



PTSD *Research Quarterly*

ADVANCING SCIENCE AND PROMOTING UNDERSTANDING OF TRAUMATIC STRESS

Published by:

National Center for PTSD
VA Medical Center (116D)
215 North Main Street
White River Junction
Vermont 05009-0001 USA

(802) 296-5132
FAX (802) 296-5135
Email: ncptsd@va.gov

All issues of the PTSD Research Quarterly are available online at: www.ptsd.va.gov

Editorial Members:

Editorial Director
Paula P. Schnurr, PhD

Scientific Editor
Fran H. Norris, PhD

Managing Editor
Heather Smith, BA Ed

National Center Divisions:

Executive
White River Jct VT

Behavioral Science
Boston MA

Dissemination and Training
Menlo Park CA

Clinical Neurosciences
West Haven CT

Evaluation
West Haven CT

Pacific Islands
Honolulu HI

Women's Health Sciences
Boston MA



U.S. Department
of Veterans Affairs

Impact of Mass Shootings on Individual Adjustment

Norris (2007) provided an excellent introduction to the literature on mass shootings. Our goal is to provide an update on this literature. Norris focused on individual, as well as broader community factors in examining responses to mass shootings. Our guide focuses solely on quantitative studies examining factors at the level of the individual that appear to be related to adjustment following a mass shooting.

Our definition of a mass shooting involves an individual (with few exceptions, a male), acting alone and with generally personal rather than political motivation, entering a densely populated space and shooting as many people as possible. In addition, while not required in the definition, the shooter typically takes, his or her, own life. Our guide to the literature proceeds chronologically, with an emphasis on studies that use longitudinal data.

Winnetka School Shooting

On May 21, 1988, a shooter entered an elementary school in Winnetka, Illinois, killing one child and injuring several others before taking her own life. Six to 14 months postshooting, Schwarz and Kowalski (1991) screened children and adults for PTSD and found prevalence rates of 27% and 19%, respectively (using a moderate threshold for *DSM-III-R* diagnosis). While there was not a significant difference in these rates, children tended to report more symptoms and identified the shooting as a greater stressor compared to adults. In children, the loss of recently acquired developmental skills was related to more symptoms. Factors associated with greater PTSD symptoms in children were younger age, greater feelings of being in danger, closer proximity to the shooting, and female gender. Six and 18 months postshooting, 12 school personnel were also assessed for their posttrauma pathology and retrospective reports of the event. Schwarz, Kowalski and McNally (1993) found that personnel who initially reported being

Holly K. Orcutt, PhD, Lynsey R. Miron, MA,
and Antonia V. Seligowski, MA
Northern Illinois University

close to the shooting demonstrated an increase in self-reported proximity 18 months postshooting, while those who initially reported being farther away demonstrated a decrease in self-reported proximity. The authors also found that increases in emotional responding, sense of life threat, and sensory experiences on the day of the shooting were associated with greater PTSD symptoms, while decreases in these areas were associated with lower levels of anxiety and depression, and greater self-confidence.

Luby's Cafeteria Shootings

On October 16, 1991, a gunman crashed his truck through a window and opened fire on a restaurant in Killeen, Texas, killing 23 individuals before fatally shooting himself. Approximately one month postshooting, North, Smith, and Spitznagel (1994) interviewed 136 survivors, many of whom provided additional follow-up assessments approximately one and three years after the incident (North, Smith, & Spitznagel, 1997; North, McCutcheon, Spitznagel, & Smith, 2002).

At one month postshooting, North et al. (1994) found that 20% of male and 36% of female survivors met diagnostic criteria for PTSD; most of these individuals did not have a history of mental illness. Although a history of PTSD did not predict postshooting PTSD in either men or women, other mental illnesses (e.g., depression) predicted postshooting PTSD in women. Approximately one year postshooting, 17% of survivors met criteria for PTSD, and the only significant demographic predictor of diagnosis was female gender (North et al., 1997). Of survivors interviewed at both 1 and 12 months postshooting, 61% had inconsistent diagnoses of PTSD, suggesting that memory for trauma reactions may change over time. At three years postshooting, 18% met diagnostic criteria for PTSD (North et al., 2002).

Continued on page 2

Authors' Addresses: **Holly K. Orcutt, PhD, Lynsey R. Miron, MA, and Antonia V. Seligowski, MA** are affiliated with the Department of Psychology, 305 Psychology/Computer Science Building, Northern Illinois University, DeKalb, IL 60115-2854. Email Addresses: horcutt@niu.edu, lmiron1@niu.edu, and aseligowski@niu.edu.

Of those with PTSD at any time in the three years postshooting, approximately half were considered to be in remission. Individuals who did not recover tended to report greater avoidance and numbing symptoms of PTSD. Predictors of PTSD chronicity included greater functional impairment and increased levels of treatment seeking. In terms of coping strategies, North, Spitznagel, and Smith (2001) reported that discussing the shooting, reaching out to social support networks, engaging in structured activities, and gaining information about the shooting may be helpful methods of managing postshooting distress.

Virginia Tech Shooting

On April 16, 2007 a student at Virginia Tech (VT) killed 32 individuals, wounded an additional 25 people, and fatally shot himself. The first shooting was in a student dormitory and the second in an academic building near the center of campus.

Prior to the shooting, an embedded researcher (Littleton) was screening women for negative sexual experiences as part of a multi-university online study, providing the opportunity for preshooting data on 843 women. Participants were invited to complete follow-up surveys 2, 6, and 12 months postshooting. Littleton, Axsom, and Grills-Taquechel (2009) examined the extent to which losing or gaining interpersonal (e.g., companionship, loyalty of friends) and intrapersonal resources (e.g., hope, intimacy) predicted shooting adjustment among a subset of 193 women. Resource loss two months postshooting predicted greater psychological distress six months postshooting, while resource gain was weakly related to lower levels of psychological distress. Less preshooting social support and greater psychological distress predicted resource loss, whereas greater social support and active coping with the shooting predicted resource gain. In another subset of this sample, Grills-Taquechel, Littleton, and Axsom (2011) evaluated anxiety symptoms and quality of life two months postshooting among 298 women with varying levels of exposure. For those more severely exposed to the shooting, greater belief in a lack of control over outcomes was associated with increased anxiety symptoms. Conversely, higher self-worth beliefs after the shooting, as well as the perception of greater family support prior to the shooting, emerged as protective.

