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**SYSTEMATIC REVIEWS**

- 83 Dissociation and disasters: A systematic review  
*Canan F, North CS*

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## Dissociation and disasters: A systematic review

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### Abstract

#### BACKGROUND

Dissociation, which is defined as the failure to associate consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior into an integrated whole, has long been assumed to be generated by trauma. If dissociation is a product of trauma exposure, then dissociation would be a major mental health outcome observed in studies of disaster survivors. Although some studies have examined dissociation in disasters, no systematic literature reviews have been conducted to date on the topic.

#### AIM

To systematically evaluate the literature on the association between disaster and dissociation to determine the prevalence and incidence of dissociation after exposure to disaster and further examine their relationship.

#### METHODS

EMBASE, Medline, and PsychINFO were searched from inception to January 1, 2019 to identify studies examining dissociative disorders or symptoms related to a disaster in adult or child disaster survivors and disaster responders. Studies of military conflicts and war, articles not in English, and those with samples of 30 or more participants were excluded. Search terms used were "disaster\*" and dissociation ("dissociat\*", "multiple personality," "fugue," "psychogenic amnesia," "derealization," and "depersonalization"). Reference lists of identified articles were scrutinized to identify studies for additional articles.

#### RESULTS

The final number of articles in the review was 53, including 36 articles with samples of adults aged 18 and above, 5 of children/adolescents under age 18, and 12 of disaster workers. Included articles studied several types of disasters that occurred between 1989 and 2017, more than one-third (38%) from the United States. Only two studies had a primary aim to investigate dissociation in relation



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to disaster and none reported data on dissociative disorders. All of the studies used self-report symptom scales; none used structured interviews providing full diagnostic assessment of dissociative disorders or other psychopathology. Several studies mixed exposed and unexposed samples or did not differentiate outcomes between exposure groups. Studies examining associations between dissociation and disaster exposure have been inconclusive. The majority (75%) of the studies compared dissociation with posttraumatic stress, with inconsistent findings. Dissociation was found to be associated with a wide range of other psychiatric disorders, symptoms, and negative emotional, cognitive, and functional states.

### CONCLUSION

The studies reviewed had serious methodological limitations including problems with measurement of psychopathology, sampling, and generation of unwarranted conclusions, precluding conclusions that dissociation is an established outcome of disaster.

**Key words:** Dissociation; Dissociative disorders; Disaster; Systematic review; Methodology; Diagnostic validity; Psychopathology; Normative response; Posttraumatic stress; Association vs causation

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**Core tip:** Almost all existing studies of dissociation in relation to disaster have not focused specifically on this purpose but rather on the relationship of dissociation to other disaster outcomes. Instead of dissociative disorders, broadly defined dissociative phenomena have been examined in disaster survivors. The literature uniformly contains unsurmountable methodological limitations such as reliance on nondiagnostic dissociation measures, lack of temporal specificity to postdisaster time frames, and problems with disaster exposure issues pertaining to sampling, measurement, and analysis. It cannot be concluded from the research that dissociation is an established outcome of disasters.

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## INTRODUCTION

The current Diagnostic and Statistical Manual of Mental Disorders (5<sup>th</sup> edition) (*DSM-5*)<sup>[1]</sup> defines dissociation as “a disruption of and/or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior” (p. 291). Dissociative disorders listed and defined in *DSM-5* are Dissociative Identity Disorder, Dissociative Amnesia, and Depersonalization/Derealization Disorder, as well as Other Specified Dissociative Disorder and Unspecified Dissociative Disorder. The concept of dissociation was first introduced in the field of medicine in the 1800s by the French physician Pierre Janet who described it as a breakdown of the integration, or the compartmentalization, of the mental processes required for a unified experience of consciousness and of self<sup>[2,3]</sup>. A variant of dissociation also introduced by Janet was described as “narrowing of the field of consciousness,” reflecting reduced capacity to assimilate elements of sensation into complex personal perceptions, a process that has subsequently been linked to hysteria<sup>[4,5]</sup>. Current concepts of dissociation encompass a wide range of phenomena including highly pathological disturbances of memory such as in states of amnesia, disturbance of consciousness such as in fugue states, and identity disturbance as well as common and benign experiences involving attention such as absorption, daydreaming, and fantasy<sup>[6-8]</sup>.

Dissociation has long been assumed to develop as a mechanism for coping with severe trauma<sup>[3,9]</sup>. Extensive literature has documented a relationship between trauma and dissociation and elaborated presumptive psychological mechanisms in a “trauma model of dissociation”<sup>[10]</sup>. It follows logically that if dissociation is a product of trauma

exposure, then dissociation would be a major mental health outcome observed in studies of disaster survivors. Despite the publication of some studies of dissociation in disaster survivors, no major systematic reviews of this literature have been conducted. Therefore, the lack of reviews of research on dissociation and disasters in the context of widespread assumptions that trauma generates dissociative psychopathology, the purpose of this article is to provide a systematic review of published studies on dissociation and disaster to determine the prevalence and incidence of dissociation after exposure to disaster and further examine their relationship.

## MATERIALS AND METHODS

A systematic literature search was undertaken to locate studies examining dissociative disorders or symptoms related to a disaster in adult or child disaster survivors and rescue/recovery workers. Only studies with samples of  $\geq 30$  were included, because of known problems with non-normal sampling distributions in smaller studies<sup>[11]</sup>. Articles not in English and studies of military conflicts and war were excluded.

