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A study of dissociation in survivors of 5 disasters

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ABSTRACT

This study examined dissociation as an outcome to disaster in dissociative data collected from 423 highly-exposed survivors of 5 different disasters using consistent methodology. Ten items selected for conceptual relevance to disaster experience were administered from the Dissociative Disorders Interview Schedule, a structured interview for lifetime dissociative disorders. Structured psychiatric interviews provided data on incident somatization symptoms, disaster-related PTSD, and lifetime predisaster psychopathology. The Temperament and Character Inventory assessed personality. Observed levels of dissociation were low and not usually postdisaster. Dissociation level was associated with female sex, number of incident somatization symptoms, personality (underdeveloped executive functioning), PTSD, and predisaster psychopathology in bivariate analyses. In multiple linear regression models, dissociation was associated with the low number of incident somatoform symptoms observed independent of the effects of PTSD, hyperarousal specifically (but not intrusion or avoidance/numbing), personality, predisaster psychopathology, and demographic variables which were not independently associated with dissociation. The low levels of dissociation found in this study and the lack of association between dissociation and indicators of psychopathology point to a largely nonpathological nature of the dissociative phenomena measured. These findings do not indicate the development of dissociative psychopathology as a prevalent mental health outcome of disasters.

1. Introduction

Dissociation was first defined in the late 1800s by Pierre Janet as a pathological process involving discontinuity in the normal integration of mental functions (van der Hart and Horst, 1989). Psychiatric disorders described in the first edition of the Diagnostic and Statistical Manual (DSM) of Mental Disorders (*DSM-I*) (APA, 1952) in 1952 included a section on "dissociative reactions" that were considered to represent a neurotic type of personality disorganization manifested as depersonalization, dissociated personality, stupor, fugue, amnesia, dream states, and somnambulism. The classification of dissociative disorders has subsequently evolved to include dissociative identity disorder, dissociative amnesia, depersonalization/derealization disorder as the main types of dissociative psychopathology in the 5th edition of the criteria (*DSM-5*) published in 2013 (APA, 2013), and these dissociative disorders can be severely disabling and clinically distressing (Johnson et al., 2006; Mueller-Pfeiffer et al., 2012). Concomitantly, the term "dissociation" also came to be used more broadly in general discourse to describe a wide range of psychological phenomena including not only the psychopathology represented in psychiatric disorders but also a variety of benign or normative experiences such as narrowly focused attention and losing track of time (Butler, 2006; Ross et al., 1991; Seligman and Kirmayer, 2008; van der Hart and Dorahy, 2009).

From its inception, dissociation was assumed to represent an adaptive response to severe trauma (van der Kolk and van der Hart, 1989). Over time, the role of trauma in the development of dissociation has been further expanded into a formal "trauma model of dissociation" (Dalenberg et al., 2012). An extensive literature has not only described the association of trauma and dissociation but also elaborated the role of trauma as pivotal to dissociation (Classen et al., 1993; Nijenhuis et al., 1998; Sar and Ozturk, 2006; Spiegel 1986). Based on this background, dissociation could be expected to be an observed major mental health outcome of disaster trauma exposure.

The literature connecting trauma with dissociation has been conducted in populations with general trauma exposures (Ozer et al., 2003; van der Hart et al., 2008; van der Velden and Wittmann, 2008). Studies of general trauma endemic to populations, however, are subject to selection biases based on preexisting characteristics such as history of childhood abuse or psychopathology known to be associated with trauma and subsequent psychopathology. Because disasters strike populations relatively randomly, disaster epidemiology is useful for

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investigating mental health outcomes of trauma with minimal confounding effects of preexisting characteristics. Research examining dissociation in relation to disaster trauma exposure specifically has been relatively limited and largely focused on the relationship of dissociation to PTSD and other psychopathology. Only 2 disaster studies have focused primarily on dissociation as an outcome, and neither one found dissociation to represent an important disaster outcome (Cardena and Spiegel, 1993; Koopman et al., 1996). Therefore, the current study was conducted to further examine dissociation as a disaster outcome. In dissociative data collected from highly-exposed survivors of 5 different disasters using consistent methodology, structured psychiatric interviews were used to assess incident somatization symptoms, disaster-related PTSD, and lifetime predisaster psychopathology, and the Temperament and Character Inventory was used to measure personality.