In a study using each of the follow-up assessments, Littleton and colleagues (2011) found that both pre- and postshooting psychological distress (i.e., anxiety and depressive symptoms) predicted avoidant and ruminative coping 2, 6, and 12 months postshooting, while postshooting PTSD symptoms predicted greater use of maladaptive coping 6 and 12 months postshooting. Greater reliance on maladaptive coping also predicted distress at 12 months postshooting, but did not predict PTSD symptomatology. In 2012, Littleton et al. evaluated the cumulative impact of trauma among a subset of 215 women who were either sexual trauma victims or women who had not experienced sexual trauma before the mass shooting at VT. Sexual trauma victims reported significantly more depressive symptoms and shooting-related PTSD 12-months postshooting, as well as less belief in benevolence and lower family support 6 and 12 months postshooting. Family support and benevolence beliefs at 6 months were also found to mediate the relationship between sexual trauma history and both depressive and PTSD symptoms 12 months postshooting.

A second research team embedded at VT, Hughes et al. (2011) analyzed the impact of the campus shooting using cross-sectional data from a sample of 4,639 students who completed a web-based survey three to four months after the incident. High levels of PTSD symptoms were reported by 15.4% of respondents. Individuals who experienced a loss (i.e., injury or death of someone close) or were unable to confirm the safety of friends during or immediately after the shooting were more likely to have elevated PTSD symptoms three to four months postshooting. Overall, women reported more PTSD symptoms than men; the authors speculate that this finding was due to significantly greater losses in secondary social networks for women. Focusing on a subsample of 245 students who reported the loss of a close friend, significant other, and/or professor in the VT shooting, Smith, Abeyta, Hughes, and Jones (2014) found that PTSD symptom severity at three to four months postshooting predicted grief severity 12 months postshooting. Further, the relationship between elevated PTSD symptoms and grief severity seemed to operate indirectly via two cognitive processes, decreased self-efficacy and report of a severely disrupted worldview.

Jokela School Shooting

On November 7, 2007, a student at Jokela High School in Finland opened fire and killed six students, the principal, the school nurse, and eventually himself; several others were injured. Approximately four months after the shooting, 27% of female students and 7% of male students met criteria for probable PTSD (data were obtained from 49% of all exposed students; Suomalainen, Haravuori, Berg, Kiviruusu, & Marttunen, 2011). Factors associated with increased risk for PTSD included greater exposure to the event and female gender, while social support was found to be protective. In addition, Haravuori, Suomalainen, Berg, Kiviruusu, and Marttunen (2011) examined the same sample of students and found that greater levels of PTSD were associated with being interviewed by the media. Female students were more likely than males to report feeling poorly after being interviewed about the shooting. In terms of following news coverage of the event, both genders reported more negative affect as a result of greater media exposure, but this finding was stronger for females than for males.

Northern Illinois University Shooting

On February 14, 2008, a former student at Northern Illinois University (NIU) entered a large lecture hall and opened fire, wounding 18 and killing five students before taking his own life. As with Littleton and colleagues at VT, an embedded researcher (Orcutt) was conducting an ongoing longitudinal study examining mediators of risk for sexual revictimization among women. Orcutt and colleagues surveyed the women in the ongoing study 17 days postshooting as well as five additional timepoints spaced approximately 6 months apart, with the last survey occurring approximately 2.5 years postshooting.

Using three waves of data (preshooting, and one and seven months postshooting), Kumpula, Orcutt, Bardeen and Varkovitzky (2011) found that experiential avoidance at preshooting significantly predicted three of the four posttraumatic stress symptom clusters at one month postshooting after controlling for level of exposure to the shooting and peritraumatic dissociation.

Preshooting experiential avoidance also significantly predicted level of peritraumatic dissociation reported one month postshooting. Over time, while peritraumatic dissociation was significantly related to symptoms at one month postshooting, it was not predictive of symptoms at seven months postshooting. Experiential avoidance, on the other hand, did continue to exert an effect on symptom levels at seven months postshooting suggesting that experiential avoidance functions to promote and maintain the presence of various posttraumatic stress symptoms. Relatedly, Bardeen, Kumpula, and Orcutt (2013) tested a model of emotion regulation difficulties and posttraumatic stress symptomatology (PTSS) using the same three timepoints. Emotion regulation difficulties and PTSS mutually influenced each other between preshooting and one month postshooting, but not between one and seven months postshooting. Instead, one month postshooting emotion regulation difficulties predicted seven month postshooting PTSS, but not vice versa.

Miron, Orcutt, and Kumpula (2014) examined whether risk factors for probable PTSD differed for those with (a) no probable PTSD at one and seven months postshooting, (b) probable PTSD at one month postshooting only (transient stress reaction), and (c) probable PTSD at both one and seven months postshooting (prolonged distress). Results specified a number of significant preshooting and postshooting predictors, highlighting the importance of pretrauma functioning in predicting transient and prolonged distress. Postshooting emotion regulation difficulties and peritraumatic dissociation emerged as particularly strong predictors of prolonged distress.

Using all seven waves of data, Orcutt, Bonanno, Hannan and Miron (2014) recently published the first trajectory analysis examining predictors of PTSS following a mass shooting. Four trajectories were identified: (1) minimal impact resilience (60.9%), (2) high impact-recovery (29.1%), (3) moderate impact-moderate symptoms (8.2%), and (4) chronic dysfunction (1.8%). Although PTSS clearly increased for most classes at one month postshooting, by seven months postshooting each class was at or very close to preshooting levels of PTSS. Race, age, shooting exposure, preshooting trauma exposure, selected emotion regulation strategies, and preshooting experiential avoidance significantly predicted class membership.

