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ORIGINAL PAPER

Dimensions of Religiosity and PTSD Symptom Clusters in US Veterans and Active Duty Military

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Abstract

We examined multiple dimensions of religiosity and their relationship to the four DSM-5 PTSD symptom clusters among US Veterans and Active Duty Military (ADM), hypothesizing that religiosity would be most strongly inversely related to negative cognitions/emotions (Criterion D symptoms) and less strongly to neurobiologically based symptom clusters (B, C, and E). This cross-sectional multisite study involved 591 Veterans and ADM from across the southern USA. Inclusion criteria were having served in a combat theater and the presence of PTSD symptoms. Measures of religious beliefs/practices, social involvement, and PTSD symptoms were administered, and bivariate and multivariate analyses were conducted in the overall sample, and in exploratory analyses, in the sample stratified by race (White, Black, and Hispanic). In the overall sample, multivariate analyses revealed that the only PTSD symptom cluster inversely related to religiosity was Criterion D, and only to organizational ($b = -0.08$, $P = 0.028$) and cognitive/intrinsic religiosity ($b = -0.06$, $P = 0.049$), relationships that were fully explained by social factors. Religious struggles, in contrast, were positively related to all four symptom clusters. Inverse relationships with Criterion D symptoms were particularly strong in Blacks, in whom inverse relationships were also present with Criterion E symptoms. In contrast, only positive relationships with PTSD symptom clusters were found in Hispanics, and no relationships (except for religious struggles) were present in Whites. As hypothesized, the inverse relationship between religious involvement and PTSD symptoms in Veterans and ADM was strongest (though modest) for Criterion D negative cognitions/emotions, especially in Blacks.

Keywords Religiosity · Post-traumatic stress disorder · Symptom clusters · Veterans · Active Duty Military

Disclaimer: The views expressed are solely those of the authors and do not reflect the official policy or position of the US Department of Veterans Affairs, US Army, US Navy, US Air Force, the US Department of Defense, or the US Government.

Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders version 5 (DSM-5; American Psychiatric Association 2013), the diagnosis of post-traumatic stress disorder (PTSD) requires a traumatic stressor (Criterion A) and the presence of symptoms from each of four criterion symptom clusters: Criterion B intrusion (flashbacks, nightmares, etc.), Criterion C avoidance (avoidance of trauma-related stimuli or external reminders), Criterion D negative cognitions/mood (negative cognitions/emotions), and Criterion E hypervigilance (irritability, heightened startle reactions, difficulty concentrating, etc.). These symptoms are widespread among US Veterans and Active Duty Military after deployment to war zones (Tanielian and Jaycox 2008). As a result, PTSD is the most common mental disorder among Veterans treated at Veterans Affairs (VA) facilities (Kang 2009), and after major depression, it is the most common mental disorder among US Veterans with mental illness seen in VA primary care settings (Trivedi et al. 2015).

PTSD is not only a psychological response to trauma but a neurobiological illness that affects the brain itself. In brief, the amygdala is considered the central processing unit for the fear response. It coordinates responses to dangerous threats in the environment and is closely linked to brain structures responsible for memory (hippocampus), production of stress hormones (hypothalamus), and activation of the sympathetic nervous system (locus coeruleus). Chronic stress increases levels of the stress hormone cortisol, which is thought to be neurotoxic to cells in the amygdala, hippocampus, anterior cingulate cortex, corpus callosum, and connections between them, helping to explain why many neuroimaging studies find decreased volumes of these brain regions in chronic PTSD (Karl et al. 2006; O'Doherty et al. 2015, 2018).

Although all four PTSD symptom clusters are likely to be driven to some extent by physiological changes in the brain as a result of chronic psychological trauma (Fenster et al. 2018), certain symptom clusters may be more biologically based (e.g., clusters B, C, and E) than others (cluster D). In particular, Criterion B (intrusive flashbacks/nightmares) and Criterion E symptoms (hypervigilance, irritability, exaggerated startle response, difficulty concentrating) are thought to derive from physical changes in brain structure/connectivity and function, resulting in reduced inhibition of amygdala activity by the prefrontal cortex (Tursich et al. 2015; Fenster et al. 2018). Likewise, Criterion C avoidance symptoms result from decreased activity in the anterior cingulate and inferior frontal cortex, along with increased activity in the superior temporal cortex, resulting in prolonged activation of the fear response (Fenster et al. 2018).

As a result of these alterations in brain structure and changes in connectivity between brain regions, Criterion B, C, and E symptoms may be less directly amenable to psychological or social interventions. In contrast, Criterion D symptoms (negative thoughts/feelings about self or the others, guilt/shame, decreased interest, difficulty experiencing positive feelings, hopelessness, etc.) appear to be more cognitive/psychological in nature and perhaps more responsive to

psychological or social influences. This reasoning is supported by the cognitive theory of PTSD, which focuses on the psychological interpretation of traumatic events and responses to them (Ehlers and Clark 2000).