2. Methods

Data for this study were collected as part of a series of studies of survivors of 10 separate disasters that have been described in detail in several previous articles (North et al., 2011, 2012a; Zhang and North, 2017). Five of these disaster studies included data on dissociative symptoms, and these studies provide the data for the analysis in this article. These 5 disasters were a cafeteria mass shooting in Killeen, Texas ($n = 73$), a firestorm in Oakland and Berkeley, California ($n = 42$), severe floods in the St. Louis, Missouri area ($n = 103$), a 6.7-Richter scale earthquake in Northridge, California ($n = 89$), and the bombing of the Murrah Federal Building in Oklahoma City, Oklahoma ($n = 116$). For all 5 disasters, baseline interviews were conducted between 2 and 6 months post disaster on average. Follow-up interviews were conducted an average of 15–17 months post disaster. Institutional Review Board (IRB) approval for human subject research was obtained in advance, and all participants provided written informed consent.

The samples for the Oklahoma City bombing and Killeen mass shooting were systematically recruited from victim registries with 71% and 82% participation respectively. The Oakland/Berkeley firestorm, St. Louis area floods, and Northridge earthquake survivors represented volunteer samples with unknown participation rates selected from households in disaster-affected areas determined by official geographical disaster maps. The combined sample of 423 survivors of these 5 disasters includes only individuals who were directly exposed to trauma in the disaster as defined by Criterion A for the *DSM-III-R* diagnosis of PTSD, i.e., a direct threat to one`s own life or limb.

The data were collected using the Diagnostic Interview Schedule (DIS) for *DSM-III-R* (Robbins, et al., 1989), the Disaster Supplement (Robins and Smith, 1983), 10 items from the Dissociative Disorders Interview Schedule (DDIS) (Ross et al., 1989), and the Temperament and Character Inventory (TCI) (Cloninger, 1987). The DIS, Disaster Supplement, and TCI data are from the baseline interviews. The DDIS data were collected at follow-up. (A subsample of 221 participants from the Northridge earthquake and St. Louis flood studies completed the DDIS items at both baseline and follow-up. Pairwise comparisons of the baseline and follow-up data revealed no significant differences in dissociation level, and thus only the more complete follow-up data were used.)

The DIS is a structured diagnostic interview that assesses full diagnostic criteria for psychiatric disorders and collects demographic information. The modules of the DIS administered for this study included the sections on PTSD, somatization disorder, major depression, panic disorder, generalized anxiety disorder, and alcohol and drug use disorders. Onset and recency information for each disorder were keyed to the date of the disaster, yielding postdisaster and lifetime predisaster diagnoses. Assessment of somatization symptoms required that the symptom was clinically significant and it was not accounted for by an established medical or psychiatric illness, use of a substance (medication, drugs, or alcohol), or a known physiologic etiology. Incident somatization symptoms were those that were new after the disaster, i.e., were not present at any time prior to the disaster. The Disaster Supplement provided information about the survivors` disaster experience.

The DDIS is a structured interview for lifetime dissociative disorders from which the investigators selected 10 items from 3 sections of the interview for conceptual relevance to disaster experience. These items inquired about blank spells or periods of missing time, inability to remember things other people reported that one said or done, sudden floods or flashbacks of memories, feeling unreal/in a dream/not really there, hearing voices (altogether 5 items from the multiple personality disorder section); inability recall important personal information or events (1 item from the psychogenic amnesia section); and seeing oneself from outside one`s body, feeling one`s body parts changed in size, seeing oneself outside one`s body, and persistent strong feelings of unreality (altogether 4 items from the depersonalization disorder section). Item frequency was measured using a numerical response format (0 = never, 1 = only once, 2 = occasionally, 3 = fairly often, 4 = frequently). The dissociative item responses were summed to create a numeric variable. The 10 dissociation items demonstrated good internal reliability (Cronbach's alpha = 0.90). For each dissociative item scored greater than 0, recency information was obtained, allowing creation of a dichotomous variable reflecting the presence of any dissociative symptom since the time of the disaster (postdisaster dissociation prevalence).