In the case of the NIU shooting, all individuals experienced a similar traumatic event and importantly, the trauma exposure can be considered “fateful” (i.e., outside of the victims’ control), thus mitigating the problem of gene-trauma correlation (i.e., trauma exposure is in part determined by heritable factors). These unique characteristics, coupled with the existence of preshooting information, created a unique opportunity to examine gene x environment (G X E) interactions. Mercer et al. (2012) examined G X E interactions among 204 participants who had provided a saliva sample for DNA analysis and who did not present with preshooting PTSD symptoms. Focusing on the serotonin transporter, Mercer et al. found that proximity to the shooting was highly associated with PTSS and that the low-expressing genotypes had significantly higher PTSD symptoms one month postshooting compared with higher-expressing genotypes, controlling for the degree of shooting exposure.

Finally, in the weeks following the mass shooting, a subset of 58 women from the NIU Trauma Study participated in an expressive writing task where they wrote about their deepest thoughts and feelings about the NIU shooting for up to 20 minutes Reddy, Seligowski, Rabenhorst, and Orcutt (in press). The hypothesis that prospective PTSS would be predicted by cognitive-emotional processing during writing was generally not supported, however exploratory results were suggestive of the notion that processes may operate differently as a function of exposure level.

Summary and Conclusions

Consistent with the conclusion of Norris (2007), we also assert that the psychological consequences of directly experiencing or witnessing a mass shooting are often serious. Cumulatively, the studies highlighted in this guide illuminate several factors that increase risk for distress, including pretrauma vulnerability, exposure to the event, resource loss, and maladaptive coping. In addition, several factors that may be protective in the wake of mass shootings have been identified, including social support, greater self-efficacy and self-worth beliefs, and active coping.

Because of the public and fateful nature of mass shootings, they afford a unique, albeit tragic, opportunity to examine predictors of adjustment, particularly when preshooting data are available. To date, findings from the mass shooting literature appear generally consistent with findings from the study of a range of trauma exposures. For example, increased exposure levels are predictive of increased adjustment problems. Further, the single trajectory study to date is consistent with emerging trajectory research in other trauma exposures and populations. The extant literature however is clearly limited by the number of research teams, populations available, and the variables of focus. Recent longitudinal work has primarily involved college-aged women in the United States. That said, however, the embedded research teams of Littleton and Orcutt, for example, were investigating trauma prior to the shooting and thus had included many preshooting variables identified by previous research as predictive of adjustment following trauma exposure.

Of note, mass shootings are public and publicized, in contrast to other forms of trauma such as interpersonal trauma and even other violent/shooting-related trauma (e.g., military trauma). How and whether the highly public nature of the trauma affects adjustment is largely unknown, although the Harauvori et al. (2011) finding that higher levels of PTSD were associated with being interviewed by the media is preliminary evidence of relevance.

Importantly for postshooting screening and intervention, although higher levels of exposure are associated with greater distress, the extant research suggests that even low-level exposure (e.g., ability to confirm safety of friends in Hughes et al., 2011) results in widespread significant distress after a shooting.

References

Norris, F.H. (2007). **Impact of mass shootings on survivors, families and communities.** *PTSD Research Quarterly*, 18 (3), 1-7. <http://www.ptsd.va.gov/professional/newsletters/research-quarterly/V18N3.pdf>

Grills-Taquechel, A.E., Littleton, H.L., & Axsom, D. (2011). **Social support, world assumptions, and exposure as predictors of anxiety and quality of life following a mass trauma.** *Journal of Anxiety Disorders, 25*, 498-506. doi:10.1016/j.janxdis.2010.12.003

This study examined the influence of a mass trauma (the VT campus shootings) on anxiety symptoms and quality of life, as well as the potential vulnerability/protective roles of world assumptions and social support. Pretrauma adjustment data, collected in the six months prior to the shooting, was examined along with two-month postshooting data in a sample of 298 female students enrolled at the university at the time of the shootings. Linear regression analyses revealed consistent predictive roles for world assumptions pertaining to control and self-worth as well as family support. In addition, for those more severely exposed to the shooting, greater belief in a lack of control over outcomes appeared to increase vulnerability for posttrauma physiological and emotional anxiety symptoms. Implications of the results for research and intervention following mass trauma are discussed.

Haravuori, H., Suomalainen, L., Berg, N., Kiviruusu, O., & Marttunen, M. (2011). **Effects of media exposure on adolescents traumatized in a school shooting.** *Journal of Traumatic Stress, 24*, 70-77. doi:10.1002/jts.20605

This study analyzes the impact of the media on adolescents traumatized in a school shooting. Participants were trauma-exposed students ($n = 231$) and comparison students ($n = 526$), aged 13-19 years. A questionnaire that included the Impact of Event Scale and a 36-item General Health Questionnaire was administered four months after the shooting. Being interviewed was associated with higher scores on the Impact of Event Scale ($p = .005$), but posttraumatic symptoms did not differ between those who refused to be interviewed and those not approached by reporters. Following a higher number of media outlets did not affect symptoms.

Hughes, M., Brymer, M.J., Chiu, W.T., Fairbank, J.A., Jones, R.T., Pynoos, R.S., et al. (2011). **Posttraumatic stress among students after the shootings at Virginia Tech.** *Psychological Trauma: Theory, Research, Practice, and Policy, 3*, 403-411. doi:10.1037/a0024565

On April 16, 2007, in the worst campus shooting incident in U.S. history, 49 students and faculty at Virginia Polytechnic Institute and State University (VT) were shot, of whom 32 were killed. A cross-sectional survey of 4,639 VT students was carried out the following summer/fall to assess PTSD symptoms using the Trauma Screening Questionnaire (TSQ). High levels of posttraumatic stress symptoms (probable PTSD) were experienced by 15.4% of respondents three to four months following the shooting. Exposure to trauma-related stressors varied greatly, from 64.5% unable to confirm the safety of friends to 9.1% who had a close friend killed. Odds ratios for stressors predicting high levels of posttraumatic stress symptoms were highest for losses (2.6-3.6; injury/death of someone close) and inability to confirm the safety of friends (2.5). Stressor effects were unrelated to age, gender, and race/ethnicity. The exposures that explained most of the cases of high posttraumatic stress symptoms were inability to confirm the safety of friends (30.7%); death of a (not close) friend (20.3%); and death of a close friend (10.1%). The importance of high-prevalence low-impact

stressors resulted in a low concentration of probable cases of PTSD, making it difficult to target a small, highly exposed segment of students for mental health treatment outreach. The high density of student social networks will likely make this low concentration of probable PTSD a common feature of future college mass trauma incidents, requiring broad-based outreach to find students needing mental health treatment interventions.

