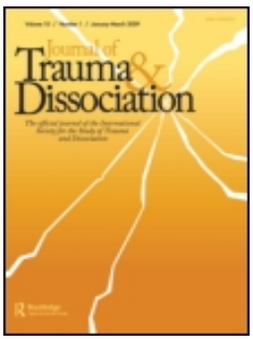

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John Briere, Natacha Godbout & Colin Dias

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ARTICLES

Cumulative Trauma, Hyperarousal, and Suicidality in the General Population: A Path Analysis

JOHN BRIERE, PhD
Department of Psychiatry and the Behavioral Sciences, University of Southern California, Los Angeles, California, USA

NATACHA GODBOUT, PhD
Department of Sexology, University of Quebec in Montreal, Montreal, Quebec, Canada

COLIN DIAS, MD
Department of Psychiatry and the Behavioral Sciences, University of Southern California, Los Angeles, California, USA

Although trauma exposure and posttraumatic stress disorder (PTSD) both have been linked to suicidal thoughts and behavior, the underlying basis for this relationship is not clear. In a sample of 357 trauma-exposed individuals from the general population, younger participant age, cumulative trauma exposure, and all three Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, *PTSD clusters (reexperiencing, avoidance, and hyperarousal) were correlated with clinical levels of suicidality. However, logistic regression analysis indicated that when all PTSD clusters were considered simultaneously, only hyperarousal continued to be predictive. A path analysis confirmed that posttraumatic hyperarousal (but not other components of PTSD) fully mediated the relationship between extent of trauma exposure and degree of suicidal thoughts and behaviors.*

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Address correspondence to Natacha Godbout, PhD, Department of Sexology, University of Quebec in Montreal, 455 East Rene-Levesque, Suite W-R165, Montreal, Quebec, Canada, H2L 4Y2. E-mail: godbout.natacha@uqam.ca

KEYWORDS suicidality, posttraumatic stress, cumulative trauma

The relationship between trauma exposure and later suicidal behavior is widely reported in the literature (Belik, Stein, Asmundson, & Sareen, 2009; Dube et al., 2001; Krysinska, Lester, & Martin, 2009). Yet the basis for this relationship is not entirely clear. Trauma (especially child abuse) is known to produce a wide number of outcomes also associated with suicidality, such as depression (Weiss, Longhurst, & Mazure, 1999), substance abuse (Jacobsen, Kosten, & Southwick, 2001; Ouimette & Brown, 2003), and involvement in self-destructive or dysfunctional behaviors (Briere, Hodges, & Godbout, 2010). Perhaps most noted, however, is the relatively high prevalence of suicidality among those who meet diagnostic criteria for posttraumatic stress disorder (PTSD; American Psychiatric Association, 2013; e.g., Kessler, Borges, & Walters, 1999; Krysinska & Lester, 2010). In a community sample of 1,698 urban young adults (Wilcox, Storr, & Breslau, 2009), for example, those exposed to traumatic events without PTSD were less likely to have made a suicide attempt than those with a PTSD diagnosis, even after the potential effects of depression, alcohol abuse or dependence, and drug abuse or dependence were controlled.

The *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM–IV;* American Psychiatric Association, 2000)[1] PTSD consists of three symptom clusters: *reexperiencing* (Cluster B, including flashbacks and nightmares), *avoidance* (Cluster C, avoidance of trauma-reminiscent stimuli, as well as emotional numbing), and *hyperarousal* (Cluster D, including hypervigilance, tension, and sleep problems). Each of these symptom clusters, when present chronically, might be expected to increase suicidal thoughts and behaviors. For example, reexperiencing is associated with reliving emotional and sensory memories of very distressing experiences, which may produce distress and motivate suicidal behavior. Avoidance symptoms directly represent attempts to escape, numb, or otherwise avoid the intensity of painful memories; an extreme example may be suicide. Finally, hyperarousal involves sustained experiences of anxiety, hyperalertness, restlessness, and irritability (American Psychiatric Association, 2000) that might specifically motivate a desire to terminate such aversive states through suicide.