Religious beliefs and behaviors are often mobilized to deal with traumatic stress and may help individuals adapt to the stressor and derive meaning from it. Alternatively (or even simultaneously), religious struggles (e.g., anger at God, feeling punished by the Divine, or loss of religious faith entirely) may also result from traumatic events that disrupt worldview and challenge previously held beliefs (Fontana and Rosenheck 2004; Koenig 2018). If religious beliefs and practices are effective in coping with stress, religious/spiritual involvement should be associated with less PTSD symptoms following trauma, as has been reported in several cross-sectional studies (Tsai et al. 2015; Tait et al. 2016; Sharma et al. 2017), and faster remission of PTSD symptoms in prospective studies (Currier et al. 2015). When religious struggles predominate, however, the opposite may occur and this too has been reported (Wortmann et al. 2011; Currier et al. 2014, 2019; Raines et al. 2017). A number of studies, however, have reported no relationship or even a positive one between religious involvement and PTSD (Ali et al. 2012; Chan and Rhodes 2013; Thabet et al. 2014; Ganocy et al. 2016). One reason for the latter may be that different aspects of religiosity are related in different ways to different kinds of PTSD symptoms. Symptoms that result from chronic stress-induced brain changes might be less influenced by religious involvement than those that are more cognitive/psychological and result from failure to cope with the trauma.

To our knowledge, no studies have yet examined the association between specific aspects of religion or religiosity and different symptom clusters in those with PTSD. In a study of the relationship between religiosity and depressive symptoms in medically ill hospitalized patients conducted more than two decades ago, we found that while religious involvement was related to the cognitive and emotional symptoms of depression (self-blame, social withdrawal, feeling sad and blue, feeling like a failure, etc.), it was unrelated to more biologically based symptoms (loss of energy, decreased appetite, weight loss, difficulty concentrating, psychomotor retardation) (Koenig et al. 1995). Perhaps a similar dynamic may extend to the relationship between religiosity and PTSD.

In an earlier report from the present study, we found no relationship between overall religiosity and PTSD symptom severity in Veterans and ADM (Koenig et al. 2018a). This finding was at least partly a result of correlations in Blacks and Hispanics that were in opposite directions (negative in Blacks, positive in Hispanics, and no relationship in Whites). In particular, this study found that controlling for depression/anxiety (which strongly overlaps with Criterion D symptoms) and quality of relationships (overlapping with Criterion D and E symptoms) helped to explain the relationships observed in Hispanics and Blacks, respectively. We did not, however, conduct a detailed examination of the association between different aspects of religion and each of the four PTSD symptom clusters.

Hypotheses

The following hypotheses are based on the review above and developed prior to performing statistical analyses:

(1) After controlling for demographic and military-related factors, overall religiosity will be more strongly related to the negative cognitions/emotions symptom cluster D than to the intrusion (B), avoidance (C), or hyperarousal/reactivity (E) symptom clusters, since the latter are more driven by physiological changes in the brain that result from prolonged traumatic stress; this association will be partly explained by social factors (marital status, quality of relationships, community involvement);
(2) Social forms of religious involvement and degree of cognitive/intrinsic religious commitment will be more strongly inversely related to Criterion D negative cognitions/emotions than private religious activity, since the latter may often be mobilized as a coping response to the trauma;
(3) Religious struggles (which we hypothesize will be inversely related to religious involvement) will be strongly and positively related to Criterion D symptoms, given that the former may be more a *consequence* than a cause of the latter.

Methods

This was a multisite cross-sectional study involving 591 Veterans and ADM. Veterans ($n = 488$) completed in-person questionnaires onsite and were recruited from outpatient Veterans Administration (VA) hospital clinics located in Augusta, Georgia (Charlie Norwood Veterans Administration Hospital, $n = 201$), Los Angeles, California (VA Greater Los Angeles Healthcare System, $n = 99$), Durham, North Carolina (Durham Veterans Affairs Health Care System, $n = 92$), San Antonio, Texas (South Texas Veterans Healthcare System, $n = 48$), and Houston, Texas (Michael E. DeBakey VA Medical Center, $n = 47$). ADM, who completed online questionnaires, were recruited from students attending Liberty University ($n = 54$) and from individuals ($n = 49$) identified through Qualtrics (Provo, UT), an online data collection platform. Inclusion criteria were a history of deployment to a combat theater and having PTSD symptoms. Participants completing in-person questionnaires provided written informed consent, except Veterans at the Greater Los Angeles VA Healthcare System, who received a study information sheet and provided verbal consent. Participants received a $25 gift card for completing the questionnaires. Institutional review boards (IRBs) and Research & Development Committees of the above VA Health Systems, Duke University, and Liberty University approved the study, which involved an expanded sample from a project originally designed to develop a measure of moral injury (original sample $n = 427$) (Koenig et al. 2018b).

Questionnaire

Demographics. Age, gender, race, and education were assessed in the usual manner.

Military information. Participants provided information on whether they had been in combat, the particular combat theater deployed to (Middle East vs. other), time since deployment (years), and whether they were ADM or Veterans. Participants were asked whether they had a formal diagnosis of PTSD or only had symptoms.

Religion and religiosity. Assessed were religious affiliation, subjective religious/spiritual importance, religious commitment, and religious struggle.