Kumpula, M.J., Orcutt, H.K., Bardeen, J.R., & Varkovitzky, R.L. (2011). **Peritraumatic dissociation and experiential avoidance as prospective predictors of posttraumatic stress symptoms.** *Journal of Abnormal Psychology, 120*, 617-627. doi:10.1037/a0023927

Peritraumatic dissociation (PD) and experiential avoidance (EA) have been implicated in the etiology of PTSS; however, the function of these two factors in the onset and maintenance of PTSS following a potentially traumatic event is unclear. The temporal relationships between EA, PD, and the four clusters of PTSS proposed by the Simms/Watson dysphoria model were examined in a three-wave prospective investigation of 532 undergraduate women participating in an ongoing longitudinal study at the time of a campus shooting. Path analyses indicated that preshooting EA predicted greater PD, intrusions, and dysphoria symptoms approximately one month postshooting. PD was associated with increased symptomatology across all four clusters one-month postshooting, while one-month postshooting EA was associated with higher dysphoria and hyperarousal symptoms eight months postshooting. PD had a significant indirect effect on all four PTSS clusters eight months postshooting via 1-month postshooting symptom reports. The results suggest that both EA and PD show unique influences as risk factors for PTSS following a potentially traumatic event.

Littleton, H.L., Axsom, D., & Grills-Taquechel, A.E. (2009). **Adjustment following the mass shooting at Virginia Tech: The roles of resource loss and gain.** *Psychological Trauma: Theory, Research, Practice, and Policy, 1*, 206-219. doi:10.1037/a0017468

Unfortunately, many individuals will be exposed to traumatic events during their lifetime. The experience of loss and gain of valued resources may represent important predictors of psychological distress following these experiences. The current study examined the extent to which loss and gain of interpersonal and intrapersonal resources (e.g., hope, intimacy) predicted psychological distress among college women following the mass shooting at VT. Participants were 193 college women from whom prevent psychological distress and social support data had been obtained. These women completed surveys regarding their psychological distress, coping, and resource loss and gain two- and six-months after the VT shooting. Structural equation modeling supported that resource loss predicted greater psychological distress six months after the shooting whereas resource gain was weakly related to lower levels of psychological distress. The study also revealed that social support and psychological distress prior to the shooting predicted resource loss, and social support and active coping with the shooting predicted resource gain. Implications of the results for research examining the roles of resource loss and gain in posttrauma adjustment and the development of interventions following mass trauma are discussed.

Littleton, H.L., Axsom, D., & Grills-Taquechel, A.E. (2011). **Longitudinal evaluation of the relationship between maladaptive trauma coping and distress: Examination following the mass shooting at Virginia Tech.** *Anxiety, Stress, and Coping*, 24, 273-290. doi:10.1080/10615806.2010.500722 Growing evidence supports that the coping strategies that individuals utilize are a key predictor of distress following trauma. However, there is limited longitudinal research examining the relationship between psychological distress and coping over time, and even less research examining the possibility of reciprocal relationships between distress and coping, despite the fact that prior theoretical work posits such a relationship. The current study modeled the relationship between distress (PTSD and general distress) and maladaptive coping over time in a sample of 368 college women exposed to the mass shooting at VT. Participants completed web surveys regarding their distress, shooting-related coping, and shooting-related PTSD two months, six months, and one year following the shooting. They also completed measures of their psychological distress prior to the shooting as part of an unrelated study. A structural cross-lagged model with latent variables supported a reciprocal relationship between maladaptive coping and general psychological distress over time. In contrast, the cross-lagged model evaluating the relationship between PTSD and maladaptive coping supported that PTSD symptoms predicted coping over time, but there was no reciprocal relationship between coping and PTSD. Implications of the findings for future work examining adjustment following traumatic events are discussed.

Littleton, H.L., Grills-Taquechel, A.E., Axsom, D., Bye, K., & Buck, K.S. (2012). **Prior sexual trauma and adjustment following the Virginia Tech campus shootings: Examination of the mediating role of schemas and social support.** *Psychological Trauma: Theory, Research, Practice, and Policy*, 4, 578-586. doi:10.1037/a0025270 A sizable body of research supports trauma's cumulative nature. However, few studies have evaluated potential mechanisms through which the experience of multiple traumas leads to elevated distress. The current study sought to evaluate differences between sexual trauma victims and women who had not experienced sexual trauma in their adjustment following a mass trauma (college women exposed to the 2007 VT campus shooting). In addition, the study examined whether maladaptive schema change (lower self-worth and less belief in benevolence) and social support mediated the relationship between experiencing multiple traumas (sexual trauma and the campus shooting) and distress. The sample consisted of 215 college women who were assessed preshooting as well as two months and one year following the campus shooting. Women who had experienced sexual trauma (either contact sexual abuse or sexual assault) were compared to those who had not on their one-year postshooting PTSD and depressive symptoms. Results supported that sexual trauma victims reported significantly more depressive symptoms and shooting-related PTSD as well as less belief in benevolence and lower family support. Family support and benevolence beliefs at the two-month postshooting assessment were significant mediators of the association between sexual trauma history and depression and PTSD. Implications of the findings for future research evaluating the cumulative impact of multiple traumatic experiences are discussed.