A small number of studies have examined the three *DSM–IV* PTSD clusters as they predict suicidality. In one investigation of combat veterans, posttraumatic numbing (part of Cluster C), but not reexperiencing or hyperarousal, was associated with suicidal ideation (Guerra & Calhoun, 2011). In another study of Vietnam veterans, reexperiencing symptoms, but not avoidance or hyperarousal, predicted suicidal ideation (Bell & Nye, 2006). In a third, Bryan and Anestis (2011) examined reexperiencing symptoms and potential suicidality in 157 military personnel and civilian

contractors in Iraq and found that reexperiencing symptoms were directly related to an acquired capability for suicide—defined by the authors as the respondent's learned fearlessness about death and pain. Unfortunately, they did not include the other two *DSM–IV* PTSD clusters in their study. Finally, Anestis, Tull, Bagge, and Gratz (2012) found that both reexperiencing and hyperarousal symptoms were associated with suicidality in a sample of 164 substance use disorder inpatients with a history of trauma exposure. However, they tested their models separately for each PTSD cluster and thus did not examine unique effects of any given cluster when controlling for the others.

Taken together, these studies are insufficient to determine what specific constellation of PTSD symptom clusters is most associated with suicidality. Yet information in this area might allow clinicians to more accurately screen trauma-exposed individuals for those posttraumatic symptoms most associated with suicidality and might allow for more targeted treatment for those traumatized individuals who are at risk for suicide. For example, to the extent that suicidality can arise from specific aspects of posttraumatic stress, interventions focused on therapeutic exposure for intrusive memories (Foa, Hembree, & Rothbaum, 2007) or affect regulation training for hyperarousal (Cloitre, Koenen, Cohen, & Han, 2002) might represent new pathways to the reduction of suicide risk.

Despite the contradictory findings of existing studies in this area, our own clinical experience in trauma services and emergency psychiatry suggested to us that posttraumatic hyperarousal might especially contribute to suicidality. In this regard, just as research has shown for other negative internal states associated with suicide, such as akathisia (American Psychiatric Association, 2000; Hamilton & Opler, 1992) and depressive or manic irritability (Parmentier et al., 2010; Perlis et al., 2009), trauma survivors with PTSD often describe a desire to escape the uncontrollable anxiety, lack of sleep, and physical/emotional tension associated with hyperarousal symptoms (American Psychiatric Association, 2000). In some cases, this may motivate drug or alcohol abuse (Brady, Hien, Haynes, & Killeen, 2010; Chilcoat & Breslau, 1998). In others, suicide may be contemplated as an option to escape interminable distress (see, more generally, Shneidman, 1998a, 1998b).

Given this, a related posttraumatic correlate of suicidality might be the PTSD avoidance cluster, as suicidal behavior can be characterized as an avoidance response (e.g., Baumeister, 1990; Briere et al., 2010; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). It is not clear, however, whether the PTSD avoidance cluster shares the same underlying psychological (or physiological) characteristics as the avoidant coping implied by suicide. Furthermore, posttraumatic avoidance, to the extent that it is successful, might actually eliminate the need for a coping response as dire as suicide.

Given the complexities and contradictions of the existing literature, we conducted the present study in order to further explore the relationship between various types of posttraumatic symptoms and suicidality using a general population sample. We hypothesized a specific interrelation of factors in the genesis of posttraumatic suicidality: Although (a) the degree of trauma exposure would be associated with suicidality, (b) this relationship would be mediated by posttraumatic stress, and (c) within posttraumatic stress, hyperarousal and, possibly, avoidance, would be specifically related to the extent of suicidality. We tested this hypothesis by applying logistic regression and path analysis to examine the multivariate association between cumulative trauma exposure, the three *DSM–IV* PTSD symptom clusters, and suicidality in a sample of trauma-exposed adults from the general population.

