$ ,  $p < .001$ , dysfunctional coping,  $R^2 = .27$ ,  $F(3, 76) = 8.85$ ,  $p < .001$ . The only unique predictor of the coping styles was trauma, higher levels of which predicted increases in both emotion-focused coping,  $b = 0.23$ ,  $p = .03$ , and dysfunctional coping,  $b = 0.15$ ,  $p = .02$ .

The combination of trauma, (non)spirituality, problem-focused coping, emotion-focused coping, dysfunctional coping, Trauma  $\times$  (Non)spirituality, Problem-focused Coping  $\times$  (Non)spirituality, Emotion-focused Coping  $\times$  (Non)spirituality, and Dysfunctional Coping  $\times$  (Non)spirituality predicted significant variance in Posttraumatic

**Table 2a:** Effects of Trauma and Non-Spirituality on Coping Styles.

<b>M1: Problem Focused Coping</b> $R^2 = .19$ $F = 6.07$ $p < .001$						
Variable	<i>t</i>	<i>b</i>	95% CI Low	95% CI Upper	<i>p</i>	
Trauma	1.15	0.15	0.55	2.41	.002	
Non-Spirituality	-0.69	-0.12	-0.46	0.23	.491	
Trauma $\times$ Non-Sprt	0.38	0.02	-0.08	0.12	.699	
<b>M2: Emotion Focused Coping</b> $R^2 = .18$ $F = 5.72$ $p = .001$						
Trauma	2.06	0.21	0.01	0.42	.043	
Non-Spirituality	-0.10	-0.15	-0.30	0.27	.918	
Trauma $\times$ Non-Sprt	-1.08	-0.04	-0.13	0.04	.282	
<b>M3: Dysfunctional Coping</b> $R^2 = .28$ $F = 10.02$ $p < .001$						
Trauma	2.69	0.17	0.05	0.30	.008	
Non-Spirituality	0.31	0.03	-0.15	0.20	.754	
Trauma $\times$ Non-Sprt	-0.81	-0.02	-0.07	0.03	.423	

**Table 2b:** Moderated-Mediation Effects of Trauma, Non-Spirituality, and Coping on Posttraumatic Growth.

<i>Y: Posttraumatic Growth</i>					
		<i>R<sup>2</sup> = .50</i>	<i>F= 8.08</i>	<i>p &lt; .001</i>	
<b>Variable</b>	<i>t</i>	<i>b</i>	<i>95% CI Low</i>	<i>95% CI Upper</i>	<i>p</i>
Prob-Focused Cope	-0.35	-0.26	-1.75	1.22	.725
Emo-Focused Cope	0.51	0.46	-1.38	2.30	.615
Dysfunctional Cope	0.83	-0.71	-2.37	0.96	.399
Trauma	2.94	0.72	0.23	1.20	.004
PFCope × NonSprt	1.28	0.38	-0.21	0.97	.206
EmoCope × NonSprt	-0.16	-0.06	-0.85	0.73	.877
Dysfnct × NonSprt	0.74	0.29	-0.50	1.09	.459
Non-Spirituality	-0.55	-0.28	-1.30	0.74	.585
Trauma × NonSprt	-2.44	-0.24	-0.44	-0.04	.017
<i>Conditional Direct Effects of X on Y</i>					
	<i>t</i>	<i>b</i>	<i>95% CI Low</i>	<i>95% CI Upper</i>	<i>p</i>
Non-Spiritual Low	3.07	0.41	0.14	0.68	.003
Non-Spiritual Med	2.96	0.14	-0.03	0.31	.114
Non-Spiritual High	-1.04	-0.17	-0.48	0.15	.303
<i>Indirect – Problem Focused Coping</i>					
		<i>B</i>	<i>95% CI Low</i>	<i>95% CI Upper</i>	<i>p</i>
Non-Spiritual Low		0.04	-0.07	0.22	>.05
Non-Spiritual Med		0.12	0.01	0.23	<.05
Non-Spiritual High		0.24	-0.05	0.49	>.05
<i>Indirect – Emotion Focused Coping</i>					
		<i>b</i>	<i>95% CI Low</i>	<i>95% CI Upper</i>	<i>p</i>
Non-Spiritual Low		0.06	-0.06	0.25	>.05
Non-Spiritual Med		0.04	-0.02	0.12	>.05
Non-Spiritual High		0.01	-0.07	0.14	>.05
<i>Indirect – Dysfnctinal Coping</i>					
		<i>b</i>	<i>95% CI Low</i>	<i>95% CI Upper</i>	<i>p</i>
Non-Spiritual Low		-0.05	-0.08	0.27	>.05
Non-Spiritual Med		-0.00	-0.11	0.18	>.05
Non-Spiritual High		0.04	-0.13	0.32	>.05