The TCI is a 240-item, true/false self-report questionnaire that assesses temperament in 4 dimensions (harm avoidance, novelty seeking, reward dependence, and persistence) and character in 3 dimensions (self-directedness, cooperativeness, self-transcendence). Self-directedness (SD) measures an individual's ability to engage in purposeful actions and adapt to changing environment and Cooperativeness (CO) is a measure of the extent to which one identifies oneself as an integral part of the society as a whole. The combination of low SD and low CO has been determined to represent an unhealthy personality structure with underdeveloped executive functions representing the core features of personality disorder (Bayon et al., 1996; Gutiérrez et al., 2008; Svrakic et al., 1993; North and Cloninger, 2012; North et al., 2012b). A variable indicating underdeveloped executive functioning (elevated probability of personality disorder) was created to indicate lower-half rankings on both SD and CO (Cloninger, 2010).

2.1. Statistical analysis

SAS 9.4 software (SAS institute, Cary, NC) was used for data analyses. Descriptive data are summarized with means and standard deviations (SD) for continuous variables and with simple counts and percentages for categorical variables. The Wilcoxon two-sample test was used to assess between-group differences in continuous variables. Two categorical variables were compared using χ^2 tests, substituting Fisher exact tests when expected cell sizes were <5 observations. Pearson correlations were used for comparison of 2 continuous variables. Multiple linear regression analyses were used to investigate relationships between dissociation level (dependent variable) and a list of independent variables bivariately associated with dissociation level (sex, number of incident somatoform symptoms, disaster-related PTSD, and underdeveloped executive functioning) were entered simultaneously into the model. Because previous analysis using this same dataset found that type of disaster was not associated with postdisaster psychopathology independent of disaster characteristics of scope and magnitude (North et al., 2012a), these analysis did not control for disaster typology. Additional multiple linear regression analyses were conducted using the same dependent and independent variables except that PTSD symptom group B, C, and D criteria were substituted for the disaster-related PTSD variable. The maximum variance inflation factor found in the multiple regression models was 1.6, indicating no collinearity problems. Level of statistical significance for all comparisons was set as alpha <0.05.

Table 1
Sample characteristics.

	Total sample (N = 423)
Demographic variables	
Male,% (n)	42 (176)
Age, mean (SD)	49.9 (14.4)
White,% (n)	94 (396)
Currently married,% (n)	74 (312)
College graduate,% (n)	39 (163)
Psychiatric variables	
Dissociation level, mean (SD)	4.9 (5.4)
# incident somatoform symptoms, mean (SD)	.3 (0.7)
Disaster-related PTSD,% (n)	20 (86)
PTSD group B,% (n)	73 (308)
PTSD group C,% (n)	26 (105)
PTSD group D,% (n)	69 (292)
Predisaster lifetime disorder,% (n)	38 (163)
Underdeveloped executive functioning,% (n)	40 (152)

3. Results

The 5 disasters together provided a sample of 423 directly-exposed survivors who completed the DDIS items and the TCI from a total of 655 survivors who completed the disaster interview, representing 65% of the total number of survivors. Participants with complete data were older (mean = 48.8, SD = 14.7 vs. mean = 45.1, SD = 15.3; $z = 3.16$, $p = .002$), were more likely to be nonwhite (6% vs. 13%; $\chi^2 = 7.17$, $p = .007$), had a higher proportion with college education (39% vs. 31%; $\chi^2 = 4.25$, $p = .039$), more were married (74% vs. 61%; $\chi^2 = 10.63$, $p = .001$), and fewer had disaster-related PTSD (20% vs. 28%; $\chi^2 = 4.47$, $p = .035$) or any postdisaster disorder (31% vs. 42%; $\chi^2 = 7.41$, $p = .007$) than those without complete data. Table 1 provides demographic characteristics and psychiatric findings of the participants. The sample was slightly less than one-half male, nearly 50 years of age on average, predominantly Caucasian, nearly three-fourths married, and more than one-third college educated.