Religious affiliation. Affiliation was assessed by the categories Catholic, Protestant, non-traditional Christian, Jewish, Hindu, Muslim, Buddhist, no affiliation, and atheist/agnostic.

Subjective religiosity/spirituality. Participants were asked how important religion or spirituality was in their lives, each assessed on a 4-point Likert scale from "not at all important" to "very important."

Religious commitment. Commitment was assessed by the 10-item Belief into Action Scale (BIAC; Koenig et al. 2015a,b). The BIAC assesses level of religiosity across three dimensions: organizational religious activity (ORA: religious service attendance, other public religious activity, religious volunteering), private religious activity (PRA: prayer, scripture study, TV/radio viewing/listening, religious money giving), and cognitive/intrinsic religious commitment (IR: priority placed on God vs. other priorities, decision to place life under God's direction, decision to conform life to religious teachings). Each of the 10 items is rated on a visual analogue scale from 1 to 10 and summed to create an overall score (ranging from 10 to 100) and subscale scores. The BIAC has high internal reliability ($\alpha = 0.89$, 95% CI = 0.86–0.91), test–retest reliability (ICC = 0.92, 95% CI = 0.87–0.95), and convergent, discriminant, and factor analytic validity (Koenig et al. 2015a). In the present sample, the internal reliability (Cronbach's α) was 0.91 for the overall BIAC ($n = 589$) and was likewise acceptable for the ORA (0.78), PRA (0.84), and IR (0.72) subscales.

Religious struggles. Religious struggles were assessed using the 7-item negative religious coping subscale of the Brief RCOPE (Pargament et al. 1998), the most widely used measure of this construct in the literature (Koenig 2018). Sample items on the subscale include "I wonder whether God had abandoned me"; "I felt punished by God for my lack of devotion"; and "I questioned God's love for me." Each of these items was rated on agreement from 1 to 10. The internal reliability of the subscale in the present sample was 0.88, and 10-day test–retest reliability (intraclass correlation coefficient) was 0.80 (95% CI = 0.68–0.87, $n = 74$).

Social factors. Social factors assessed included marital status (dichotomized as married = 1, not married = 0), quality of social relationships ("How good are your relationships with your spouse, children, and/or friends, compared to most?" with responses ranging from 1 = "not good at all" to 10 = "very good"), and involvement in community activities ("Other than involvement in religious groups, how much are you involved in community activities?" with responses ranging from 1 = "not at all" to 10 = "a great deal").

PTSD symptoms. The presence and severity of PTSD symptoms were assessed with the 20-item PTSD Checklist of the Department of Veterans Affairs, DSM-5 version 5 (PCL-5) (Blevins et al. 2015). The PTSD symptoms assessed by this scale follow the DSM-5 diagnostic criteria for PTSD, assessing each of the four criterion symptom clusters: Criterion B (five items), Criterion C (two items), Criterion D (seven items), and Criterion E (six items). The PCL-5 has high overall reliability and strong associations with combat exposure and functional impairment in military populations (Hoge et al. 2014; Ashbaugh et al. 2016). In the present sample, the internal reliabilities of the overall PCL-5 and the Criterion B–E subscales were 0.95, 0.90, 0.86, 0.88, and 0.84, respectively.

Missing values. For calculating scale scores, missing data were handled by using the mean substitution method (Downey and King 1998). For participants who completed at least 50% on a scale or subscale, the average score for items answered was substituted for the missing item score. This was done for 15% of cases on the PCL-5 and 5% on the BIAC. In most cases (> 80%) where this was done, only a single substitution was made.

Statistical Analyses

Descriptive statistics examined the means (SD—standard deviations) and frequency distributions (percentage, sample size) of participant characteristics (Table 1). Bivariate associations between religion variables and PTSD criterion symptom clusters were examined using Student's *t* test for dichotomized predictors, analysis of variance (ANOVA) for predictors with more than two categories, and Pearson's correlation for continuous variables (Table 2). Stepwise general linear regression modeling was used to examine associations between religious variables and each of the four PTSD symptom clusters, controlling for potential confounds. First, demographic and military characteristics were entered into the model. Second, religious characteristics were entered into a reduced model that included only demographic and military variables significant at $P \leq 0.10$; separate models were developed for each religious characteristic, given the potential for multiple collinearity (Table 3; final models only). Next, social factors (marital status, relationship quality, community involvement) were entered into the models in Table 3 to examine their mediating effects on relationships identified between religious characteristics and PTSD symptom clusters (Table 4). Finally, in exploratory analyses, the regression models above were repeated in Whites, Blacks, and Hispanics, given our prior report that the relationship between religiosity and PTSD symptoms varied by race (Koenig et al. 2018a). Statistical significance was set at $\alpha \leq 0.05$ and was not adjusted for multiple comparisons due to the exploratory nature of all these analyses; trend level was set at $\alpha \leq 0.10$. Analyses were conducted using SAS (version 9.4; SAS Institute, Cary, NC) and SPSS Statistics version 24.