**Table 3a:** Effects of Trauma and Non-Religion on Coping Styles.

<i>M1: Problem Focused Coping</i>					
		<i>R<sup>2</sup> = .20</i>	<i>F= 6.68</i>	<i>p &lt; .001</i>	
<b>Variable</b>	<i>t</i>	<i>b</i>	<i>95% CI Low</i>	<i>95% CI Upper</i>	<i>p</i>
Trauma	-0.71	-0.18	-0.69	0.33	.482
Non-Religion	-1.58	-0.51	-1.15	0.13	.119
Trauma × Non-Relig	1.50	0.13	-0.04	0.31	.138
<i>M2: Emotion Focused Coping</i>					
		<i>R<sup>2</sup> = .17</i>	<i>F= 5.32</i>	<i>p = .002</i>	
Trauma	-0.11	-0.02	-0.45	0.40	.915
Non-Religion	-1.65	-0.44	-0.98	0.09	.102
Trauma × Non-Relig	0.67	0.05	-0.10	0.20	.505
<i>M3: Dysfunctional Coping</i>					
		<i>R<sup>2</sup> = .24</i>	<i>F= 8.29</i>	<i>p &lt; .001</i>	
Trauma	0.57	0.07	-0.18	0.33	.569
Non-Religion	-0.61	-0.10	-0.42	0.22	.542
Trauma × Non-Relig	0.34	0.01	-0.07	0.10	.738



**Table 3b:** Moderated-Mediation Effects of Trauma, Non-Religion, and Coping on Posttraumatic Depression.

<i>Y: Posttraumatic Depression</i>		$R^2 = .50$	$F = 8.08$	$p < .001$		
<b>Variable</b>	<b><i>t</i></b>	<b><i>b</i></b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b><i>p</i></b>	
Prob-Focused Cope	-1.57	-0.91	-2.05	0.24	.119	
Emo-Focused Cope	1.68	0.99	-0.18	2.18	.097	
Dysfunctional Cope	1.18	1.12	-0.76	3.00	.238	
Trauma	2.37	0.47	0.07	0.86	.021	
PFCope × NonRel	1.79	0.38	-0.42	0.79	.077	
EmoCope × NonRel	-1.83	-0.39	-0.82	0.03	.071	
Dysfnct × NonRel	-0.58	-0.21	-0.92	0.50	.561	
Non-Religion	2.22	0.91	0.09	1.72	.029	
Trauma × NonRel	-1.81	-0.13	-0.27	0.01	.074	
<b>Conditional Direct Effects of X on Y</b>		<b><i>t</i></b>	<b><i>b</i></b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b><i>p</i></b>
Non-Religion Low	3.69	0.18	0.08	0.27	<.001	
Non-Religion Med	3.66	0.13	0.06	0.19	<.001	
Non-Religion High	-0.06	-0.00	-0.15	0.14	.953	
<b>Indirect – Problem Focused Coping</b>		<b><i>b</i></b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b><i>p</i></b>	
Non-Religion Low	-0.01	-0.05	0.05	>.05		
Non-Religion Med	0.01	-0.02	0.08	>.05		
Non-Religion High	0.14	0.01	0.42	<.05		
<b>Indirect – Emotion Focused Coping</b>		<b><i>b</i></b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b><i>p</i></b>	
Non-Religion Low	0.01	-0.02	0.05	>.05		
Non-Religion Med	-0.00	-0.04	0.02	>.05		
Non-Religion High	-0.07	-0.24	-0.00	<.05		
<b>Indirect – Dysfnctinal Coping</b>		<b><i>b</i></b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b><i>p</i></b>	
Non-Religion Low	0.07	-0.01	0.15	>.05		
Non-Religion Med	0.06	0.00	0.12	<.05		
Non-Religion High	0.05	-0.13	0.17	>.05		