EMBASE, Medline, and PsychINFO were used to identify articles before January 1, 2019. Search terms used were “disaster\*” and dissociation (“dissociat\*”, “multiple personality,” “fugue,” “psychogenic amnesia,” “derealization,” and “depersonalization”). Reference lists of identified articles were inspected for additional articles. [Figure 1](#) provides a flow chart of this article selection process. The manuscript was prepared and revised according to the PRISMA 2009 Checklist<sup>[12]</sup>. The search strategy and list of excluded articles with the reason of exclusion are presented in [Supplementary table 1](#).

### Quality appraisal

The quality of the included studies was measured using a modified version of a tool generated for assessing the quality of prevalence studies<sup>[13,14]</sup>. The features assessed included description of target population, inclusion/exclusion criteria, sampling method, demographic characteristics, information on nonresponders, use of validated and professional-administered diagnostic instruments, and report of prevalence estimates. This instrument has 10-items and allows for the calculation of a total quality score (range = 0-10), with higher summed scores indicating higher study quality.

### Assessment of risk of bias

The Hoy Risk of Bias Tool (RoBT)<sup>[15]</sup> was used to assess methodological bias. The RoBT consists of 10 items evaluating external (4 items) and internal (6 items) validity. Studies were classified as having a low risk of bias when 8 or more of the 10 items were answered as “yes (low risk),” a moderate risk of bias when 6 to 7 of the questions were answered as “yes (low risk),” and a high risk of bias when 5 or fewer questions were answered as “yes (low risk)”<sup>[16]</sup>.

### Statistical analysis

Simple chi-square analyses were conducted to compare proportions of two different comparison groups with positive findings, substituting Fisher’s exact tests for expected cell sizes of  $< 5$ .

## RESULTS

### Included studies

The final number of articles in the review was 53, including 36 articles with adult (aged  $\geq 18$ ) samples ([Table 1](#)), 5 of children/adolescents ( $< \text{age } 18$ ) ([Table 2](#)), and 12 of disaster workers ([Table 3](#)). These articles, published between 1993 and 2019, included 51 original articles, 1 letter to the editor, and 1 doctoral dissertation. The disasters occurred between 1989 and 2017, and 60% were from countries: United States ( $n = 20$ ), Netherlands ( $n = 4$ ), Italy ( $n = 4$ ), and Turkey ( $n = 4$ ). The types of disasters included earthquakes ( $n = 17$ ), explosive accidents ( $n = 11$ ), terrorist attacks ( $n = 8$ ), hurricanes/typhoons ( $n = 7$ ), ferry sinkings ( $n = 3$ ), firestorms ( $n = 2$ ), floods ( $n = 2$ ), tsunamis ( $n = 2$ ), fires ( $n = 1$ ), plane crashes ( $n = 1$ ), train crashes ( $n = 1$ ), and mass shootings ( $n = 1$ ). Multiple disasters were examined in five of the articles. Specific population subgroups, namely women, older adults (aged  $\geq 60$ ), and pet owners were the focus in three adult survivor studies represented in four articles. More than one-third (36%) of the articles involved longitudinal prospective studies and the

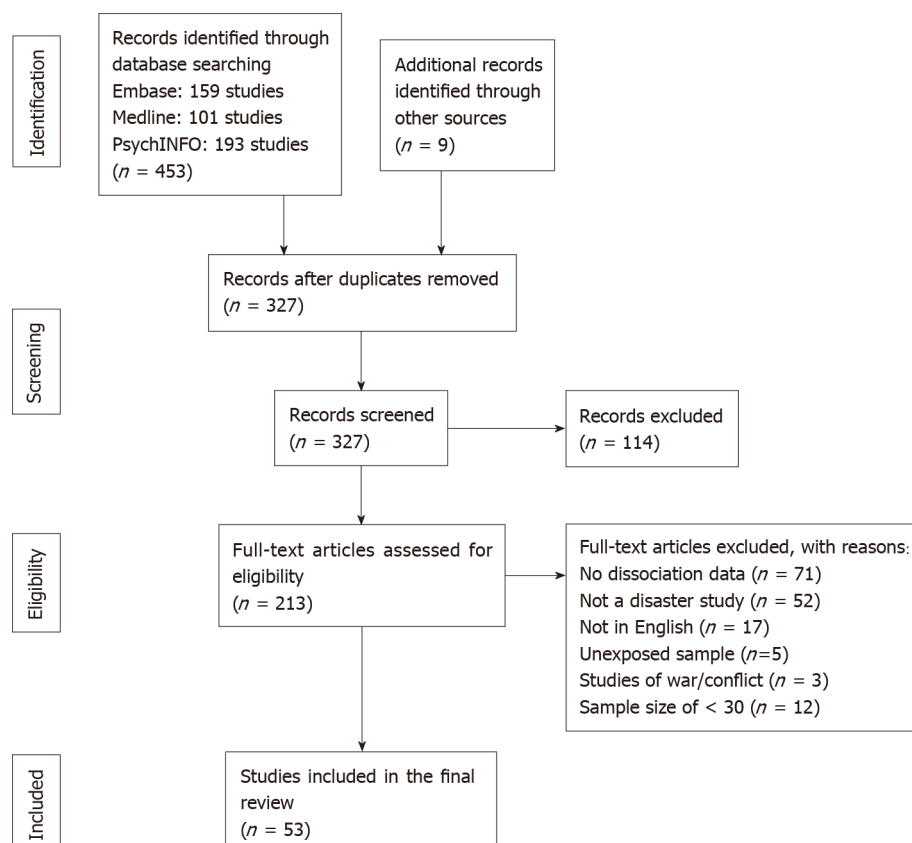


Figure 1 Flow chart of selection process for articles in the review.

remainder described cross-sectional studies.

### Quality and risk of bias

The total quality score of the studies ranged from 1 to 5 (out of a maximum possible of 10), indicating that none of the studies included had good quality (Supplementary table 2). According to the RoBT, the majority of studies had a high risk of bias with only three having a moderate risk (Supplementary table 3).