METHODS

Procedure

The current study was performed on data from the Detailed Assessment of Posttraumatic Stress (DAPS; Briere, 2001) standardization study with authorization of the test publisher, Psychological Assessment Resources. See a description of the DAPS measure in "Measure." Subsequent to approval by the institutional review board of the University of Central Florida, a random sample of registered automobile owners and/or individuals with listed telephone numbers was collected by a national sampling service. Recruitment materials referred to the measurement of unwanted psychological states but made no specific reference to suicidality. Potential participants were stratified to match general population proportions on sex, age, race, and geographic location and were mailed a questionnaire containing demographic questions and, among other measures, the DAPS. Participants received $5 upon mailing back the questionnaire. In addition, 70 university students were recruited from college classes and offered course credit to complete the questionnaires, but without financial compensation, in order to provide additional participants in the lower age ranges. This data set has been used in several published studies of posttraumatic stress in the general population (e.g., Briere et al., 2010; Briere, Scott, & Weathers, 2005).

Participants

The first 558 (10%) of 5,485 potential participants to respond, along with the 70 university students, were included in this study. Data collection ended as soon as the data required to fill relevant cells of the stratified sample matrix were complete. As a result, the response rate is unknown; the recruitment of participants was terminated before all eligible participants were able to respond.

Of the 628 participants, 430 (68%) reported a lifetime exposure to one or more traumas that met Criterion A1 (the traumatic event represented a threat to physical integrity for self or others) and A2 (there was an intense negative emotional response, specifically terror, horror, or extreme helplessness, following trauma exposure) required for a *DSM–IV* diagnosis of PTSD. Among these, 14 participants did not respond completely to the relevant DAPS, 29 participants did not indicate their age, and 30 did not indicate their gender, leaving a final sample of 357.

The mean age of trauma-exposed participants in this sample was 44.7 years ($SD = 16.4$, range = 18–91 years). A total of 52.7% ($n = 188$) of participants were male and 47.3% ($n = 169$) were female. The average participant had been exposed to 3.1 ($SD = 2.1$) different types of trauma in his or her life.

Measure

The DAPS was used to assess the extent of trauma exposure, PTSD symptom clusters, and suicidality in the current study. This measure is a 104-item normed, standardized test of trauma and its effects that contains two validity scales and 10 scales evaluating lifetime exposure to traumatic events; immediate cognitive, emotional, and dissociative responses to a specified trauma; the subsequent symptoms of PTSD and acute stress disorder; and three associated features of posttraumatic stress: suicidality, dissociation, and substance abuse. The DAPS is a relatively widely used trauma instrument in both clinical and research contexts (Elhai, Gray, Kashdan, & Franklin, 2005), has good sensitivity and specificity with respect to the gold standard Clinician-Administered PTSD Scale (Blake et al., 1995; Briere, 2001), and has been shown to be reliable and valid in a variety of contexts (see reviews by Plake, Impara, & Spies, 2003; Weathers, Keane, & Foa, 2009).

In the present study, cumulative trauma exposure was measured using the DAPS Relative Trauma Exposure scale, which is a sum of the respondent's lifetime number of up to 13 different types of traumatic events (e.g., natural disasters, motor vehicle accidents, assaults, and child abuse) and thus ranges from 0 to 13. The number of different types of trauma exposure, generally referred to as *cumulative trauma,* has been shown to predict posttraumatic distress in a number of studies (e.g., Briere, Kaltman, & Green, 2008; Cloitre et al., 2009; Follette, Polusny, Bechtle, & Naugle, 1996). The DAPS Reexperiencing, Avoidance, and Hyperarousal scales evaluate symptoms of posttraumatic stress linked to a specific trauma that are experienced over the prior month. If the participant experienced multiple traumas, he or she is instructed to select the experience that "bothers you the most now." Cronbach's alpha indicated good internal consistency of these scales in the present study (αs = .92, .88, and .90, for reexperiencing, avoidance, and hyperarousal, respectively). Finally, the Suicidality scale, which evaluates suicidal thoughts and behaviors over the prior month, is composed of

10 items and demonstrated good internal consistency in the current study ($\alpha = .90$).