The sum of the dissociation items for the entire sample was a mean of 5, far closer to the minimum possible (0) than to the maximum possible (40). However, 60% of individuals with any positive dissociative items reported that these experiences had occurred only prior to the disaster; thus, only a fraction of the reported dissociation occurred after the disaster, and the sum of the postdisaster dissociation items was a mean of 6. The mean number of incident somatoform symptoms for the entire sample was only 0.3 of a maximum possible of 32 symptoms. One-fifth of the entire sample met criteria for disaster-related PTSD, with more than two-thirds meeting symptom group B and D criteria, and only one-fourth meeting symptom group C criteria. More than one-third of the sample had a predisaster lifetime psychiatric disorder and more than one-third had underdeveloped executive functioning indicating an elevated probability of a personality disorder.

The dissociation level was not associated with the scores on any of the TCI temperament or character scales. Table 2 presents results of bivariate comparisons of other variables with dissociation level. Dissociation level was positively associated with female sex, number of incident somatization symptoms, underdeveloped executive functioning, PTSD, and predisaster psychopathology. Of note, the number of months elapsed since the disaster was not associated with dissociation level, number of incident somatization symptoms, or personality variables (not shown in table).

Table 3 presents the results of 2 multiple linear regression models predicting dissociation level (dependent variable in both models) from a list of independent variables bivariately associated with dissociation level (number of incident somatoform symptoms, disaster-related PTSD diagnosis or PTSD symptom groups, underdeveloped executive functioning, any predisaster disorder, and sex). In the PTSD diagnosis model, dissociation level was positively associated with number of incident somatoform symptoms independent of the effects of the other variables in the model. Of note, dissociation level was not independently associated with disaster-related PTSD, underdeveloped executive functioning, or predisaster psychopathology in this model. In the PTSD symptom group model, dissociation level was significantly and positively associated with number of incident somatoform symptoms independent of the other variables in the model. In this model, the dissociation level was significantly associated with PTSD symptom group D but not groups B or C.

Table 2
Bivariate associations of dissociation level with demographics, PTSD variables, predisaster psychopathology, personality, and number of incident somatoform symptoms*.

	Mean (SD) dissociation level	***Z***	***p***
Male sex (n = 176)	4.2 (5.1) vs. 5.5 (5.8)	−2.30	.021
Disaster-related PTSD (n = 86)	7.3 (6.4) vs. 4.4 (5.2)	4.20	<.001
Meets criterion B (n = 308)	5.4 (5.8) vs. 3.7 (4.7)	2.97	.003
Meets criterion C (n = 105)	7.1 (6.4) vs. 4.3 (5.1)	4.36	<.001
Meets criterion D (n = 292)	5.7 (5.8) vs. 3.4 (4.6)	4.06	<.001
Predisaster lifetime disorder (n = 163)	5.7 (6.0) vs. 4.5 (5.3)	2.35	.019
Underdeveloped executive functioning (n = 152)	5.6 (5.5) vs. 4.4 (5.3)	2.50	.012
		r	***p***
# incident somatoform symptoms		.286	<.001

* Only variables significantly associated with dissociation level are listed in table. (Race, marital status, education, and injury in the disaster were not significantly associated with dissociation level.).

Table 3
Multiple regression models predicting dissociation level.