### Focus of the studies

Only two of the studies in the review focused solely on dissociation without including other disaster mental health outcomes such as posttraumatic stress<sup>[17,18]</sup>. The majority of studies ( $n = 40$ ) had a primary focus on posttraumatic stress, including dissociation only as a secondary topic, typically examining it in relation to posttraumatic stress. The remaining few studies ( $n = 10$ ) had a joint focus on posttraumatic stress and dissociation, investigating the relationship between these two entities.

### Dissociation measures

All of the studies used self-report symptom scales; none used structured diagnostic interviews for dissociative disorders. The Peritraumatic Dissociative Experiences Scale (PDEQ)<sup>[19]</sup> was used in 49% of the studies and the Dissociative Experiences Scale (DES)<sup>[20,21]</sup> was used in 13%. The Maslach Burnout Inventory–Human Services Survey (MBI-HSS)<sup>[22]</sup> was used to measure depersonalization in four studies. Dissociative symptoms embedded in Criterion B of acute stress disorder were assessed by three studies; two others approximated dissociation respectively with one panic disorder symptom and a single traumatic event-related amnesia item.

### Dissociation levels and associations with demographic and psychopathological variables

Several studies in this review (for example<sup>[23-27]</sup>) reported dissociation levels in mixed samples of exposed and unexposed survivors without differentiating results between exposure groups. In some studies, references to disaster exposures did not differentiate between disaster trauma exposure specifically, and the experiences of other stressors in the disaster such as property damage or loss of possessions.

The presentation of dissociation data was limited to univariate results in two

**Table 1 Studies of dissociation in adult disaster survivors**

Disaster	Sample	Measures	Results
Ferry sinking (Baltic Sea 1994) <sup>[93,94]</sup>	42 survivors	3 ASD dissociation items	3-mo dissociation associated with 3-mo and 1-yr but not 14-yr posttraumatic stress
Earthquake (Haiti 2010) <sup>[28]</sup>	167 exposed volunteers	PDEQ	Mean 27-mo PDEQ score = 25. Dissociation predicted posttraumatic stress symptoms and depression
Explosion (France 2001) <sup>[95-97]</sup>	430 survivors from local EDs	PDEQ	6-mo dissociation predicted posttraumatic stress at 6 and 15 mo but not 5 yr
Train crash (Israel 2005) <sup>[50]</sup>	53 survivors	DES, PDEQ	Scores higher in survivors with vs without fibromyalgia (9 vs 2; 20 vs 9)
Earthquake (San Francisco, CA 1993) <sup>[17]</sup>	100 exposed volunteer college students	SASRQ	All 5 dissociation subscale scores higher at 1 wk than 4 mo
Explosion (Denmark 2004) <sup>[29,42]</sup>	169 evacuees	4 TSC dissociation items	Mean dissociation score = 6 (of 12). 3-mo dissociation predicted 1-yr posttraumatic stress in women only and not 1-yr somatization
Floods/ mudslides (Italy 2009) <sup>[48]</sup>	287 exposed residents	DES, PDEQ	DES, difficulty identifying feelings, and externally oriented thinking predicted 27-mo PDEQ. PDEQ explained 44% of IES-R
Explosion (Belgium 2004) <sup>[98]</sup>	1027 exposed residents	PDEQ	5-mo dissociation predicted 5-mo (not 14-mo) posttraumatic stress
9/11, WTC (NYC 2001) <sup>[23]</sup>	1009 Manhattan residents, workers	1 DTS dissociation item (event amnesia)	Event amnesia was least endorsed item (2%)
Earthquake (NZ, 2011) <sup>[40]</sup>	101 exposed treatment seekers	PDEQ (4 items)	Dissociation predicted posttraumatic stress symptoms, anxiety at 2-8 wk
9/11 Pentagon (Washington, DC 2001) <sup>[44]</sup>	77 exposed military, civilian staff	PDEQ	Dissociation associated with posttraumatic stress (18 vs 5) and alcohol use and negatively with perceived safety
3 technological accidents (Netherlands) <sup>[99]</sup>	49 affected individuals	PDEQ, SDQ-P	20-d dissociation did not predict 6-mo posttraumatic stress symptoms
Hurricane Katrina (New Orleans, LA 2005) <sup>[100]</sup>	65 exposed pet owners	PDEQ	Dissociation associated with having to abandon pet (mean PDEQ = 30 vs 23), depression, acute stress, and posttraumatic stress symptoms.
Hurricane Katrina (New Orleans, LA 2005) <sup>[32]</sup>	117 people in mandatory evacuation zones	PDEQ	Mean PDEQ score = 12 (unknown timing). Dissociation associated with property damage
Earthquakes; floods (Australia/NZ 2010-2011) <sup>[101]</sup>	662 exposed residents	PDEQ	Dissociation associated with posttraumatic stress symptoms and negative beliefs about memory
Firestorm (Oakland/Berkeley 1991) <sup>[18,102]</sup>	94 referral center help seekers, 93 local students	SASRQ	1-mo dissociation associated with 7-9-mo posttraumatic stress symptoms but not intrusions
9/11 WTC (NYC 2001) <sup>[24]</sup>	2001 NYC residents	2 DIS dissociation, panic attack items	4-5 mo dissociation associated with posttraumatic stress symptoms, older age, female sex, non-white race, and fear of death or injury
Earthquake (Haiti 2010); tsunami (Japan, 2011) <sup>[103]</sup>	140 Haiti/12 Japan disaster exposed; 80 other trauma exposed	DES	Dissociation scores (unknown timing) not different between trauma groups
Mass shooting (DeKalb, IL 2008) <sup>[25]</sup>	583 female university students	4 PDEQ items	2-wk dissociation predicted 2-wk to 3-mo and 8-mo probable posttraumatic stress
Earthquake (Iran 2017) <sup>[80]</sup>	230 exposed volunteers from 2 cities	DES, PDEQ	3-4 mo dissociation associated with posttraumatic stress
Earthquake (Turkey 2011) <sup>[26]</sup>	583 randomly sampled residents	DES (with Taxon)	2-yr DES Taxon membership = 25%. Dissociation predicted posttraumatic stress symptoms, re-experiencing, avoidance, and hyperarousal but not functional impairment
Earthquake (Turkey 2011) <sup>[27]</sup>	317 volunteer college students	DES (with Taxon)	High (21%) DES Taxon membership (unknown timing). DES predicted posttraumatic stress symptoms. Pathological dissociation mediated between posttraumatic stress symptoms and ADHD symptoms