Statistical Analyses

Following univariate correlation analysis, logistic regression was performed to assess the relationship between age, gender, cumulative trauma, reexperiencing, avoidance, hyperarousal, and suicidality. The validated clinical cutoff for the DAPS Suicidality scale (a T score of 65; see Briere, 2001) was used to categorize clinically suicidal participants (coded as 1) versus those without clinical suicidality (coded as 0). This was done because it might be argued that significant relationships between predictors and the Suicidality scale could be clinically trivial to the extent that the variance accounted for in this scale could represent very low versus, for example, moderate (but not clinically significant) endorsements. In contrast, by dichotomizing suicidality into clinically significant versus not clinically significant, we were able to directly evaluate variables as they related to serious suicidal response.

Bentler's (2005) EQS (Version 6) software was used to explore relationships between cumulative trauma exposure, trauma-related symptoms (reexperiencing, avoidance, and hyperarousal), and suicidality, the latter of which was used as a continuous score. Path analysis estimates relationships among variables, considering all relationships simultaneously. Because the variables of interest in the current study are naturally nonnormally distributed, the robust estimation method was used. The robust method allows for the calculation of the adapted Satorra–Bentler scaled chi-square value, corrected fit indices, and robust standard error, all of which address nonnormality (see Byrne, 2006). Several indices were used to determine whether the hypothesized models fit the observed data. A nonsignificant chi-square indicates the absence of meaningful unexplained variance. However, because this statistic is sensitive to sample size, the ratio of chi-square to degrees of freedom (χ^2/df) was also considered, with values of 2.0 or less considered satisfactory (Newcomb, 1990). The comparative fit index (CFI), which compares the hypothesized model with the null model, was calculated, with a value of .95 or higher indicating a good fit (Hu & Bentler, 1999). Finally, the root mean square error of approximation (RMSEA) considers the error of approximation in the population and estimates the difference between model-implied and actual variances and covariances, with values less than .06 being preferred (Hu & Bentler, 1999).

As noted, participants in this study included 70 university students from the original DAPS standardization sample. Because these individuals might be expected to differ from general population participants on suicidality and related variables, additional logistic and path analyses were rerun without the university students in order to determine any potential influence of this specific subgroup on the findings reported.

RESULTS

Correlation Analysis

Simple correlation analysis was used to determine the univariate, potentially redundant relationships between significant suicidality, demographics, cumulative trauma, and PTSD clusters. A total of 18 participants (5.0%) reached the DAPS cutoff representing a clinically significant level of suicidality over the prior month, whereas 334 did not. As presented in Table 1, this index of suicidality was positively correlated with participant age (but not gender), cumulative trauma, and all three PTSD clusters: reexperiencing, avoidance, and hyperarousal.

Logistic Regression Analysis

Logistic regression analysis was used to evaluate the unique, multivariate relationship among demographics, PTSD clusters, cumulative trauma, and clinically significant suicidality. Results indicated significant prediction, $\chi^2(6, N = 357) = 42.13$, $p < .001$. At Step 1, age and gender were entered into the equation to predict suicidality. Although the omnibus test indicated that the step was not significant, $\chi^2(2, N = 357) = 4.83$, $p = .09$, the Wald test was significant for age (see Table 2). Cumulative exposure to trauma was added to the equation at Step 2. This step was significant, $\chi^2(1, N = 357) = 5.08$, $p = .02$, with the Wald test indicating that the number of different types of traumas experienced by the participant was positively related to clinical levels of suicidality. Finally, *DSM–IV* PTSD symptom clusters (reexperiencing, avoidance, and hyperarousal) were added to the equation at Step 3. This step was significant, $\chi^2(3, N = 357) = 32.22$, $p < .001$, with hyperarousal symptoms alone being a significant predictor when all clusters and prior predictors were taken into account (see Table 2).