Mercer, K.B., Orcutt, H.K., Quinn, J.F., Fitzgerald, C.A., Conneely, K.N., Barfield, R.T., et al. (2012). **Acute and posttraumatic stress symptoms in a prospective gene x environment study of a university campus shooting.** *Archives of General Psychiatry*, 69, 89-97. doi:10.1001/archgenpsychiatry.2011.109 *Context:* The serotonin transporter (SLC6A4) has been associated with several stress-related syndromes including PTSD. The ability to detect meaningful associations is largely dependent on reliable measures of preexisting trauma. *Objective:* To study the association of genetic variants within SLC6A4 with acute and posttraumatic stress symptoms in a civilian cohort with known levels of preexisting trauma and PTSD symptoms collected prior to a shared index traumatic event. *Design:* Ongoing longitudinal study. *Setting:* On February 14, 2008, a lone gunman shot multiple people on the campus of NIU in DeKalb, Illinois, killing 5 and wounding 21. As part of an ongoing longitudinal study on that campus, a cohort of female undergraduate students, interviewed prior to the shooting, completed follow-up trauma-related measures including PTSD symptom severity (follow-up survey was launched 17 days postshooting; $n = 691$). To obtain DNA, salivary samples were collected from a subset of the original study population based on willingness to participate ($n = 276$). *Participants:* 204 undergraduate women. *Main Outcome Measures:* SLC6A4 polymorphisms STin2, 5-HTTLPR, and rs25531 were genotyped in 235 individuals. *Results:* We found that although the STin2 variant and 5-HTTLPR alone did not associate with increased PTSD symptoms, rs25531 and the 5-HTTLPR multimarker genotype (combined 5-HTTLPR and rs25531) were associated with significantly increased acute stress disorder symptoms at two to four weeks postshooting ($n = 161$; $P < .05$). This association remained significant when controlling for race and for level of shooting exposure ($n = 123$; $P < .007$). The association was most robust with the 5-HTTLPR multimarker genotype and avoidance symptoms ($P = .003$). *Conclusions:* These data suggest that differential function of the serotonin transporter may mediate differential response to a severe trauma. When examined in a relatively homogenous sample with shared trauma and known prior levels of child and adult trauma, the 5-HTTLPR multimarker genotype may serve as a useful predictor of risk for PTSD-related symptoms in the weeks and months following the trauma.

Miron, L.R., Orcutt, H.K., & Kumpula, M.J. (2014). **Differential predictors of transient stress versus posttraumatic stress disorder: Evaluating risk following targeted mass violence.** *Behavior Therapy*. doi:10.1016/j.beth.2014.07.005 Schools have become a common incident site for targeted mass violence, including mass shootings. Although exposure to mass violence can result in significant distress, most individuals are able to fully recover over time, while a minority develop more pervasive pathology, such as PTSD. The present study investigated how several pre- and posttrauma factors predict PTSS in both the acute and distal aftermath of a campus mass shooting using a sample with known levels of pretrauma functioning ($N = 573$). While the largest proportion of participants evidenced resilience following exposure to the event (46.1%), many reported high rates of PTSS shortly after the shooting (42.1%) and a smaller proportion (11.9%) met criteria for probable PTSD both in the acute and more distal aftermath of the event. While several preshooting

factors predicted heightened PTSS after the shooting, prior trauma exposure was the only preshooting variable shown to significantly differentiate between those who experienced transient versus prolonged distress. Among postshooting predictors, individuals reporting greater emotion dysregulation and peritraumatic dissociative experiences were over four times more likely to have elevated PTSS eight months postshooting compared to those reporting less dysregulation and dissociative experiences. Individuals with less exposure to the shooting and greater satisfaction with social support were more likely to recover from acute distress. Results suggest that, while pretrauma factors may differentiate between those who are resilient in the aftermath of a mass shooting from those who experience heightened distress, several event-level and posttrauma coping factors help distinguish between those who eventually recover and those whose PTSD symptoms persist over time.

North, C.S., McCutcheon, V.V., Spitznagel, E.L., & Smith, E.M. (2002). **Three-year follow-up of survivors of a mass shooting episode.**

Journal of Urban Health: Bulletin of the New York Academy of Medicine, 79, 383-391. doi:10.1093/jurban/79.3.383 This report describes a three-year follow-up study of survivors of a mass shooting incident. Acute-phase and one-year follow-up data from this incident have been previously reported. The Diagnostic Interview Schedule/Disaster Supplement was used to assess 116 survivors at one to two months and again one and three years later, with an 85% reinterview rate. Examining the course of postdisaster PTSD and major depression in individuals allowed detailed consideration of remissions and delayed detection of disorders not possible from data presenting overall rates across different time frames. Only about one half of the PTSD cases identified at any time over three years were in remission at the three-year follow-up. Those who did not recover from PTSD diverged from those who recovered at three years by reporting increased numbers of symptoms over time, especially avoidance and numbing symptoms. Although women and people with preexisting disorders were at greater risk for the development of PTSD, these variables did not predict chronicity. Chronicity of PTSD was predicted by functional impairment and seeking mental health treatment at baseline. Chronicity of major depression was predicted by report of family history of depression and treatment for paternal alcohol problems. No delayed cases of PTSD were identified. Studies are needed to compare these characteristics of the course of PTSD with other populations, using consistent methodology to allow valid comparison.

North, C.S., Smith, E.M., & Spitznagel, E.L. (1994). **Posttraumatic stress disorder in survivors of a mass shooting.** *American Journal of Psychiatry*, 151, 82-88. *Objective:* PTSD has been best studied among combat Veterans. Less is known about PTSD among civilian populations exposed to traumatic events. A recent mass murder spree by a gunman in a cafeteria in Killeen, Texas, has provided a unique opportunity to study acute-phase civilian responses to a combat type of experience. *Method:* Approximately one month after the disaster, 136 survivors were interviewed with the Diagnostic Interview Schedule/Disaster Supplement. *Results:* In the acute postdisaster period, 20% of the men and 36% of the women met criteria for PTSD, which was the most prevalent psychiatric disorder. Most subjects who developed PTSD had no

history of psychiatric illness. Rates of preexisting PTSD were relatively high and did not predict the presence of PTSD after the disaster. A history of other predisaster psychiatric disorders predicted postdisaster PTSD in women but not in men. One-half of the women and one-fourth of the men with postdisaster PTSD also met criteria for another postdisaster psychiatric diagnosis, especially major depression. Psychopathology was infrequent in subjects without PTSD. *Conclusions:* Disaster intervention workers may be able to most effectively use limited mental health provider resources in the acute postdisaster period by focusing on screening for acute PTSD, which will identify the majority of cases with psychiatric disorders following this kind of disaster. Survivors who have no history of psychiatric disorder should be screened along with those who do because in the present study, they represented the majority of the PTSD cases. Subjects with a history of major depression and women with preexisting psychopathology may be especially vulnerable to posttraumatic syndromes. Individuals with PTSD should be further examined for additional psychiatric diagnoses that may complicate recovery, especially major depression. PTSD among survivors of civilian combat-like experiences does not appear to present in the same way that it has been described in Vietnam Veterans.