Earthquake (Italy 2009) <sup>[35]</sup>	84 university student volunteers	14 TSI dissoci. items	7-yr dissoci. scores in exposed than unexposed. Dissoc. not associated with exposure
Hurricane Ike (Texas coast, 2008) <sup>[66,104]</sup>	75 older residents	PDEQ	Mean PDEQ = 11. Dissoc. associated with 3-mo posttraumatic stress but not 3-mo depression. Dissoc. not associated with posttraumatic stress trajectories
Tsunami (Indonesia 2004) <sup>[30]</sup>	660 evacuated Danish tourists	4 ERDTS dissoci. items	10-mo dissoci. predicted posttraumatic stress symptoms, depression
9/11 WTC (NYC 2001) <sup>[36,105]</sup>	75 exposed NYC residents	PDEQ, DES, CDS, CADDs	Mean PDEQ = 35, DES = 17. 3-mo dissoci. not associated 1-yr posttraumatic stress symptoms. Dissoc. not associated with exposure
Explosion (Taiwan 2015) <sup>[47]</sup>	116 burn survivors	SDQ	25-mo dissoci. associated with posttraumatic stress but not depression
Fire (Nether-lands, 2000) <sup>[31]</sup>	662 residents	PDEQ	Mean PDEQ = 24. 2-3 wk dissoci. not associated with 18-mo or 4-yr posttraumatic stress symptom severity
Fire and explosion (Netherlands 2001, 2004) <sup>[106]</sup>	94 disaster, 111 non-disaster burn survivors	3 ADS dissoci. items	1-wk dissoci. Disaster > others. Disaster: 1-wk dissoci. not associated with 12-mo posttraumatic stress

ADS<sup>[107]</sup>: Anxiety and Dissociation Scale; ASD: Acute stress disorder measure; CDS<sup>[105]</sup>: Cambridge Depersonalization Scale; CADDs<sup>[108]</sup>: Clinician Administered Dissociative States Scale; DES<sup>[20,21]</sup>: Dissoc.: Dissociation; Dissociative Experiences Scale; DIS<sup>[109]</sup>: Diagnostic Interview Schedule; DTS<sup>[110]</sup>: Davidson Trauma Scale; ERDTS<sup>[30]</sup>: Emotional Reactions During Trauma Scale; NYC: New York City; NZ: New Zealand; PDEQ<sup>[19]</sup>: Peritraumatic Dissociative Experiences Scale; SASRQ<sup>[111]</sup>: Stanford Acute Stress Reaction Questionnaire; SDQ<sup>[112]</sup>: State Dissociation Questionnaire; SDQ-P<sup>[113]</sup>: Somatoform Dissociation Questionnaire-Peritraumatic; TSC<sup>[114]</sup>: Trauma Symptom Checklist; TSI<sup>[115]</sup>: Trauma Symptom Inventory; WTC: World Trade Center.

studies, one<sup>[17]</sup> documenting a decline in dissociation from 1 wk to 6 mo and the other<sup>[23]</sup> reporting event amnesia in only 2% of the sample. Demographic factors reported to be associated with dissociation in bivariate comparisons included advanced age<sup>[24,28]</sup>, female sex<sup>[24,28-31]</sup>, African American or Hispanic race<sup>[24]</sup>, and limited education<sup>[31]</sup>.

The findings of associations between dissociation and disaster exposure in the studies reviewed are inconclusive. Dissociation was found to be significantly associated with disaster exposure in three studies. Non-traumatic stressor exposures by themselves or included in a mixed list of traumatic and other stressful disaster exposures were associated with dissociation in a firestorm study<sup>[18]</sup> and a hurricane study<sup>[32]</sup>, and specific trauma exposures were associated with higher dissociation scores among children in a severe earthquake<sup>[33]</sup>. Several studies did not identify associations between dissociation and disaster exposures. Dissociation was not found to be associated with disaster trauma exposures or exposure proxies such as physical proximity to the World Trade Center towers in the 9/11 attacks<sup>[24]</sup>, losing significant others or possessions in the disaster<sup>[24,34]</sup>, or being trapped under earthquake rubble<sup>[34,35]</sup>. A study of survivors of the 9/11 attacks found that levels of dissociation were not associated with immediate life threat in the disaster, indirect exposure *via* threat to loved ones, or participation in rescue efforts<sup>[36]</sup>. Depersonalization in disaster workers responding to a typhoon was not found to be associated with contact with disaster survivors or witnessed disaster trauma exposures<sup>[37]</sup>.