Table 1 Sample characteristics

Characteristics	% (*n*)	Mean (SD) (*n*)
Demographic		
Age, years (range 19–92)		51.3 (15.4) (590)
Education, years (range 1–28)		14.2 (3.2) (582)
Gender (% female)	14.1 (83)	
Race (%)		
Black	43.7 (254)	
White	40.8 (237)	
Hispanic	9.1 (53)	
Military		
Combat status (% actual combat)	69.6 (403)	
Combat theater (Middle East) (% yes)	58.5 (341)	
Veterans (vs. Active Duty Military) (% yes)	82.6 (488)	
Time since last deployment (years) (range 0–72)		21.0 (18.0) (554)
Religious		
Religious affiliation		
Christian	82.3 (482)	
Jewish or Muslim	2.4 (14)	
Buddhist	0.9 (5)	
No affiliation	11.6 (68)	
Agnostic or atheist	1.9 (11)	
Importance of religion (% important/very important)	69.3 (408)	
Importance of spirituality (% important/very important)	78.3 (459)	
Overall religious involvement (BIAC) (range 10–94)		42.4 (20.8) (590)
Organizational religious activity (range 3–30)		11.7 (6.9) (590)
Private/personal religious activity (range 4–38)		15.4 (8.4) (590)
Cognitive/intrinsic religious commitment (3–30)		15.4 (7.9) (590)
Religious struggle (range 7–70)		26.1 (17.2) (586)
Social		
Marital status (% married)	49.7 (290)	
Quality of relationships (range 1–10)		6.5 (2.6) (577)
Involvement in community activities (range 1–10)		3.8 (2.6) (579)
Post-traumatic stress disorder		
Diagnosis of PTSD (self-reported, % yes)	80.7 (463)	
Overall PTSD symptoms (PCL-5) (range 9–80)		52.2 (16.2) (590)
Intrusion Cluster B (range 0–20)		13.0 (4.8) (589)
Avoidance Cluster C (range 0–8)		5.6 (2.1) (590)
Negative cognitions/mood Cluster D (range 0–28)		17.5 (6.6) (590)
Hyperarousal Cluster E (range 0–24)		16.2 (5.1) (590)

PCL-5 PTSD Checklist–DSM-5, *BIAC* Belief into Action Scale

Table 2 Bivariate associations between religious characteristics and PTSD symptom domains (PCL-5)

	Criterion B Intrusion	Criterion C Avoidance	Criterion D Negative emotions	Criterion E Hypervigilant	Overall Symptoms
	Mean (SD)/*r*	Mean (SD)/*r*	Mean (SD)/*r*	Mean (SD)/*r*	Mean (SD)/*r*
Religious affiliation					
Catholic	13.1 (4.8)	5.5 (2.3)	17.9 (6.5)	16.7 (4.9)	53.2 (16.4)
Protestant	12.3 (4.6)	5.4 (2.2)	16.4 (6.7)	15.2 (5.1)	49.2 (15.9)
Non-trad Christian	13.7 (4.8)	5.9 (1.9)	18.7 (6.3)	17.0 (5.0)	55.3 (16.0)
Jewish or Muslim	13.8 (4.0)	5.7 (2.1)	17.8 (6.4)	15.6 (4.2)	53.0 (14.4)
Buddhist	13.6 (6.5)	4.8 (2.3)	15.8 (5.1)	14.2 (5.1)	48.4 (16.8)
No affiliation	12.8 (5.0)	5.6 (2.2)	17.2 (6.6)	16.2 (5.1)	51.8 (16.6)
Agnostic or atheist	12.0 (3.9)	5.2 (2.1)	17.1 (6.8)	15.5 (5.8)	49.8 (15.9)
Importance of religion					
Not at all/somewhat	12.4 (4.5)	5.5 (2.1)	17.6 (6.6)	16.0 (5.3)	51.6 (16.2)
Important/very	13.2 (4.8)	5.6 (2.1)	17.5 (6.5)	16.2 (5.0)	52.6 (16.2)
Importance of spirituality					
Not at all/somewhat	12.4 (4.6)	5.5 (2.1)	17.5 (6.8)	16.3 (5.0)	51.6 (16.1)
Important/very	13.1 (4.8)	5.6 (2.1)	17.6 (6.5)	16.1 (5.1)	52.5 (16.2)
Religiosity (BIAC)	0.05	0.02	−0.05	−0.02	−0.01
Organizational relig	−0.02	−0.04	−0.09 *	−0.06	−0.07
Private/personal relig	0.12 **	0.07^{T}	0.01	0.03	0.06
Cogn/intrinsic relig	0.02	0.02	−0.06	−0.03	−0.03
Religious struggle	0.23 ****	0.15 ***	0.22 ****	0.16 ****	0.23 ****

Pearson's correlations (*r*) for associations between continuous variables

Student's *t*-test for dichotomized variables; analysis of variance (ANOVA) for comparison across variables with > 2 categories

PCL-5 PTSD Checklist—DSM-5, *BIAC* Belief into Action Scale

$^{T}0.05 < P < 0.10$, $*P \leq 0.05$, $**P \leq 0.01$, $***P \leq 0.001$, $****P \leq 0.0001$; SD = standard deviation; *n*'s vary across categories by < 1%

Results

Participant characteristics are presented in Table 1. The average age was 51.3 years (SD = 15.4); the majority were men (85.9%); Blacks and Whites made up the majority races (43.7% and 40.8%, respectively); and half (49.7%) were currently married. Education level on average included at least some college (14.1 years). More than two-thirds (69.6%) had been involved in combat, the majority served in the Middle East (58.5%), and the average time since last deployment was 21.0 years. Veterans made up more than three quarters of the sample (82.6%).