Depressive Symptoms,  $R^2 = .50$ ,  $F(9, 70) = 7.95$ ,  $p < .001$ . Dysfunctional coping positively predicted significant unique variance in depressive symptoms,  $b = 0.05$ ,  $p = .05$ .

Examination of the conditional direct effects showed that the direct effect of trauma on posttraumatic depressive symptoms was significant at moderate to low levels of individual spirituality, but not at higher levels of individual spirituality. This effect was stronger at moderate levels of individual spirituality than at low levels of individual spirituality, however, was trending in the same direction for high individual spirituality. Indirect effects were not significant at any level of (non)spirituality for either of the other two coping styles (see **Tables 4a** and **4b**).

## Discussion

To date, scholarship related to psychological responses to traumatic natural disasters has disproportionately focused on religiously-identified people, primarily Christians, and religious coping strategies, specifically. The present study sought to explore the relationship between broad coping

styles and posttraumatic adjustment following a natural disaster among people of varying levels of (non)religiousness and (non)spirituality. Consistent with our expectations, findings suggested that one adaptive style of coping, problem-focused coping, may be particularly important in facilitating posttraumatic growth and lower levels of psychological distress among trauma-exposed people at lower levels of institutional religiousness and/or individual spirituality. But, contrary to predictions, this finding was not supported among people at high levels of religiousness/spirituality. Also as expected, participants with moderate levels of institutional religiousness reported more dysfunctional coping and, in turn, higher levels of psychological distress. Other adaptive coping strategies, specifically emotion-focused coping, did not appear to be associated with posttraumatic growth or posttraumatic depressive symptoms for people at high levels of (non) religiousness and/or (non)spirituality; though, emotion-focused coping was associated with fewer depressive symptoms following trauma among participants with

**Table 4a:** Effects of Trauma and Non-Spirituality on Coping Styles.

<b>M1: Problem Focused Coping</b> $R^2 = .21$ $F = 6.75$ $p < .001$					
<b>Variable</b>	<b>t</b>	<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>P</b>
Trauma	1.34	0.16	-0.08	0.41	.185
Non-Spirituality	-0.64	-0.11	-0.46	0.24	.524
Trauma × Non-Sprt	0.27	0.01	-0.08	0.11	.785
<b>M2: Emotion</b> $R^2 = .20$ $F = 6.35$ $p < .001$					
Focused Coping					
Trauma	2.24	0.23	0.03	0.43	.028
Non-Spirituality	-0.01	-0.00	-0.29	0.29	.994
Trauma × Non-Sprt	-1.19	-0.05	-0.13	0.03	.236
<b>M3: Dysfunctional Coping</b> $R^2 = .27$ $F = 9.21$ $p < .001$					
Trauma	2.43	0.16	0.03	0.28	<.001
Non-Spirituality	0.15	0.01	-0.16	0.19	.882
Trauma × Non-Sprt	-0.61	-0.02	-0.07	0.03	.546