Three-fourths (75%) of the studies (40 articles) compared dissociation with posttraumatic stress. These articles used self-report posttraumatic stress measures such as the Impact of Event Scale-Revised, Posttraumatic Stress Disorder (PTSD) Checklist, PTSD Symptom Scale, and Child Posttraumatic Stress Disorder-Reaction Index. As for dissociation, none of the studies of posttraumatic stress used structured diagnostic assessment interviews. Of the 25 studies reporting results of bivariate comparisons, 100% reported significant associations between dissociation and posttraumatic stress. Of the 30 studies reporting results of multivariate models, only 60% found significant associations between dissociation and posttraumatic stress, a significantly lower proportion ( $\chi^2 = 12.79$ ,  $df = 1$ ,  $P < 0.001$ ). Of the 16 longitudinal multivariate studies, only one-fourth (25%) found that dissociation measured shortly after a disaster was associated with long-term posttraumatic stress, significantly less often than in cross-sectional multivariate studies ( $\chi^2 = 5.12$ ,  $df = 1$ ,  $P = 0.024$ ).

Of the seven studies conducting bivariate comparisons of dissociation with depressive pathology, all reported significant associations (for example<sup>[26,28,34,38,39]</sup>).

**Table 2 Studies of dissociation in child and adolescent disaster survivors**

Disaster	Sample	Measures	Results
Hurricane Katrina (New Orleans, LA 2005) <sup>[41]</sup>	112 exposed students with ≥ 1 other trauma exposure	9 TSCC dissociation items	4-mo to 7-yr dissociation associated with posttraumatic stress symptoms, anger, anxiety, depression
Earthquake (Turkey 2011) <sup>[34]</sup>	738 exposed high school students	A-DES	6-mo dissociation associated with posttraumatic stress, anxiety, prior mental health problems, metacognitions, but not with age, sex, disaster exposure, prior exposure to trauma
Earthquake (Turkey 1999) <sup>[33]</sup>	202 exposed, 101 unexposed children	11 TDGS dissociation items	Exposed children had higher 4-5 mo perceptual distortions (1.3 <i>vs</i> 1.2), body-self distortions (1.1 <i>vs</i> 1.1) (range = 1-3 for both subscales)
Ferry disaster (South Korea 2014) <sup>[65]</sup>	57 child and adolescent survivors	3 PDEQ items	20-mo dissociation associated with posttraumatic symptoms
Earthquake (China 2010) <sup>[116]</sup>	753 exposed middle school students	1 UPRI dissociation item (derealization)	Majority (77%) positive for derealization. 6-mo derealization predicted PTSD

A-DES<sup>[117]</sup>: Adolescent Dissociative Experiences Scale; dissociation: Dissociation; TDGS<sup>[33]</sup>: Traumatic Dissociation and Grief Scale; TSCC<sup>[118]</sup>: Trauma Symptom Checklist for Children; UPRI<sup>[119]</sup>: The University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index.

Only two of five studies comparing dissociation with depressive pathology in multivariate models reported significant associations<sup>[28,30]</sup>, a significant difference from the bivariate analysis findings (Fisher's exact test,  $P = 0.021$ ). Other problems found to be positively associated with dissociation in sporadic studies included anxiety<sup>[34,40,41]</sup>, somatization<sup>[42]</sup>, adult attention-deficit/hyperactivity disorder<sup>[27]</sup>, general mental health problems<sup>[43]</sup>, increased postdisaster use of alcohol<sup>[44]</sup> or tobacco<sup>[38]</sup>, suicidality<sup>[26]</sup>, hopelessness<sup>[26]</sup>, anger<sup>[41]</sup>, hostility<sup>[45]</sup>, feeling unsafe<sup>[44,46]</sup>, fear during the disaster<sup>[24,47]</sup>, alexithymia<sup>[48]</sup>, trauma memory disorganization<sup>[47]</sup>, trauma-related rumination<sup>[47]</sup>, maladaptive coping strategies<sup>[49]</sup>, lower academic achievement<sup>[27]</sup>, greater injury-related functional impairment<sup>[47]</sup>, lower health-related quality of life<sup>[26]</sup>, and fibromyalgia syndrome<sup>[50]</sup>. Dissociation was also associated with early traumatic experience<sup>[51]</sup> and religiosity<sup>[28]</sup>. In the above studies, none were found in which dissociation was not associated with any of these outcomes.

## DISCUSSION

Although there are a number of reviews<sup>[52-55]</sup>, meta-analyses<sup>[56,57]</sup>, and a bibliometric analysis<sup>[58]</sup> examining the studies on mental health outcomes of disasters, no prior reviews have been published specifically on dissociation associated with disasters even though a few reviews of PTSD and dissociation included very small numbers of disaster studies without specific comment on them<sup>[59-62]</sup>. The current review found 53 published articles on this topic among adult and child survivors of disasters as well as disaster workers. Only 2 of the 53 studies reviewed was designed for the main purpose of examining the prevalence of dissociation following a disaster. The main purpose of the remaining 51 studies was to examine the occurrence of other outcomes (posttraumatic stress in the majority) after disaster, and dissociation was included only as a secondary outcome in relation to the primary outcome of interest. The quality of the studies reviewed was exceedingly limited by methodological problems inherent in them. Problems with measurement of psychopathology, sampling issues, assessment time frames, and generation of conclusions unwarranted from the data represented serious methodological weaknesses in this literature.