North, C.S., Smith, E.M., & Spitznagel, E.L. (1997). **One-year follow-up of survivors of a mass shooting.** *American Journal of Psychiatry*, 154, 1696-1702. *Objective:* This report describes a one-year follow-up study of survivors of a mass shooting incident. Acute-phase data from this incident were previously reported in this journal. *Method:* The Diagnostic Interview Schedule/Disaster Supplement was used to assess 136 survivors at one to two months and again a year later, with a 91% reinterview rate. *Results:* In the acute postdisaster period, 28% of subjects met criteria for PTSD, and 18% of subjects qualified for another active psychiatric diagnosis. At follow-up, 24% of subjects reported a history of postdisaster PTSD (17% were currently symptomatic), and 12% another current psychiatric disorder. Half (54%) of all 46 individuals identified as having had PTSD at either interview were recovered at follow-up, and no index predictors of recovery were identified. There were no cases of delayed-onset PTSD (beyond six months). Considerable discrepancy in identified PTSD cases was apparent between index and follow-up. Inconsistency in reporting, rather than report of true delayed onset, was responsible for all PTSD cases newly identified at one year. The majority of subjects with PTSD at index who were recovered at follow-up reported no history of postdisaster PTSD at follow-up, suggesting considerable influence of fading memory. *Conclusions:* This study's findings suggest that disaster research that conducts single interviews at index or a year later may overlook a significant portion of PTSD. The considerable diagnostic comorbidity found in this study was the one robust predictor of PTSD at any time after the disaster. Disaster survivors with a psychiatric history, especially depression, may be most vulnerable to developing PTSD and therefore may deserve special attention from disaster mental health workers.

Orcutt, H.K., Bonanno, G.A., Hannan, S.M., & Miron, L.R. (2014). **Prospective trajectories of posttraumatic stress in college women following a campus mass shooting.** *Journal of Traumatic Stress*, 27, 249-256. doi:10.1002/jts.21914 In a sample with known

levels of preshooting posttraumatic stress (PTS) symptoms, we examined the impact of a campus mass shooting on trajectories of PTS in the 31 months following the shooting using latent growth mixture modeling. Female students completed seven waves of a longitudinal study (sample sizes ranged from 812 to 559). We identified four distinct trajectories ($n = 660$): (a) minimal impact-resilience (60.9%), (b) high impact-recovery (29.1%), (c) moderate impact-moderate symptoms (8.2%), and (d) chronic dysfunction (1.8%). Individuals in each trajectory class remained or returned to preshooting levels of PTS approximately six months postshooting. The minimal impact-resilience class reported less prior trauma exposure ($h^2 = .13$), less shooting exposure ($h^2 = .07$), and greater emotion regulation skills than all other classes ($h^2 > .30$). The chronic dysfunction class endorsed higher rates of experiential avoidance prior to the shooting than the minimal impact-resilient and high impact-recovery classes ($h^2 = .15$), as well as greater shooting exposure than the recovery class ($h^2 = .07$). Findings suggest that preshooting functioning and emotion regulation distinguish between those who experience prolonged distress following mass violence and those who gradually recover.

Schwarz, E.D., & Kowalski, J.M. (1991). **Malignant memories: PTSD in children and adults after a school shooting.** *Journal of the American Academy of Child and Adolescent Psychiatry, 30*, 936-944. doi:10.1097/00004583-199111000-00011 64 children and 66 adults were screened for PTSD 6 to 14 months after a school shooting. Although there were no differences in overall frequencies of DSM-III-R diagnoses or cluster endorsements, there were developmental influences. PTSD was associated more with emotional states recalled from the disaster than with proximity. Emotional states mediated the formation of malignant memories leading to symptomatology, suggesting that postdisaster intervention be offered on the basis of degree of emotional reaction as well as proximity.

Schwarz, E.D., Kowalski, J.M., & McNally, R.J. (1993). **Malignant memories: Posttraumatic changes in memory in adults after a school shooting.** *Journal of Traumatic Stress, 6*, 545-553. doi:10.1007/BF00974322 The study explores changes in retrospective reports of experiences after a man-made disaster. 6 and 18 months after a school shooting, 12 school personnel recalled in identical self-report questionnaires their proximity to the site, and emotional, including life threat, and sensory experiences the day of the incident. All changed some aspect of their recall on retest. Those close to the shooting increased and those far decreased their reported proximity to the site; and most respondents both enlarged and diminished at the same time reports of specific emotional, life threat, and sensory experiences. Enlargement on retest appeared associated with PTSD symptoms, while diminishment with lessening of anxiety and depression and increase in self confidence. The authors offer these preliminary findings for further inquiry into the biopsychological basis of posttraumatic memory.

Smith, A.J., Abeyta, A.A., Hughes, M., & Jones, R.T. (2014). **Persistent grief in the aftermath of mass violence: The predictive roles of posttraumatic stress symptoms, self-efficacy, and disrupted worldview.** *Psychological Trauma: Theory, Research, Practice, and Policy*. doi:10.1037/tra0000002 This study tested a

conceptual model merging anxiety buffer disruption and social-cognitive theories to predict persistent grief severity among students who lost a close friend, significant other, and/or professor/teacher in tragic university campus shootings. A regression-based path model tested posttraumatic stress (PTS) symptom severity three to four months postshooting (Time 1) as a predictor of grief severity one year postshootings (Time 2), both directly and indirectly through cognitive processes (self-efficacy and disrupted worldview). Results revealed a model that predicted 61% of the variance in Time 2 grief severity. Hypotheses were supported, demonstrating that Time 1 PTS severity indirectly, positively predicted Time 2 grief severity through undermining self-efficacy and more severely disrupting world-view. Findings and theoretical interpretation yield important insights for future research and clinical application.