**Table 4b:** Moderated-Mediation Effects of Trauma, Non-Spirituality, and Coping on Posttraumatic Depression.

<b>Y: Posttraumatic Depression</b> $R^2 = .51$ $F = 7.95$ $p < .001$					
<b>Variable</b>	<b>t</b>	<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Prob-Focused Cope	0.94	0.30	-0.34	0.94	.350
Emo-Focused Cope	0.47	0.19	-0.61	0.98	.640
Dysfunctional Cope	2.00	0.70	0.00	1.40	.050
Trauma	0.49	0.05	-0.15	0.25	.623
PFCope × NonSprt	-0.48	-0.06	-0.32	0.19	.633
EmoCope × NonSprt	-0.71	-0.12	-0.46	0.22	.483
Dysfnct × NonSprt	-0.46	-0.08	-0.41	0.26	.644
Non-Spirituality	1.92	0.42	-0.02	0.86	.058
Trauma × NonSprt	0.55	0.02	-0.06	0.11	.581
<b>Conditional Direct Effects of X on Y</b>					
	<b>t</b>	<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Spiritual Low	1.42	0.08	-0.03	0.19	.160
Non-Spiritual Med	2.91	0.11	0.03	0.18	.005
Non-Spiritual High	2.00	0.14	0.00	0.27	.050
<b>Indirect – Problem Focused Coping</b>					
		<b>B</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Spiritual Low		0.04	-0.03	0.14	>.05
Non-Spiritual Med		0.03	-0.01	0.12	>.05
Non-Spiritual High		0.02	-0.10	0.21	>.05
<b>Indirect – Emotion Focused Coping</b>					
		<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Spiritual Low		0.01	-0.07	0.09	>.05
Non-Spiritual Med		-0.01	-0.04	0.02	>.05
Non-Spiritual High		-0.01	-0.08	0.04	>.05
<b>Indirect – Dysfnctinal Coping</b>					
		<b>b</b>	<b>95% CI Low</b>	<b>95% CI Upper</b>	<b>p</b>
Non-Spiritual Low		0.08	-0.02	0.19	>.05
Non-Spiritual Med		0.06	-0.02	0.12	>.05
Non-Spiritual High		0.04	-0.05	0.15	>.05

low levels of institutional religiousness. Interestingly, (non)religiousness and (non)spirituality were not directly associated with posttraumatic growth, but lower levels of institutional religiousness were related to higher rates of posttraumatic depressive symptoms.

### ***Integration with Previous Research***

The present study found complex relationships between trauma intensity, posttraumatic growth and depressive symptoms, (non)religiousness/(non)spirituality, and coping. In some cases, the curvilinear relationship between (non)religiousness/(non)spirituality and outcomes like psychological distress found in previous studies (Galen & Kloet, 2011) were observed in the present study. For example, there was a positive relationship between trauma intensity and depressive symptoms among the moderately spiritual, as compared to those at high or low levels of individual spirituality, and indirectly through dysfunctional coping among the moderately religious, as compared to participants with high or low levels of institutional religiousness. Generally, though, (non)religiousness and (non)spirituality were not independently predictive of posttraumatic growth.

Further, the current study, like previous examinations of trauma (Koenig, 2012; Moore & Leach, 2016), natural disasters (Aslam & Kamal, 2015; Aten et al., 2019), and religiousness, suggested higher levels of institutional religiousness may provide some protection against negative trauma-related outcomes and religiousness and spirituality may facilitate posttraumatic growth at higher levels of trauma intensity. However, the relationship between positive outcomes and religiousness may be driven by active participation in a personal belief system, rather than strength of identification alone (Berthold & Ruch, 2014) or social engagement (McCaffree, 2019). Secular community involvement among atheists appears to minimally influence mental health outcomes (Brewster et al., 2019); but, secular involvement may often occur online (Abbott et al., 2020). Perhaps in-person experiences of secular community, particularly in the case of shared natural disasters, may ameliorate distress and foster posttraumatic growth. A perpetual problem in the study of nonreligion is the default comparison of the nonreligious to a dominant religious reference group; however, people across the (non)religious spectrum possess worldviews and meaning-making structures that serve similar purposes (Taves, 2018). Thus, there may be a psychologically beneficial form of engagement in nonreligion, similar to religious practices, that has yet to be identified.