### Dissociation measures

Problems in the instruments of assessment were fundamental limitations in all of the studies reviewed. None used diagnostic instruments assessing accepted standards such as *DSM-5* criteria for dissociative disorders; dissociative identity disorder, dissociative amnesia, and depersonalization/derealization disorder were not mentioned in any of these studies' findings. All depended on symptom measures to assess dissociation, with 72% using the PDEQ, DES, or MBI-HSS. These self-report questionnaires inquire about many kinds of experiences not generally corresponding to the established symptoms of *DSM-5* dissociative disorders; these items are then

**Table 3 Studies of dissociation in exposed disaster workers**

Disaster	Sample	Measures	Results
9/11, WTC (NYC 2001) <sup>[38]</sup>	90 disaster workers	PDEQ	Number of 2-3 wk dissoc. symptoms associated with probable ASD
Typhoon Haiyan (Philippines 2013) <sup>[37]</sup>	61 religiously, spiritually oriented humanitarian aid workers	MBI-HSS (5 depersonalization items)	Mean 8-mo depersonalization score = 1.1 (of 30). Depersonalization associated with negative religious coping but not with indirect exposure, direct exposure, or positive religious coping
Earthquake (Japan 2011) <sup>[43]</sup>	34 healthcare providers	MBI-HSS (5 depersonalization items)	Mean 2-yr depersonalization score = 0.6 (of 30). Depersonalization not associated with general mental health
Plane crash (Sioux City, IA 1989) <sup>[39]</sup>	207 exposed, 421 unexposed disaster workers	3 ASD dissoc. items	Number of 2-mo dissoc. symptoms associated with 13-mo posttraumatic stress but not depression. Any 2-mo dissoc. symptoms not associated with 13-mo posttraumatic stress or depression
9/11 WTC (NYC 2001) <sup>[46]</sup>	89 disaster responders	PDEQ	2-wk dissoc. negatively associated with perceived safety
Hurricane Katrina (New Orleans, LA 2005) <sup>[51]</sup>	441 rescue personnel	PDEQ	2-yr dissoc. associated with being single, exposure severity, physical victimization
Earthquake (Loma Prieta, CA 1989) <sup>[67,68]</sup>	198 exposed, 251 unexposed rescue personnel	PDEQ	1.5-yr dissoc. associated with 3.5-yr posttraumatic stress symptoms, intrusion, avoidance, hyperarousal
Earthquake (Italy 2009) <sup>[49,120]</sup>	285 healthcare workers at one hospital	MBI-HSS (5 depersonalization items)	Mean 6-yr depersonalization score = 1.1 (of 30) Depersonalization associated negatively associated with planning and positively with behavioral disengagement and self-distraction
Terror attacks (Norway 2011) <sup>[121]</sup>	238 rescue personnel	5-item scale developed by authors	8-11 mo dissoc. predicted posttraumatic stress
Fire (Netherlands 2000) <sup>[45]</sup>	66 ambulance personnel	PDEQ	2-3 wk dissoc. predicted 18-mo hostility, but not posttraumatic stress symptoms or depression

ASD: Acute stress disorder; dissoc.: Dissociation; MBI-HSS<sup>[22]</sup>: Maslach Burnout Inventory–Human Services Survey; NYC: New York City; NZ: New Zealand; PDEQ<sup>[19]</sup>: Peritraumatic Dissociative Experiences Scale; WTC: World Trade Center.

tabulated and summarized into indistinct “dissociation” scores of unclear meaning or significance. The PDEQ, which was used in about half of the studies, collects information about lack of awareness that is not reflected in diagnostic criteria for any dissociative disorder, and its other items do not provide data on symptoms of dissociative identity disorder, dissociative amnesia, or depersonalization/derealization disorder<sup>[63,64]</sup>. Numerous studies using the PDEQ have not been faithful to the full instrument (for example<sup>[25,40,44,65,66]</sup>) or its scoring algorithms<sup>[50,51,67,68]</sup>, creating further threats to its validity in these studies. DES scores have been demonstrated to correlate with dissociative disorder diagnoses, but its subscales are not only not specific to dissociation but they also correlate with other psychopathology more broadly<sup>[69,70]</sup>. The MBI-HSS depersonalization subscale does not measure diagnostic constructs incorporated into depersonalization/derealization disorder.

A major problem with these dissociation measures is the potential for conflation of nonpathological experiences with the pathological components of dissociative disorders. Conceptually, many DES items elicit experiences that are common in general populations and reflect benign or everyday processes such as not remembering parts of conversations or complete absorption of attention in a television program or a movie, especially the items contained in the “imaginative absorption” subgroup comprising about half of its items<sup>[7]</sup>. For example, “missing part of a conversation” was endorsed by 83% of the general population in one study, and even “feeling as though one were two different people” was endorsed by nearly half<sup>[7]</sup>. Because the imaginative absorption subscale of the DES has been demonstrated to reflect nonpathological processes<sup>[7,71,72]</sup>, the total dissociation score from this instrument includes a substantive amount of nonpathological material contributed by this subscale. To address this problem, a specifically pathological dissociative taxon

was constructed from the DES items considered to be most pathological (and specifically not including any of the imaginative absorption subscale items)<sup>[73]</sup>. The DES taxon has been superior to the entire DES in correlating with dissociative diagnoses<sup>[72,74,75]</sup>, but it has not been demonstrated to have the ability to classify or even identify dissociative disorders with reasonable accuracy<sup>[72,74]</sup>. No other dissociation scales have been systematically examined for their ability to differentiate diagnosable psychopathology from benign or nonpathological experiences.

Another problem with many dissociation measures (especially DES and MBI-HSS) is the lifetime collection of dissociative experiences that is far broader than the time frame of interest, *i.e.* the postdisaster period. Thus, much of the data collected with these instruments may pertain to predisaster periods only, which thus cannot reflect effects of the disaster ostensibly examined in these studies. In contrast, the PDEQ does focus on the acute postdisaster time frame and thus its data does have the potential to provide information relevant to effects of the disaster. However, the collection of PDEQ data months and even years after the disaster in many of these studies introduced potential recall bias through the fading of memory with time elapsed since the event.