With regard to religious characteristics, 82.3% were Christian, 2.4% Jewish or Muslim, 1.9% agnostic or atheist, and 11.6% reported no affiliation. More than two-thirds (69.3%) indicated that religion was important or very important in their lives, and more than three quarters (78.3%) indicated the same for spirituality. Religious struggles

Table 3 Multivariate models examining relationships between religiosity and PTSD symptom domains

	Criterion B Intrusion	Criterion C Avoidance	Criterion D Negative Emotions	Criterion E Hypervigilant
	b (SE)[1]	*b* (SE)	*b* (SE)	*b* (SE)
Independent variables				
Demographic				
Age (years)	–	–	–	–
Gender (female)	–	–	–	–
Education (years)	–	–	–	–
Race (Black)	0.90 (0.40) *	0.44 (0.18) **	–	–
Military				
Combat status (active)	–	–	–	0.88 (0.44) *
Combat theater (Middle East)	–	–	2.16 (0.57) **	1.44 (0.45) ***
Time since deployment (years)	–	–	–	–
Veteran (yes)	3.65 (0.51) ****	1.25 (0.23) ****	6.24 (0.73) ****	4.27 (0.57) ****
Religious				
Religious affiliation (yes)	−0.06 (0.55)	−0.11 (0.25)	0.02 (0.75)	−0.14 (0.58)
Importance of religion (1–4)	0.11 (0.19)	−0.06 (0.09)	−0.14 (0.25)	0.09 (0.20)
Importance of spirituality (1–4)	0.22 (0.22)	0.00 (0.10)	−0.02 (0.29)	0.00 (0.23)
Overall religiosity (BIAC)[1]	0.001 (0.009)	−0.001 (0.004)	−0.018 (0.012)[@]	−0.007 (0.010)
Organizational religiosity	−0.04 (0.03)	−0.02 (0.01)	−0.08 (0.04) *	−0.04 (0.03)
Private/personal religiosity	0.04 (02)[T]	0.01 (0.01)	0.00 (0.03)	0.01 (0.02)
Cognitive/intrinsic religiosity	−0.01 (0.02)	0.00 (0.01)	−0.06 (0.03) *	−0.03 (0.03)
Religious struggle	0.07 (0.01) ****	0.02 (0.004) ****	0.08 (0.01) ****	0.05 (0.01) ****
Model R^2 (*n*)	0.11 (579) ****	0.07 (580) ****	0.11 (582) ****	0.10 (571) ****

Religious variables are examined in separate models to avoid multicollinearity

Models presented above are from final stepwise regression after elimination of covariates with $P \geq 0.10$

b = unstandardized beta

PTSD post-traumatic stress disorder, *BIAC* Belief into Action Scale, *SE* standard error

"–" indicates $P \geq 0.10$ in previous models; b's for religious characteristics included regardless of p value

[1]b's for demographic/military covariates and Model R^2 displayed above are from model with overall religiosity (BIAC) as predictor

[T]$0.05 < P < 0.10$, *$P \leq 0.05$, **$P \leq 0.01$, ***$P \leq 0.001$, ****$P \leq 0.0001$

were not uncommon in this sample (average 26.1, SD = 17.2, on 7–70 scale) and were weakly but inversely related to overall religiosity (BIAC; $r = -0.07$, $P = 0.08$).

PTSD symptoms were widespread in this sample, with more than 80% self-reporting a formal diagnosis of PTSD and an average PCL-5 score of 52.2 (SD = 16.2), where scores above 31–33 indicate clinically significant symptoms (Bovin et al. 2016).

Bivariate Analyses

In the overall sample, bivariate analyses indicated little difference in overall PTSD symptoms or symptom domains across religious affiliations (Table 2). The same was true for importance of religion/spirituality and the overall BIAC score. However,

Table 4 Multivariate models examining relationships between religiosity and PTSD symptom domains including social factors