As described in the Methods section, another logistic regression analysis was conducted without the university student subsample. The results

TABLE 1 Simple Correlation Analysis for Variables Predicting Clinical Suicidality ($N = 357$)

Variable	1	2	3	4	5	6	7
1. Suicidality	—	−.11*	.01	.14**	.33***	.36***	.43***
2. Age		—	−.25***	−.10	−.09	−.09	−.07
3. Gender			—	.09	.12*	.13*	.05
4. Cumulative trauma				—	.28**	.23***	.28***
5. Reexperiencing					—	.80***	.79***
6. Avoidance						—	.86***
7. Hyperarousal							—

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

TABLE 2 Summary of Logistic Regression Analysis for Variables Predicting Suicidality (N = 357)

Variable	Wald	*df*	OR	95% CI
Step 1				
Age	4.18*	1	0.96	0.93, 0.99
Gender	0.14	1	0.83	0.31, 2.24
Step 2				
Cumulative trauma	5.53*	1	1.25	1.04, 1.51
Step 3				
Reexperiencing	0.01	1	0.99	0.89, 1.11
Avoidance	0.80	1	0.93	0.80, 1.09
Hyperarousal	10.18***	1	1.28	1.10, 1.49

Notes: OR = odds ratio; CI = confidence interval.
*$p < .05$
***$p < .001$

were equivalent to the full-sample findings, except that cumulative trauma was no longer associated with clinically significant suicidality (Wald = 1.68, *ns*). As with the total sample, reexperiencing and avoidance were not significant predictors (Wald = .07, *ns;* and Wald = .59, *ns,* respectively), whereas hyperarousal continued to be significantly related to clinically significant suicidality (Wald = 8.33, $p = .004$).

Path Analysis

A path analysis was performed to explore the extent to which age and PTSD symptom clusters mediated the relationship between cumulative trauma and suicidality identified by logistic analysis. In this case, suicidality was indexed by the total (nondichotomized) DAPS Suicidality scale, as the standard assumptions of path analysis include the use of continuous outcome variables (Asher, 1976). Because visual inspection suggested that the Suicidality scale was not normally distributed, however, the robust estimation method approach to path analysis was used, as described in the Methods section.

We first tested the model allowing cumulative trauma and all trauma-related symptoms scales to predict the DAPS Suicidality scale, controlling for age as suggested by logistic regression. Results indicated that the relationship between cumulative trauma exposure and suicidality was not significant once PTSD symptoms were entered ($\beta = -.09$). Among PTSD symptoms, posttraumatic reexperiencing ($\beta = .04$) and avoidance ($\beta = .11$) were not significantly related to suicidality. In contrast, however, age ($\beta = -.11$, $p = .01$) and posttraumatic hyperarousal ($\beta = .26$, $p = .02$) were significant predictors.

Following these results, the model was respecified with all nonsignificant paths deleted. This final model indicated that cumulative trauma experiences were not multivariately related to suicidality but rather exerted their influence through their specific effects on hyperarousal, which, in turn,