### **Trauma exposures**

Correct measurement of exposure is critical to the ability to determine if an outcome is related to the disaster. Disaster research requires special attention to trauma exposures, because of the conditional nature of the diagnostic construct of PTSD requiring a qualifying exposure to trauma to consider symptoms or a diagnosis to be disaster-related, and because psychosocial outcomes are highly linked to trauma exposures<sup>[76]</sup>. Trauma exposure data are also needed in studies of dissociation to determine associations with disaster to support assumptions of a causal role of disaster trauma in the development of dissociation. If it is unknown whether the sample was even exposed, it cannot be stated whether exposure to disaster leads to dissociation. Many of the reviewed studies enrolled samples without disaster trauma exposure or mixed trauma-unexposed and trauma-exposed survivors resulting in problems of sample heterogeneity. Many studies either did not specify disaster trauma exposure or mixed exposure groups without controlling for them in the analyses. Some studies did not differentiate exposure to disaster trauma from other disaster-related stressors. Many of the studies reviewed did not even compare exposures with outcomes.

### **Prevalence of dissociation in different populations**

Notwithstanding the many identified methodological problems in the studies of dissociation reviewed here, comparison of levels of dissociation in disaster-affected populations with dissociation in other populations provides a broader view of the occurrence of dissociation in different settings. A number of studies have used the DES to measure dissociation prevalence in general populations, disaster-affected populations, and treatment populations, allowing comparison of these populations using a consistent measure. General population studies using the DES have identified average dissociation scores of 7-11 (out of a possible 100)<sup>[7,77-79]</sup>. Studies of disaster survivors using the DES have found somewhat higher scores, 11-26<sup>[36,48,50,80]</sup>. Studies of patients with dissociative disorders using the DES have found even higher scores, 24-60 (for example<sup>[81-85]</sup>). Thus, disaster survivors in these studies seem to have observably greater dissociation than in general populations, but it does not rise to the far higher levels of dissociation patient populations.

The higher prevalence of dissociative findings in disaster survivor populations than in general populations could possibly relate to two possibilities: (1) that actual dissociative psychopathology generated by disaster exposure; or (2) that benign or nonpathological experiences generated by the extreme circumstances of disaster exposure generating detectable scores on dissociation measures. Considering the first possibility, if exposure to disaster trauma precipitates the development of dissociative disorders, then it is possible that the somewhat higher dissociative scores in these groups could reflect modest numbers of individuals with dissociative disorders. However, because none of the dissociative measures in the studies reviewed assessed the diagnostic criteria for dissociative disorders, it is impossible to know if new dissociative disorders follow disaster exposure. Considering the second possibility, the somewhat higher dissociative scores in disaster survivor populations than in general populations require careful interpretation. They could at least partially represent normative responses to disaster exposure that may not reflect pathological states. Again, because none of the dissociative measures in the studies reviewed assessed the diagnostic criteria for dissociative disorders, assumptions that the dissociation measured represents dissociative pathology may constitute a conflation of nonpathological responses with psychopathology.

The conflation of normative responses to disaster trauma with psychopathology may naturally arise from the extreme and unusual disaster circumstances promoting a sense of bizarreness and unreality akin to a dream, fantasy, or movie, because it is unlike other kinds of experience occurring in real waking life. Additionally, the focus of attention in disasters may be narrowed to the most important parts of the experience, preventing memories of some parts of the experience whose absence might be inadvertently interpreted as pathological amnesia rather than a natural consequence of constricted attention. All of these disaster experiences may be considered to be examples of the cognitive processes of the dissociative absorption and imagination factor, which Ross *et al*<sup>[7]</sup> and Merckelbach *et al*<sup>[86]</sup> have interpreted as nonpathological in modest amounts, such as in these studies of general populations and disaster survivors. To the extent that general populations register small but detectable scores of dissociation measures, they may have endemic levels of benign dissociative phenomena, and the higher scores in disaster survivors may reflect generation of more of these phenomena through extreme trauma exposure.

The still higher prevalence of reported dissociation in patients with dissociative disorders than in disaster survivors may relate to presence of the dissociative psychopathology that defines dissociative patient populations as well as to patient reporting styles<sup>[87]</sup>. In part, because all patients with dissociative disorders have dissociative disorders, their scores on dissociative measures would be expected to be higher than in other populations not selected for psychiatric illness, such as disaster-exposed groups. Again, however, because the dissociative measures in the disaster studies reviewed do not diagnose dissociative disorders, there is no information about the incidence of dissociative disorders following disaster exposure. Dissociative disorders are not listed among the classical responses to disasters<sup>[88]</sup>, and even case reports of dissociative disorders in disaster survivors are very rare<sup>[89]</sup>. Thus, the association of new dissociative disorders with disaster exposure has not been demonstrated, much less causation of dissociative disorders by disaster exposure. Because a well-established characteristic of patients with dissociative disorders is a strong tendency to over-endorse symptoms<sup>[87]</sup>, it is difficult to know to what degree the very high levels of dissociation in this population are an artifact of their symptom endorsement styles and how much of it truly reflects dissociative disorders.

### **Dissociation and PTSD**

Most of the disaster studies reviewed here compared dissociation with posttraumatic stress. Like the measures for dissociation, the posttraumatic stress measures used in these studies did not assess diagnostic criteria for PTSD, did not link symptoms to PTSD-qualifying trauma exposures, included individuals not exposed to disaster trauma, did not differentiate psychopathology from normative reactions, and did not necessarily capture material from the acute postdisaster time frame. Most of the studies comparing dissociation with posttraumatic stress reported significant associations between them. Because of the many serious limitations of both sets of measures and the presence of other methodological issues, the interpretation of this association may be tenuous<sup>[59]</sup>, and even significant associations in bivariate analyses did not hold up in multivariate analyses and longitudinal assessment. The presence of an association between dissociation and posttraumatic stress might reflect well-known patterns of vulnerabilities to psychopathology broadly, as well as consistent effects of endorsement styles on both dissociative and posttraumatic stress measures. Even reviews<sup>[61,62]</sup> and meta-analyses<sup>[59,60,90]</sup> examining studies of associations of dissociation with PTSD more broadly do not find consistent associations between these two entities.