	Criterion B Intrusion	Criterion C Avoidance	Criterion D Negative Emotions	Criterion E Hypervigilant
	b (SE)[1]	*b* (SE)	*b* (SE)	*b* (SE)
Independent variables				
Religiosity				
Religious affiliation (yes)	−0.33 (0.55)	−0.18 (0.25)	−0.53 (0.74)	−0.51 (0.58)
Importance of religion	0.12 (0.20)	-0.05 (0.09)	0.05 (0.25)	0.16 (0.20)
Importance of spirituality	0.32 (0.22)	0.03 (0.10)	0.23 (0.29)	0.14 (0.23)
Overall religiosity (BIAC)[1]	0.003 (0.010)	0.002 (0.004)	−0.004 (0.013)	−0.002 (0.010)
Organizational religiosity	−0.04 (0.03)	−0.01 (0.01)	−0.05 (0.04)	−0.04 (0.03)
Private/personal religiosity	0.05 (0.03) *	0.02 (0.01)[T]	0.05 (0.03)	0.03 (0.03)
Cognitive/intrinsic religiosity	−0.01 (0.02)	0.00 (0.01)	−0.04 (0.03)	−0.02 (0.03)
Religious struggle	0.07 (0.01) ****	0.02 (0.005) ****	0.07 (0.01) ****	0.04 (0.01) **
Social				
Marital status (married)	1.06 (0.39) **	0.50 (0.17) **	1.04 (0.52) *	0.77 (0.41)[T]
Quality of relationships	−0.17 (0.08) *	−0.06 (0.04)	−0.58 (0.11) ****	−0.38 (0.08) ****
Involvement in community	−0.03 (0.08)	−0.07 (0.04) *	0.14 (0.11)	−0.06 (0.09)
Model R^2 (*n*)	0.12 (558) ****	0.09 (559) ****	0.17 (561) ****	0.13 (561) ****

Models presented above are from Table 3 with demographic and military factors controlled (not displayed)

Religious variables are examined in separate models to avoid multicollinearity

PTSD post-traumatic stress disorder, *BIAC* Belief into Action Scale, *SE* standard error

b = unstandardized beta

[T]$0.05 < P < 0.10$, *$P \leq 0.05$, **$P \leq 0.01$, ***$P \leq 0.001$, ****$P \leq 0.0001$

[1]b's for social factors and Model R^2 are from model with overall religiosity (BIAC) as predictor

private/personal religiosity (prayer, scripture study, etc.) was associated with having *more* intrusive symptoms ($r = 0.12$, $P = 0.004$) and *more* avoidance symptoms at the trend level ($r = 0.07$, $P < 0.10$). The only inverse relationship with a PTSD symptom cluster was for ORA, which was inversely related to symptoms in the Criterion D negative cognitions/emotions domain ($r = -0.09$, $P = 0.035$), as hypothesized. Religious struggles were positively related to overall PTSD symptoms ($r = 0.23$, $P < 0.0001$) and to each of the PTSD symptom clusters, especially Criterion B intrusive symptoms ($r = 0.23$, $P < 0.0001$) and Criterion D negative cognitions/emotions ($r = 0.22$, $P < 0.0001$).

Multivariate Analyses

Criterion B Intrusion Cluster. Multivariate analyses identified Black race and Veterans status as the only independent predictors of intrusive symptoms (Table 3). When including religious variables in this model one at a time, only

private/personal religiosity ($b=0.04$, $P=0.066$, marginally) and religious struggles ($b=0.07$, $P<0.0001$) were related to intrusive symptoms.

Criterion C Avoidance Cluster. Religious struggles alone were related to avoidance symptoms ($b=0.02$, $P<0.0001$), independent of race and Veterans status.

Criterion D Negative Cognitions/Emotions Cluster. After controlling for Middle East deployment and Veterans status, several inverse correlations emerged between religious characteristics and negative cognitions/emotions, as hypothesized. Overall BIAC score was marginally related ($b=-0.018$, $P=0.14$), while relationships with organizational religiosity ($b=-0.08$, $P=0.028$) and cognitive/intrinsic religious commitment ($b=-0.06$, $P=0.049$) reached statistical significance. As expected, religious struggles were positively related to this symptom domain.

Criterion E Hypervigilant Cluster. After controlling for military characteristics, only religious struggles were related to hypervigilant symptoms (similar to the findings for intrusive and avoidance symptoms).

Mediating Effects of Social Factors

Social factors, particularly relationship quality, completely mediated the inverse relationships between overall religiosity (BIAC), organizational and intrinsic religiosity, and Criterion D negative cognitions/emotions (Table 4). In bivariate analyses, quality of interpersonal relationships was positively associated with overall religiosity ($r=0.15$, $P<0.001$), organizational ($r=0.15$, $P<0.001$), and intrinsic religiosity ($r=0.08$, $P<0.05$), and negatively associated with Criterion D symptoms ($r=-0.30$, $P<0.0001$), helping to explain the mediation. Controlling for social factors actually increased the positive relationship between private/personal religiosity and intrusive symptoms, although had little effect on associations with religious struggles. This suppression pattern suggests that the association between private/personal religiosity and intrusive symptoms would be even greater if private/personal religiosity was not positively associated with social factors that buffer against intrusive symptoms.

Supplemental Analyses

Given earlier findings from this sample indicating different results with overall PTSD symptoms depending on race (Koenig et al. 2018a), and departing from our original pre-analysis hypotheses, the above multivariate analyses were repeated separately in Whites, Blacks, and Hispanics (analyses not shown).

Whites ($n=235$–237). Other than positive relationships with religious struggles, no religious characteristic was associated with any PTSD symptom clusters. Controlling for social factors had little effect on relationships with religious struggle. Relationships between religious struggles and Criterion B and D symptoms were particularly strong ($b=0.08$, SE $=0.02$, $P<0.0001$, and $b=0.10$, SE $=0.02$, $P<0.0001$, respectively).