PTSD diagnosis model (R^2 = 0.107) *Independent variables**	*df*	*β*	SE	*t*	*p*	95% CI
# incident somatoform symptoms	1	1.69	0.37	4.60	<.001	.97, 2.42
Disaster-related PTSD	1	1.28	0.70	1.83	.067	−0.09, 2.67
Underdeveloped executive functioning	1	0.77	0.54	1.43	.154	−0.29, 1.83
Any predisaster disorder	1	0.32	0.55	0.58	.561	−0.75, 1.39
Sex	1	−0.73	0.53	−1.39	.165	−1.77, 0.30
PTSD symptom group model (R^2 = 0.121)						
*Independent variables**	*df*	*β*	SE	*t*	*p*	95% CI
# incident somatoform symptoms	1	1.60	0.37	4.34	<0.001	1.20, 0.88
PTSD symptom group B	1	−0.24	0.73	−0.32	.747	1.64, −1.68
PSTD symptom group C	1	1.07	0.67	1.59	.113	1.34, −0.25
PTSD symptom group D	1	1.44	0.70	2.06	.040	1.63, 0.07
Underdeveloped executive functioning	1	0.75	0.54	1.39	.166	1.03, −0.31
Any predisaster disorder	1	0.26	0.55	0.28	.776	1.09, −0.92
Sex	1	−0.59	0.54	−1.09	.277	1.09, −1.64

* Models include only independent variables associated with dissociation level in bivariate analyses (see Table 2).

4. Discussion

This study examined the association of lifetime dissociation with incident somatoform symptoms, PTSD, and underdeveloped executive functioning in 423 directly-exposed survivors of 5 disasters studied using consistent methods. The amount of dissociation reported by these directly-exposed disaster survivors was only 12.5% of the maximum possible, reflecting low levels substantially less than those reported in studies of clinical samples; further, only a fraction of the reported dissociation occurred after the disaster.

The low dissociation item levels would seem to indicate that

exposure to disaster trauma was not a substantive source of dissociative psychopathology in this sample. Other studies have found similarly low levels of dissociation in disaster survivors (11–26% of the maximum possible) (Buskila et al., 2009; Craparo et al., 2014; Hooper et al., 2014; Nobakht et al., 2019; Simeon et al., 2005), levels that are substantially lower than in patients with dissociative disorders (24–60% of the maximum possible) (Carlson et al., 1993; Dale et al., 2009; Dorahy et al., 2006; Giesbrecht et al., 2010; Latz et al., 1995; Leavit, 1999; Lipsanen et al., 2004; Sar et al., 2007; Saxe et al., 1993; Simeon et al., 2001, 2003, 2007; Tutkun et al., 1998) and not much higher than in general populations (7–11% of the maximum possible) (Akyuz et al., 1999; Levin and Spei, 2004; Maaranen et al., 2005; Ross et al., 1991). The relatively higher levels of dissociation in disaster survivors than in general populations but far less than the pathological levels of dissociation characteristic of dissociative disorders might indicate that the dissociation measured may reflect nonpathological responses to extreme trauma exposures, in addition to the endemic levels of dissociative phenomena observed in general populations. Given these findings, 2 possible explanations are: 1) exposure to disaster trauma may have generated small amounts of pathological dissociation and 2) unusual but benign perceptions and feelings generated by the extreme circumstances of disaster exposure prompted acknowledgement of dissociative items (Canan and North, under review).

In the current study, dissociation was significantly associated with somatization symptoms in both bivariate analysis and multivariate models controlling for effects of other psychopathology. Similarly, a previous study of disaster survivors also found dissociation to be associated with somatization (Elklit and Christiansen, 2009). The degree to which this association represents a relationship with psychopathology, however, is unclear, because previous analysis by this research team found that disaster-related somatization symptoms were uncommon, with the conclusion that these symptoms may have represented nonspecific distress or could reflect endemic somatization rather than an important disaster outcome (Zhang and North, 2017).