### **Dissociation and other psychopathology**

In the studies reviewed, dissociation was associated not only with posttraumatic stress, but with a wide range of other psychiatric disorders, symptoms, and negative emotional, cognitive, and functional states. There could be a number of reasons for such broad relationships and nonspecificity of associations with dissociation. This could represent measurement problems related to the known problems of nonspecificity of certain dissociation instruments as discussed above. It is possible that the phenomenon known as publication bias<sup>[91]</sup> or file drawer bias<sup>[92]</sup>, in which studies with significant or positive findings have a much greater likelihood of being published, might have contributed to such broad associations with dissociation. Again, the apparent relationships of various disorders and negative states might occur as artifacts of consistent reporting biases within individuals across different measurements.

### **Conclusions**

In summary, the body of literature on studies of dissociation in relation to disaster has



emerged almost completely from studies not focused specifically on this purpose but rather to investigate the relationship of dissociation to other disaster outcomes. These studies uniformly contain unsurmountable methodological limitations such as reliance on nondiagnostic dissociation measures with threats to validity including conflation of nonpathological experiences with psychopathology, lack of temporal specificity to postdisaster time frames, and problems with disaster exposure issues pertaining to sampling, measurement, and analysis. Given this collection of methodological limitations in these studies, it cannot be concluded from this literature that dissociation is an established outcome of disaster. Of particular interest is the observation that no published articles, to the best of our knowledge, have presented dissociative disorders as identified outcomes of any disaster studied. If there is a relation of dissociative phenomena more broadly and the experience of disaster, it is unclear from the research conducted what these experiences represent in terms of negative mental health outcomes.

Methodologically rigorous research is needed to determine the prevalence of dissociative phenomena after disasters and their relationship to trauma exposure. Studies are needed that provide systematic diagnostic assessment of dissociative disorders such as structured interviews to formally establish the prevalence and incidence of established dissociative disorders after disasters. Nosological research is needed to further clarify the distinctions between benign or normative and pathological dissociative responses to disaster trauma exposure, such as by examining associations between observed dissociative phenomena and established indicators of psychopathology such as clinically significant distress, functional impairment, seeking treatment, and associations with other established psychopathology. Additionally, a long list of serious methodological limitations identified in the studies reviewed will need to be addressed in future research on dissociation and disaster trauma can move forward to provide data of sufficient quality to render empirically based conclusions.

### **Lessons learned**

The literature on dissociation in relation to disaster contains unsurmountable methodological limitations such as reliance on nondiagnostic dissociation measures, lack of temporal specificity to postdisaster time frames, and problems with disaster exposure issues pertaining to sampling, measurement, and analysis. It cannot be concluded from the research that dissociation is an established outcome of disasters.

## **ARTICLE HIGHLIGHTS**

### **Research background**

Trauma has long been assumed to be causally associated with the development of dissociation. If trauma causes dissociation, then dissociation would be expected to emerge in disaster-exposed populations.

### **Research motivation**

Although some studies have investigated dissociation in disaster survivors, no prior reviews have been published specifically on dissociation associated with disasters.

### **Research objectives**

This review aimed to systematically evaluate existing studies on dissociation in disaster-exposed populations and to examine the relationship between dissociation and exposure to disaster.

### **Research methods**

A systematic search was performed using Embase, Medline, and PsychINFO databases to identify studies reporting on dissociative disorders or symptoms after disasters in adult or child disaster survivors and rescue/recovery workers. The search used the following key terms: "disaster\*," "dissociat\*," "multiple personality," "fugue," "psychogenic amnesia," "derealization," and "depersonalization". Only studies in English and those with a sample size of 30 or more were considered. Studies of military conflicts and war were excluded.

### **Research results**

The final review contained 53 articles, more than two-thirds (68%) reporting dissociation in adults, about one-tenth (9%) in children or adolescents, and about one-fourth (23%) in rescue/recovery workers, involving many different types of disasters. None of the included studies assessed or provided data on dissociative disorders; all used self-report symptom scales. Only two studies focused primarily on dissociation as a disaster outcome. Many of the samples had no disaster trauma exposures or only some members with exposures, and some studies did not differentiate exposure to disaster trauma from other disaster-related stressors. Most of the disaster studies compared dissociation with posttraumatic stress and did not find consistent associations between these two entities. A wide range of other psychiatric disorders, symptoms,

and negative emotional, cognitive, and functional states were found to be associated with dissociation in disaster-exposed populations.

### Research conclusions

The existing body of research on dissociation as an outcome of disaster is fraught with serious methodological limitations in sampling, assessment of dissociation and other psychopathology, and unwarranted causal assumptions. The magnitude of these limitations precludes definitive conclusions regarding whether dissociation is an established outcome of disaster.

### Research perspectives

Methodologically rigorous research that provide systematic diagnostic assessment of dissociative disorders such as structured interviews is needed to determine the prevalence of dissociative phenomena after disasters and their relationship to trauma exposure. Further nosological research is needed to adequately differentiate between benign/normative and pathological dissociative responses to disaster trauma exposure. Also, important methodological limitations identified in the studies reviewed should be addressed in future research on the relationship of dissociation and disasters.

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