When faced with trauma, including natural disasters, adaptive coping strategies are associated with more favorable mental health outcomes (Lazarus & Folkman, 1984; Penley et al., 2002; Williams & Hasking, 2010). Notably, in the current exploration, higher levels of posttraumatic growth and lower levels of depressive symptoms were observed among people with low levels of institutional religiousness and individual spirituality who reported utilizing more problem-focused coping. Therefore, adaptive coping strategies including active coping, instrumental support, and planning (Carver, 1997) may buffer

psychological distress and foster posttraumatic growth among the nonreligious/nonspiritual. Given the association between engagement in analytic thinking and endorsement of secular ideas (Franks & Scherr, 2017; Baker & Robbins, 2012), the suggestion that nonreligious/nonspiritual people engage thinking rather than feeling strategies to cope with trauma is cogent. Caldwell-Harris and colleagues (2011) found atheists reporting making meaning and finding purpose in their lives at similar rates to Buddhists and Christians; therefore, aspects of PTG involving thinking, such as cognitive reappraisal, may be particularly important for nonbelievers' adaptation following natural disasters and other trauma. Further, the utilization of coping that is congruent with nonbelievers' predominant style of thinking may be more likely to produce favorable outcomes in the face of trauma.

### ***Limitations and Future Directions***

Participants in the present study reported overall relatively low levels of trauma intensity related to the tornado event and were restricted to a small, rural community in the Southern U.S. Thus, results may differ significantly for other natural disasters, like the Nashville, Tennessee tornado event in March 2020, or a geographically widespread traumatic experience, like the COVID-19 pandemic, with potentially higher self-reported intensity (and in the case of the pandemic, the widest conceivable range of religious and spiritual identities). Relatedly, data were collected retrospectively, such that participants were asked to recall states and strategies used months prior to the survey. Similar future examinations may benefit from "real-time" tracking of variables like trauma symptoms and coping strategies via technology like a smartphone application.

Further, a minority of the sample identified as non-religious and, on the scale measuring institutional religiousness, no participant endorsed the highest (Strongly Disagree) or lowest (Strongly Agree) level of agreement with the survey's items, suggesting people at very high and very low levels of institutional religiousness were likely not represented well in the study. The absence of such participants may explain the absence of a more evident curvilinear relationship between (non)religiousness and psychological distress. Larger scale projects in the future should attempt to recruit participants with more diverse (non)religiousness. In addition, future research may address how stigmatization and distrust of non-religious individuals (e.g., Franks et al., 2019; Gervais et al., 2011) affects their ability to use effective coping strategies in times of crisis. These stigmas may be especially salient during catastrophic events since existential threat has been shown to increase anti-atheist prejudice (Cook et al., 2015).

### ***Conclusion***

The current investigation sought to explore coping and posttraumatic response to a natural disaster among diverse (non)religious/(non)spiritual orientations. In particular, this study is among the first to prioritize exploration of coping and posttraumatic adjustment among nonreligious/nonspiritual people. Results suggested

problem-focused coping may promote positive psychological outcomes following a natural disaster among people with low institutional religiousness and/or individual spirituality. Future studies of larger scale natural disasters, other forms of trauma, and with more nationally representative samples are needed to extend and refine the findings of our study. Understanding the use and effectiveness of coping strategies among those who are non-religious may become increasingly important in the near future (particularly if the recent trend towards non-religion in the United States continues) as climate change-related catastrophes, mass shootings, and viral pandemics affect an increasing number of people.

### Competing Interests

The authors have no competing interests to declare.

### Author Contributions

Dr. Abbott initially generated the research questions and was primarily responsible for drafting the manuscript with the assistance of Ms. Mercier. Drs. Franks and Cook helped refine the hypotheses and methodology and took primary responsibility for data analyses and drafting the Results section. All authors contributed substantially to the execution of the project, including interpreting results and final revisions. All authors agreed to be named in the author list.

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