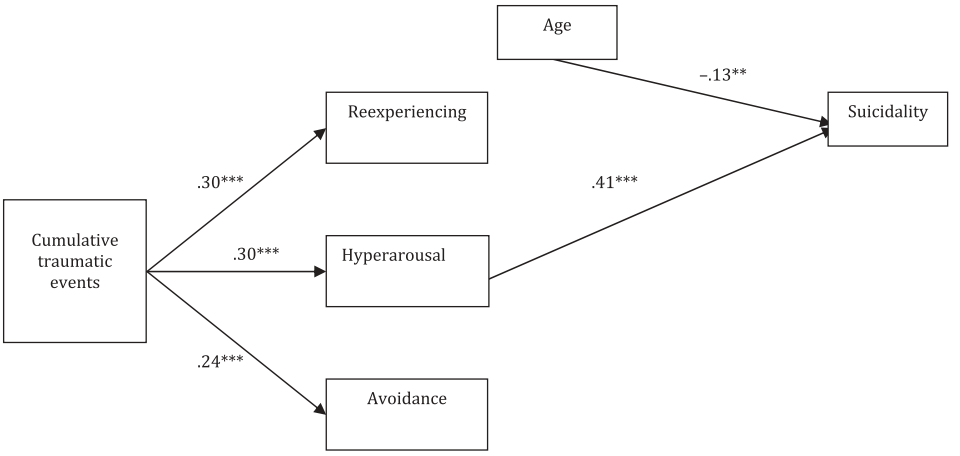

FIGURE 1 Path analysis of the relationships between lifespan trauma exposure, posttraumatic symptoms, and suicide ($N = 357$). $^{**}p < .01$. $^{***}p < .001$.

was associated with suicidality (see Figure 1). In this regard, hyperarousal appears to fully mediate the relationship between cumulative trauma exposure and degree of suicidality. The final model was associated with very good fit indices (CFI = .99; $\chi^2[7, N = 357] = 8.70$, $p = .24$; $\chi^2/df = 1.24$; RMSEA = .04) and explained 18% of the variance in clinical suicidality.

Finally, as with the logistic regression, the university student subsample was removed from the data set and the path analysis rerun. The results were equivalent, with the same significant paths from age and hyperarousal (but not reexperiencing or avoidance) to suicidality and equivalent or better fit indices (i.e., CFI = 1.0; $\chi^2[7, N = 306] = 4.32$, $p = .74$; $\chi^2/df = 0.62$; RMSEA = .01).

DISCUSSION

The current findings support the hypothesis that the relationship between extent of trauma exposure and suicidality is fully mediated by a component of posttraumatic stress. This suggests, as per other studies (e.g., Wilcox et al., 2009), that whether one has been exposed to trauma is less relevant to subsequent suicidal thoughts and behaviors than whether the trauma exposure produced significant posttraumatic stress. This is likely to explain, at least in part, why many combat veterans, disaster survivors, and assault victims do not experience subsequent suicidality.

Both the logistic and path analysis results further specified the mediation of posttraumatic stress by indicating that it is specifically the hyperarousal cluster that is associated with suicidality. The reexperiencing and avoidance clusters did not predict the DAPS Suicidality scale at the multivariate level—whether suicidality was dichotomized as clinically significant versus

nonsignificant (as in the logistic regression) or measured continuously (as in the path analysis).

One possible explanation for the failure of the avoidance cluster hypothesis is that posttraumatic avoidance (e.g., numbing and avoidance of thoughts, memories, and reminders of a traumatic event) is sufficiently different in nature than the avoidance implied in suicidal behavior, such that the association between the constructs is weak, especially once other posttraumatic stress symptoms are considered simultaneously. Alternatively, as noted earlier, it may be that those who are significantly engaged in Cluster C avoidance are able to reduce their distress to the extent that they are less motivated to consider suicide. Given at least one study indicating the importance of posttraumatic numbing to suicidality (Guerra & Calhoun, 2011), however, further research is clearly indicated in this area.

It should be noted that both the logistic regression and path analysis evaluated the relationship between three PTSD symptom clusters and suicidality multivariately, and thus each cluster was examined while controlling for the other two clusters, cumulative trauma exposure, and demographics. In contrast, simple correlation analysis does not take overlapping variance between predictor variables into account. Probably as a result, univariate analyses in the present study indicated that all three PTSD clusters were correlated with suicidality, whereas the multivariate analyses found hyperarousal to be the only posttraumatic predictor. These findings suggest that although reexperiencing and avoidance, when considered separately, are significant predictors, this is likely because of their substantial correlation with hyperarousal ($rs = .80$ and .79, respectively, in the present study), which is uniquely predictive of suicidality. If replicated, this phenomenon emphasizes the need to examine PTSD clusters multivariately, where their nonredundant association with suicidality and other variables can be specifically considered.