Suomalainen, L., Haravuori, H., Berg, N., Kiviruusu, O., & Marttunen, M. (2011). **A controlled follow-up study of adolescents exposed to a school shooting — Psychological consequences after four months.** *European Psychiatry, 26*, 490-497. doi:10.1016/j.eurpsy.2010.07.007 *Background:* In November 2007, a student shot eight people and himself at Jokela High School, Finland. This study aims to evaluate the long-term effects of exposure to a school shooting among adolescents. *Method:* Associations between psychological outcomes and background factors were analysed and compared with “comparison students” four months after the incident. A questionnaire including Impact of Event Scale (IES) and General Health Questionnaire (GHQ-36) was used. *Results:* Half of the females and a third of the males suffered from posttraumatic distress. High level of posttraumatic distress (IES ≥ 35), predicting PTSD, was observed in 27% of the females and 7% of the males. The odds ratio was 6.4 (95% confidence interval 3.5-10.5) for having high levels of posttraumatic distress. Severe or extreme exposure and female gender were found to increase the risk. 42% of the females and 16% of the males had psychiatric disturbance (GHQ ≥ 9). Severe or extreme exposure, older age, and female gender increased the risk. Perceived support from family and friends was found to be protective. *Conclusions:* The observed risk and protective factors were similar to earlier studies. Follow-up will be essential in identifying factors predicting persisting trauma-related symptoms in adolescence.

ADDITIONAL CITATIONS

Bardeen, J.R., Kumpula, M.J., & Orcutt, H.K. (2013). **Emotion regulation difficulties as a prospective predictor of posttraumatic stress symptoms following a mass shooting.** *Journal of Anxiety Disorders, 27*, 188-196. doi:10.1016/j.janxdis.2013.01.003 A strong positive association between emotion regulation difficulties (ERD) and PTSS has been consistently evidenced in cross-sectional research. However, a lack of prospective research has limited hypotheses regarding the temporal relationship between trauma exposure, ERD, and PTSS. The present prospective study investigated the role of pretrauma difficulties with emotion regulation in the development of PTSS following exposure to a potentially traumatic event. Between Time 1 (T1) and Time 2 (T2), a mass shooting occurred at the participants' ($n = 691$) university

campus. ERD and PTSS were assessed prior to the shooting (T1), in the acute aftermath of the shooting (T2), and approximately eight months later (T3). Using a cross-lagged panel design, ERD was found to prospectively predict PTSS from T1 to T2 and T2 to T3. Additionally, PTSS prospectively predicted ERD from T1 to T2. However, T2 PTSS failed to predict T3 PTSS. Results indicate that ERD and PTSS are reciprocally influential from pre- to postshooting. Further, results suggest that emotion dysregulation in the aftermath of a potentially traumatic event influences one's ability to recover from PTSS over time, even after accounting for the effects of existing symptomatology. To examine the specificity of temporal relations between ERD and PTSS a second cross-lagged panel design, in which a general distress construct was substituted for PTSS, was conducted. Results of this analysis, as well as conceptual and clinical implications, will be discussed.

Classen, C.C., Koopman, C., Hales, R.E., & Spiegel, D. (1998).

Acute stress disorder as a predictor of posttraumatic stress symptoms. *American Journal of Psychiatry*, 155, 620-624.

Objective: Using the DSM-IV diagnostic criteria for acute stress disorder, the authors examined whether the acute psychological effects of being a bystander to violence involving mass shootings in an office building predicted later posttraumatic stress symptoms. *Method:* The participants in this study were 36 employees working in an office building where a gunman shot 14 persons (8 fatally). The acute stress symptoms were assessed within 8 days of the event, and PTSS of 32 employees were assessed 7 to 10 months later. *Results:* According to the Stanford Acute Stress Reaction Questionnaire, 12 (33%) of the employees met criteria for the diagnosis of acute stress disorder. Acute stress symptoms were found to be an excellent predictor of the subjects' PTSS 7 to 10 months after the traumatic event. *Conclusions:* These results suggest not only that being a bystander to violence is highly stressful in the short run, but that acute stress reactions to such an event further predict later PTSS.

Creamer, M.C., Burgess, P.M., & Pattison, P. (1992). **Reaction to trauma: A cognitive processing model.** *Journal of Abnormal Psychology*, 101, 452-459. doi:10.1037//0021-843X.101.3.452

We integrated existing cognitive processing models of posttrauma reactions into a longitudinal model. Data were obtained after a multiple shooting in a city office block. The subject group comprised 158 office workers who were in the building at the time of the shootings. The methodology of this research was a repeated measures survey, with data collection at 4, 8, and 14 months posttrauma. Measures included the Impact of Events Scale (IES) and the Symptom Checklist-90-Revised. A path analysis was performed with the IES as an indication of cognitive processing. Intrusion and avoidance were shown to mediate between exposure to trauma and symptom development. Intrusion was also found to be negatively related to subsequent symptom levels. The findings provide provisional support for a cognitive processing model.

Hartnett, J.L., & Skowronski, J.J. (2010). **Affective forecasts and the Valentine's Day shootings at NIU: People are resilient, but unaware of it.** *The Journal of Positive Psychology*, 5, 275-280. doi:10.1080/17439760.2010.498615

People overestimate the extent to which emotion-producing life events affect subsequent affect.

However, research has yet to conclusively demonstrate that this phenomenon occurs following significant trauma affecting entire communities, or whether it applies to predictions of discrete emotions. Exploring such issues, student reports of emotion states were collected both before and after the on campus Valentine's Day, 2008 shootings at NIU. A separate group of students not on campus when the shootings occurred provided emotion state reports and predictions of the emotions they would expect to experience two weeks after a shooting occurred. Examination of these data suggests that: (1) emotion states of NIU students reflected resilience, and (2) students made affective forecasting errors indicating that this resilience was unexpected. These data confirm results of prior affective forecasting studies, extending them to cases of traumatic experiences, and suggest that such studies can expand their focus to explore specific postevent emotions.