Blacks ($n=230$–253). In contrast to results in Whites, several inverse relationships with religiosity emerged in Blacks, particularly for Criterion D and Criterion E symptom clusters. Although religious affiliation was associated with fewer Criterion C avoidance symptoms ($b=-0.79$, SE $=0.38$, $P=0.04$), no relationships were found for Criterion B intrusive symptoms. After controlling for Middle East deployment and Veterans status, overall religiosity (BIAC) ($b=-0.042$, SE $=0.019$, $P=0.03$), ORA ($b=-0.14$, SE $=0.06$, $P=0.01$), and IR ($b=-0.16$, SE $=0.05$, $P=0.0019$) were all related to fewer Criterion D symptoms. Similar findings were present for Criterion E hypervigilant symptoms. After controlling for Veterans status (the only significant demographic/military predictor), overall religiosity ($b=-0.039$, SE $=0.015$, $P=0.01$), ORA ($b=-0.13$, SE $=0.04$, $P=0.005$), and IR ($b=-0.11$, SE $=0.04$, $P=0.009$) were related to fewer hypervigilant symptoms.

All these relationships weakened when social factors were controlled, although the relationship between IR and both Criterion D and E symptoms remained significant ($b=-0.13$, SE $=0.05$, $P=0.01$, and $b=-0.08$, SE $=0.04$, $P=0.04$, respectively); likewise, the relationship between ORA and these two symptom clusters also largely persisted ($b=-0.12$, SE $=0.06$, $P=0.07$, and $b=-0.10$, SE $=0.05$, $P=0.05$, respectively). Interestingly, positive relationships between religious struggles and PTSD symptom clusters (significant for domains B, C, and D, but not E) were much weaker in Blacks than in Whites or the overall sample.

Hispanics ($n=53$). In contrast to findings in Blacks, and despite the small sample size, several significant *positive* relationships were present between religiosity and PTSD symptom clusters B and C. For Criterion B symptoms, overall BIAC score ($b=0.083$, SE $=0.028$, $P=0.004$), ORA ($b=0.017$, SE $=0.08$, $P=0.05$), private religiosity ($b=0.22$, SE $=0.07$, $P=0.0019$), IR ($b=0.20$, SE $=0.07$, $P=0.01$), and religious struggle ($b=0.07$, SE $=0.03$, $P=0.01$) were all associated with more intrusive symptoms. For the Criterion C cluster, religious affiliation ($b=2.18$, SE $=0.92$, $P=0.02$) and private religiosity ($b=0.06$, SE $=0.04$, $P=0.08$) were also positively related to avoidance symptoms. Although no associations were initially found with Criterion D or E symptoms, controlling for social factors caused the emergence of new positive associations between overall BIAC score (especially ORA and PRA subscales) and these symptom clusters, while the positive associations Criterion B and C symptoms persisted and even strengthened to some degree.

Discussion

To our knowledge, this is the first study to provide a detailed examination of the relationships between different aspects of religiosity and the four DSM-5 PTSD symptom clusters in US Veterans and Active Duty Military. Religious involvement, particularly organized social religious activities and intrinsic religious commitment, was inversely associated with Criterion D symptoms characterized by negative alterations in cognitions and mood. Although correlations were relatively weak, they were consistent with our initial hypothesis and particularly strong in Blacks. Mobilizing religious beliefs and practices to cope with traumatic stressors may help to reduce negative cognitions and emotions, and yet have little long-term impact

on chronic neurobiological changes in the brain that produce unwanted intrusions (flashbacks, nightmares), avoidance behaviors, and hypervigilance, due to deficits in connections between the prefrontal cortex and highly activated amygdala and other limbic system structures. The effect of religious beliefs/practices on improving interpersonal relationships may be particularly important in relieving negative cognitions about the self (guilt/shame) or other people (blaming others, isolating oneself socially) and negative emotions (depressed affect, loss of interest, hope, and difficulty experiencing positive emotions toward family and friends).

The positive relationship between private religious activities (prayer, scripture reading, listening to religious radio/TV) and intrusive symptoms (such as flashbacks, recurrent unwanted memories, and nightmares) is more difficult to explain. This relationship was particularly strong among Hispanics (and true for all three dimensions of religiosity in that racial group). Why private religious activities were associated with more intrusive symptoms, particularly in Hispanics, remains unclear. Criterion B intrusive symptoms are considered most characteristic for PTSD (Malaktaris and Lynn 2018), are among the most distressing of PTSD symptoms, and perhaps are more likely to result in the mobilization of religious strategies like prayer and seeking support from the Holy Scriptures to cope with them (Koenig et al. 2019). Given that the findings here were cross-sectional, it is possible that the positive relationships reflect such a dynamic.

Not surprisingly, however, religious struggles were positively related to all four symptom clusters, particularly Criterion B intrusions and Criterion D negative cognitions/emotions. This was true not only in the overall sample but also in all three racial groups when examined separately. Although these findings are not unprecedented in cross-sectional (Currier et al. 2014; Kopacz et al. 2016; Raines et al. 2017) and longitudinal (Currier et al. 2015) studies, no research (to our knowledge) has examined the relationship between religious struggles and specific PTSD criterion symptom clusters. Thus, establishing a particularly strong association with Criterion B intrusion and D negative cognitions/emotions represents a novel finding and elaboration of prior knowledge. What remains unclear, though, is whether religious struggles lead to an increase in such symptoms, are a consequence of these distressing symptom clusters, or might even be a manifestation of them, particularly Criterion D symptoms as has been shown for depression in longitudinal studies using cross-lagged analyses (Reynolds et al. 2014; Koenig 2018).