The multivariate relationship between hyperarousal symptoms and suicidality is noteworthy. It supports the notion that just as severe akathisia or manic irritability may motivate suicidal behaviors by virtue of engendering inescapable, highly aversive internal states (e.g., Hamilton & Opler, 1992; Parmentier et al., 2010), sustained posttraumatic hyperarousal also may be sufficiently painful and unremitting to motivate similar behaviors. This finding accords with our clinical experience of those with chronic PTSD-related hyperarousal: A significant number report that the irritability, edginess, internal tension, restlessness, hypervigilance, and absence of restful sleep can feel overwhelming, if not untenable, over the long term (Briere & Scott, 2014). This finding also supports the recently proposed association between anxiety sensitivity and suicidality (e.g., Capron, Cougle, Ribeiro, Joiner, & Schmidt, 2012) involving a fear of arousal sensations—especially the loss of cognitive control—that seemingly would be exacerbated in trauma survivors enduring sustained hyperarousal. Unanswered by the current study is why

hyperarousal might motivate one avoidance strategy (e.g., substance abuse) in one instance (e.g., Chilcoat & Breslau, 1998) and another (e.g., suicidality) in the next. In many cases, however, substance abuse and suicidal thoughts and behaviors coexist in trauma survivors (e.g., Price, Risk, Haden, Lewis, & Spitznagel, 2004). In others, there may be additional mediating variables (e.g., absolute levels of distress, extent of helplessness, or type of trauma) that influence the type of avoidance strategy used.

The logistic regression and path analyses reported in this study indicated that suicidality was associated with younger age. This age effect is often found in the suicide literature; as individuals age into the middle years, they appear to be somewhat less likely to engage in self-destructive behaviors (Nock, 2014). Yet several studies have indicated that elderly people also are at increased risk for suicidal ideation and behavior (e.g., Mireault & DeMan, 1996), a nonlinear phenomenon that may have contributed to the relatively small age effect found in the current study. In this regard, various studies suggest that the relationship between various aspects of suicidality and demographics such as gender, age, and race is complex, and findings can be quite variable (Casey et al., 2006; Griffin-Fennell & Williams, 2006; Hawton, 2000).

Because this study and the instrument it used were focused on posttraumatic stress per se, we were unable to evaluate comorbid depression as it influences suicidality in the trauma exposed. Depression is a common outcome among trauma-exposed individuals and especially those with posttraumatic stress (Elhai, Contractor, Palmieri, Forbes, & Richardson, 2011; Putnam, 2003) and is itself associated with suicidal thoughts and behaviors (Panagioti, Gooding, & Tarrier, 2012). Thus, the relationship between hyperarousal and suicidality identified in this study may have been further complicated by posttraumatic or preexisting depression, which may have had correlated and/or independent impacts on suicidal thoughts and behaviors. Although previous studies have shown a robust link between PTSD and suicidality, even after controlling for depression (e.g., Wilcox et al., 2009), future research will ideally examine the role of depression in the differential impacts of PTSD clusters on suicidality. We suspect, in this regard, that hyperarousal and depression, although sometimes present comorbidly, are relatively different constructs, and thus each may have unique relationships to suicidality.