Hawdon, J., & Ryan, J. (2012). **Well-being after the Virginia Tech mass murder: The relative effectiveness of face-to-face and virtual interactions in providing support to survivors.** *Traumatology*, 18, 3-12. doi:10.1177/1534765612441096

Acts of mass violence such as terrorist attacks or school shootings victimize more than those directly involved. Witness to these acts and members of the attacked community are at risk for increased levels of PTSD, depression, and other forms of mental distress. Research has clearly established that social support is critically important for recovering from such traumatic events as being imbedded in a strong private network of friends and family can provide the emotional support survivors need to effectively cope with the tragedy. Given the increased use of e-mail, text messaging, and social networking sites among youth, it is likely that survivors of mass violence use technology to communicate with the members of their private networks. However, it is unclear if this "virtual interaction" can be as effective as face-to-face interaction in providing the needed support. Our research addresses this question using data collected after the 2007 mass murder of 32 people at VT. Using data collected from 543 VT students, we predict levels of emotional and behavioral well-being five months after the shootings. Our central independent variables include measures of how frequently the students communicated with their friends and families in the week following the tragedy and if these communications were in person or "virtual." Results indicate that face-to-face interaction significantly improved well-being; however, interacting with friends and family members through email, text messaging, or some form of online communication was unrelated to well-being. Our findings highlight the importance of face-to-face interactions after acts of mass violence.

Littleton, H.L., Kumpula, M.J., & Orcutt, H.K. (2011). **Posttraumatic symptoms following a campus shooting: The role of psychosocial resource loss.** *Violence & Victims*, 26, 461-476. doi:10.1891/0886-6708.26.4.461

Conservation of resources (COR) theory has proven a useful framework for understanding posttrauma adjustment. A key tenet of this theory is the centrality of resource loss in determining adjustment. However, COR theory research has often been limited by retrospective research design, a focus on material loss (e.g., one's home), and a lack of attention

to other adjustment predictors. The current study examined whether psychosocial resource loss prospectively predicted PTSD symptomatology both immediately and eight months following a campus shooting in a sample of college women ($n = 691$). Results supported that resource loss predicted symptomatology, even after controlling for other predictors including prior trauma, psychological distress, initial PTSD symptomatology, and shooting exposure. Implications of the results for research and intervention following mass trauma are discussed.

North, C.S., Spitznagel, E.L., & Smith, E.M. (2001). **A prospective study of coping after exposure to a mass murder episode.** *Annals of Clinical Psychiatry, 13*, 81-87. doi:10.1023/A:1016615607649

In a study of 136 survivors of a mass murder spree, multidimensional scaling identified clusters of responses mapping from 75 coping behaviors described by victims. This powerful method identified three coping dimensions: (a) Active Outreach versus Passive Isolation, (b) Informed Pragmatism versus Abandonment of Control, and (c) Reconciliation/Acceptance versus Evading the Status Quo. These coping dimensions were used to predict change in psychiatric status prospectively assessed with structured diagnostic interviews at index 3-4 months after the event and follow-up assessments one and three years later. Statistically significant changes in the positive direction on each of the three dimensions in this study were associated with reductions of 47-79% of the odds for acute postdisaster major depression, PTSD, and any non-PTSD disorder. These findings suggest mechanisms for development of therapeutic techniques capitalizing on encouraging active outreach, informed focus and pragmatism, and reconciliation and acceptance, and reduction of passive and isolative behaviors, resignation of control, and avoidance of realities of the postdisaster situation.

Reddy, M.K., Seligowski, A.V., Rabenhorst, M.M., & Orcutt, H.K. [in press]. **Predictors of expressive writing content and posttraumatic stress following a mass shooting.** *Psychological Trauma: Theory, Research, Practice, and Policy*. This study examined relations among experiential avoidance, state dissociation during writing, cognitive-emotional processing, and posttraumatic stress in the context of an expressive writing task among 58 undergraduate females who were students at a large Midwestern University that had recently experienced a mass shooting. Experiential avoidance significantly predicted reported suppression during the writing task. Additionally, PTSS at the time of the writing task were significantly associated with state dissociation, suppression, and the use of positive emotion words during the writing. Finally, at the zero-order level, prospective PTSS were associated with state dissociation and suppression during the earlier writing task. However, in a full regression model, only experiential avoidance and PTSS at the time of the writing task significantly predicted prospective PTSS. Supplemental analyses suggest processes may operate differently across levels of exposure. Findings from the present study provide further support for the role of experiential avoidance, state dissociation during writing, and cognitive-emotional processing in predicting PTSS. Additionally, experiential avoidance may play an important role in how individuals use cognitive-emotional processing to narrate a traumatic event.

Stephenson, K.L., Valentiner, D.P., Kumpula, M.J., & Orcutt, H.K. (2009). **Anxiety sensitivity and posttrauma stress symptoms in female undergraduates following a campus shooting.** *Journal of Traumatic Stress, 22*, 489-496. doi:10.1002/jts.20457 Participants were recruited from female undergraduate students participating in an ongoing longitudinal study at the time of a campus shooting. 85% ($N = 691$) of the 812 students who were invited to participate in the current study completed questionnaires an average of 27 days following a campus shooting. In a mixed cross-sectional and longitudinal design, the cognitive and the physical concerns dimensions of postshooting anxiety sensitivity accounted for unique variance in posttrauma stress symptom severity (cross-sectional), after controlling for preshooting psychological symptoms (longitudinal). The cognitive concerns dimension showed the strongest relationship. Anxiety sensitivity also appeared to moderate the relationships of hyperarousal symptoms with reexperiencing and numbing symptoms.

Vicary, A.M., & Fraley, R.C. (2010). **Student reactions to the shootings at Virginia Tech and Northern Illinois University: Does sharing grief and support over the internet affect recovery?** *Personality and Social Psychology Bulletin, 36*, 1555-1563. doi:10.1177/0146167210384880 After the shootings at VT and NIU, many students gravitated to the Internet for support. Despite the fact that the Internet plays a major role in how people live their lives in contemporary society, little is known about how people use the Internet in times of tragedy and whether this use affects well-being. To address these issues, the current study assessed the types of online activities more than 200 VT and NIU students participated in two weeks after the shootings and again six weeks later, as well as their depressive and PTSD symptoms. Results showed that two weeks after the shootings, nearly 75% of students were suffering from significant psychological distress. Additionally, students participated in numerous online activities related to the shootings. Importantly, students perceived their Internet activities as being beneficial, although there was no evidence that Internet use affected their well-being.