Dissociation in this study`s multivariate models was not associated with the diagnosis of PTSD; it was associated with PTSD symptom group D but not groups B or C. The significance of this association as representing a psychopathological relationship, however, is unclear, because it has been well demonstrated that group D posttraumatic symptoms are largely reflective of nonpathological distress in the absence of group C (Ehlers et al., 1998; McMillen et al., 2000; North et al., 1997, 1999, 2009; North et al., 2012a; North, 2016, 2017).

Dissociation was not associated with predisaster psychopathology in this study. In contrast, 2 prior studies reported an association of postdisaster dissociation with predisaster history of psychiatric treatment (Kadak et al., 2013; Rosendal et al., 2011). It is possible that reported associations between dissociation and psychopathology could represent methodological issues such as selection bias contamination rather than pathological associations. Self-reported history of psychiatric treatment does not represent the same construct as psychiatric disorders assessed with structured diagnostic interviews, and this variable introduces selection biases inherent in psychiatric treatment populations. In particular, the lack of association between dissociation and predisaster psychopathology in this study, especially if this finding can be replicated, might indicate a nonpathological type of dissociative phenomena.

Dissociation was not predicted by personality variables in this study. In contrast, various studies of patient samples not selected for exposure to trauma have found dissociation to be associated with low self-directedness (Grabe et al., 1999; Evren et al., 2008), low cooperativeness (Evren et al., 2008), high harm avoidance (Evren et al., 2008; Simeon et al., 2002), high novelty seeking (Evren et al., 2008), high self-transcendence (Grabe et al., 1999), neuroticism, and low conscientiousness (Kwapil et al., 2002; Groth-Marnat and Jeffs, 2002). This discrepancy in findings is likely a product of selection bias in patient samples, as psychiatric patient populations have been well documented to have both high levels of dissociation (Carlson et al., 1993; Dale et al., 2009; Dorahy et al., 2006, Giesbrecht et al., 2010; Latz et al., 1995; Leavit, 1999, Lipsanen et al., 2004; Sar et al., 2007, Saxe et al., 1993; Simeon et al., 2001, Simeon et al., 2003, Simeon et al., 2007; Tutkun et al., 1998) and high rates of comorbid personality disorders (Johnson et al., 2006; Oldham et al., 1995). If future disaster studies in unbiased trauma-exposed populations also demonstrate no association between abnormal personality and the development of new dissociation, it would be further evidence against a relationship between dissociation and abnormal personality.

The apparent associations between dissociation and PTSD, other psychiatric disorders, and personality in bivariate analyses were not apparent in multivariate models that also included somatization as an independent covariate. Because these other variables indicating psychopathology were not significantly associated with dissociation independent of somatization, somatization may represent a pathway through which other psychopathology is indirectly associated with dissociation. In other words, this psychopathology was apparently associated with dissociation only indirectly through the effects of somatization, and not directly associated through effects of their own. Even the association of somatization with dissociation does not appear to represent a pathological process because of the very low levels of incident somatization observed after the disaster. In general, the lack of association of dissociation with pathological levels of somatization, disaster-related PTSD, lifetime predisaster psychopathology, and personality does not indicate a relationship with psychopathology. These findings further support the stated finding that the low levels of dissociation found in this study are not consistent with pathological levels of dissociation found in patient populations.

Potential mechanisms can be proposed for the generation of nonpathological experiences captured by standard dissociation measures in response to disasters. First, a known problem with dissociation measures is conflation of benign experiences with dissociative pathology. For example, most people will acknowledge not remembering parts of conversations or becoming completely absorbed in concentration, and many people will even endorse feelings of being 2 different people (Ross et al., 1991). Thus, the endorsement of these items on dissociative measures such as the DES may well indicate benign experience and not necessarily pathological dissociation (Giesbrecht et al., 2007; Leavitt, 1999; Ross et al., 1991). Second, extreme and unusual circumstances of disasters have the propensity to promote feelings of bizarreness and unreality that may be construed to represent derealization and depersonalization, and narrowly focused attention in these circumstances might be inadvertently assumed to represent pathological amnesia. These types of experiences have been classified as part of dissociative absorption and imagination processes. However, they have been interpreted by Ross et al. (1991) and Merckelbach et al. (1999) as nonpathological in modest amounts such as the levels measured in these disaster survivors and have been assumed to reflect nonpathological processes in DES responses (Canan and North, under review; Giesbrecht et al., 2007; Leavitt, 1999). Thus, problems with differentiating diagnosable psychopathology from benign or nonpathological experiences are inherent not only to measurement of dissociation but also to conceptualization of dissociative phenomena.