A potential limitation of this study is that it used the DAPS Suicidality scale, which combines suicidal thoughts and behaviors into a single variable. As a result, this study cannot determine the impacts of posttraumatic hyperarousal on suicide attempts per se in contrast to ideation. However, the logistic analysis evaluated clinically significant suicidality on the DAPS as opposed to less meaningful levels of suicidal thoughts or behaviors. Future study of posttraumatic suicidality ideally should include a large sample of trauma survivors in which the full range of suicidal thoughts and behaviors

are present in sufficient quantity to examine the differential and interactive relationships between PTSD symptom clusters and different levels of suicidality. The current findings, relatively new to the literature, support the value of such research.

As noted in the introduction, the literature on specific PTSD clusters and suicidality is relatively contradictory. Various studies alternatively suggest that reexperiencing, avoidant, and/or hyperarousal symptoms are uniquely associated with suicidality. Some of this variability may be due to the clinical samples used, ranging from combat veterans (e.g., Bell & Nye, 2006) to substance use disorder inpatients (Anestis et al., 2012), and the statistical analyses used. As well, very few studies discriminate between clinically significant and less immediately critical levels of suicidality. The current study sought to improve on this situation by utilizing a general population sample, an assessment of clinical suicidality, and analyses using two types of multivariate statistics. The use of general population participants, in particular, potentially mitigates against selection biases often associated with clinical samples (e.g., Patten, 2000). It is possible that participants self-selected in this sample as well; however, subjects were not included based on their clinical status, and a stratified sampling methodology was used to increase the representativeness of the sample. Finally, unlike most other studies, we used path analysis to examine a specific causal hypothesis regarding the sequence of trauma, PTSD clusters, and suicidality. Although such analyses do not prove a causal sequence, they are supportive of the notion that PTSD-related hyperarousal directly leads to suicidality.

To the extent that these findings are replicated, they may have significant clinical implications. Most notably, although suicide prevention often focuses on the early detection of depression (e.g., Hegerl, Wittenburg, & the European Alliance Against Depression Consortium, 2009), suicidal behavior also can arise from a variety of other psychological states and conditions (e.g., Briere & Eadie, 2012; Fergusson, Woodward, & Horwood, 2000; Panagioti, Gooding, Dunn, & Tarrier, 2011; Sareen, 2011). The current study indicates that posttraumatic stress, specifically hyperarousal, may be an additional antecedent to suicidality. Such data suggest that assessment of suicide risk should include routine inquiry about past trauma exposure and ongoing posttraumatic symptoms, perhaps especially sustained hyperarousal.

Beyond risk assessment, the possibility that hyperarousal can motivate suicidal behavior suggests additional treatments for trauma-related suicidality. In addition to interventions that emphasize remediation of suicide-related cognitive and emotional states, including depression, these findings suggest the potential value of treatments known to be helpful for heightened sympathetic nervous system activation. These include relaxation and affect regulation training (Cloitre et al., 2002; Linehan, 1993); meditation and yoga (Harvard Mental Health Letter, 2009), although see some caveats for the former (e.g., Briere & Scott, 2014); and, potentially, medications used

to treat posttraumatic hyperarousal (e.g., serotonergic reuptake inhibitors, alpha and beta blockers, and mood stabilizers; Friedman, Davidson, & Stein, 2009; Scott, Jones, & Briere, 2014). In addition, because posttraumatic stress, including hyperarousal, often responds to cognitive behavioral and other empirically validated therapies (Foa, Keane, Friedman, & Cohen, 2009), psychological treatment of PTSD symptoms may be directly relevant to the reduction of suicidality in trauma-exposed individuals, as has been shown in at least one study (Gradus, Suvak, Wisco, Marx, & Resick, 2013). It is interesting that in that study, Gradus et al. (2013) hypothesized that the success of their intervention (cognitive processing therapy; Resick & Schnicke, 1992) may have been attributable to, among other mechanisms, reductions in distress associated with posttraumatic hyperarousal and reexperiencing.

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NOTE

1. Although the fifth edition of the *DSM* (American Psychiatric Association, 2013) has recently been published, this study was conducted when the *DSM–IV* was in effect.

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