Of particular interest were the findings in each of the three racial groups. Among Whites, there were no significant relationships between any dimension of religious involvement and any of the four criterion symptom clusters, with the single exception of religious struggle. Quite a different story, however, was present for Blacks and Hispanics, as reported previously for overall religiosity and overall PTSD symptoms (Koenig et al. 2018a). The present report extends those findings to specific PTSD symptom clusters for specific aspects of religious involvement.

Among Blacks, the inverse relationships with Criterion D negative cognitions/emotions were more evident and could not be explained fully by social factors, particularly the intrinsic religious commitment dimension. There was also a significant inverse relationship with Criterion E hypervigilant symptoms in Blacks,

which could also not be explained entirely by social factors, including quality of interpersonal relationships (present for both ORA and IR). Black Americans are known to be the most religious of all ethnic groups in the USA and relationships with health the strongest (Koenig et al. 2012). However, given our initial hypothesis, the association with Criterion E hypervigilance is a curious one since of all PTSD symptoms, Criterion E symptoms are perhaps most strongly rooted in neurobiological changes from chronic trauma due to increased amygdala activity (Tursich et al. 2015; Fenster et al. 2018). Further research is needed to better understand how religious involvement may either help to resolve such neurological changes, or alternatively, whether hypervigilant symptoms may lead to less religious involvement.

Finally, the positive relationship in Hispanics between all three dimensions of religiosity and Criterion B intrusion symptoms (and to some extent Criterion C avoidance symptoms), which strengthened to some extent with control for social factors, remains a mystery. Hispanic Veterans, in general, tend to experience more PTSD symptoms, are less likely to receive religious counseling for PTSD, and at the population level tend to be less religious than Blacks (Kulka et al. 1990; Greenawalt et al. 2011; Pew Research Center 2014). Whether the positive relationship between religiosity and Criterion B and C symptoms reflects a greater turning to religion in response to these symptoms or whether religiosity exacerbates them for some reason will need to be sorted out in future studies.

Limitations

Several aspects of this study limit the interpretation and generalizability of the findings reported here. First, as noted earlier, the cross-sectional design prevents determination of causal order in the relationships identified (whether religious involvement affects certain PTSD symptom clusters, or the opposite). Second, because the participants in this study represent a convenience sample, our analyses are not generalizable to Veterans or ADM more generally in the USA. Third, most of the sample (86%) were male and 83% were Veterans, prompting caution when applying these findings to females and ADM more generally (particularly since half of ADM were students attending an explicitly Christian university). Fourth, because many statistical tests were performed and p values were not corrected for multiple comparisons, some correlations may be due to chance alone. Finally, confidence in the findings among Hispanics is tempered by the small sample size, and so attempts to replicate these findings in larger samples are encouraged.

Nevertheless, the study also has a number of strengths. First, our sample (particularly Veterans) was relatively large and recruited from multiple sites across the USA. Second, analyses were hypothesis-driven and controlled for multiple demographic and military factors. Third, psychometrically valid measures of religious involvement (BIAC) and PTSD symptoms (PCL-5) were utilized, increasing the reliability and validity of the findings. Finally, the hypotheses tested here are novel since this is the first attempt to examine the relationship between multiple dimensions of

religious involvement and specific DSM-5 PTSD symptom clusters in US Veterans and ADM.

Conclusions

Religious involvement, particularly organized religious activity and intrinsic religious commitment, was inversely associated with the PTSD Criterion D negative cognitions/emotions symptom cluster in US Veterans and ADM, and less so to the more neurobiologically based symptom clusters B, C, and E. This finding is fully explained in the overall sample by social factors, particularly higher-quality personal relationships in those who are more religious.

When analyses were repeated in different racial groups, no relationship was found in Whites with any PTSD symptom clusters other than with religious struggles (i.e., negative religious coping). In Blacks, however, not only did the positive relationship between religious struggles and PTSD symptom clusters weaken compared to other racial groups, but significant inverse relationships were found with Criterion D symptoms and with Criterion E symptoms as well, which were only partly explained by social factors. A completely different pattern of results, however, was present in Hispanics. Despite the small sample size, significant positive relationships were found between organized social, private, and intrinsic religiosity and Criterion B intrusion symptoms (in addition to those with religious struggle), and when social factors were controlled for, these relationships strengthened if anything and significant positive associations emerged with Criterion D and E symptoms as well. These findings further our understanding of the complex relationship between religious involvement and PTSD symptoms in former and current US military personnel and may help to generate new hypotheses concerning the impact of religiosity on specific PTSD symptom clusters. Future prospective studies and randomized clinical trials will eventually speak to issues of causal order and omitted variable bias.

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Compliance with Ethical Standards

Conflicts of interest The authors of this article had no conflicts of interest.

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