This study had several strengths, especially its large sample size and representation of all major categories of disaster typology in different geographical settings. The inclusion of samples from 5 separate disasters was made possible by the use of consistent research methods across the separate disaster studies. The disaster survivors in this study all had direct exposure to disaster trauma, providing a homogenous trauma exposure sample that was highly affected. Another important strength of this study was the use of structured diagnostic interviews for full assessment of psychiatric disorders, with specification of the occurrence of disorders before and after the date of the disaster. Finally, this study used prospective longitudinal follow-up with low follow-up attrition.

This study also had some methodological limitations. These data were collected at least 2 decades ago, prior to more recent editions of the diagnostic criteria for psychiatric disorders. Part of the sample consisted of research volunteers, thus introducing potential sampling bias. Only about two-thirds of the original study sample had complete data on the instruments used for this analysis, and those with missing data were biased toward being younger, white, less educated, unmarried, and having more psychopathology. Thus, postdisaster psychopathology may have been underrepresented in the data. The predominantly white racial composition of the study sample may limit generalizability to other groups exposed to disasters. Variation in the timing of interviews across the sites may have introduced potential for differences in recall of symptoms related to the amount of time elapsed from the disaster, but the time elapsed was not associated with level of dissociation. Because the disaster survivors in this study were all exposed to disaster trauma, this study was unable to examine the associations of trauma exposure with dissociation.

Probably the most serious limitation in this study was the lack of a diagnostic measure for dissociation, and thus it was not possible to differentiate dissociative pathology from other benign or normative responses. The 10 items measuring dissociation were selected from an existing dissociation measure for relevance to disaster experience rather than consisting of a complete and validated instrument by themselves; however, these items had good internal reliability. Another potential problem is that the time frame for the dissociative symptoms was lifetime. Therefore, the dissociation measured in this study cannot be assumed to have necessarily resulted from the disaster experience. Although the dissociation data were collected at follow-up rather than at baseline with rest of the data, analysis examining baseline and follow-up dissociative findings in a subset that had dissociative data at both time points showed no significant differences in pairwise comparisons, suggesting that this temporal disparity in data collection likely had no material effect on the findings.

Because of the many methodological problems in research to date on dissociation in relation to disaster—especially the lack of validated diagnostic assessments used for dissociative disorders and inability to differentiate pathological dissociation from other benign or normative responses—the findings of this research must be interpreted with great caution. The bottom line is that this limited research has not determined the postdisaster prevalence of dissociative disorders and has not demonstrated whether exposure to disaster trauma generates dissociative disorders. Therefore, it is prudent for both clinicians and researchers to avoid assumptions that pathological dissociation is a regular outcome of disaster trauma exposure, and to restrain from conclusions that dissociative pathology observed after disasters was caused by the disaster. This also has implications for etiologic assumptions about dissociation after trauma in general, considering the important potential role of confounding arising from selection bias in this research. Further, because dissociative phenomena arising in the context of disaster may not actually represent pathological states, there is no basis for recommending whether or how to intervene. Methodologically rigorous research is needed to definitively establish whether dissociative disorders regularly arise in the context of disaster and to better understand nonpathological responses captured by dissociation measures. This will require the use of validated diagnostic instruments for dissociative disorders applied to specific periods related to the timing of the disaster. Comparison of the onset of dissociation in disaster trauma-exposed and -unexposed samples will be needed to better understand the role of disaster exposure in the occurrence of dissociation.

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Conflict of interest

The authors report no conflict of interest.

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