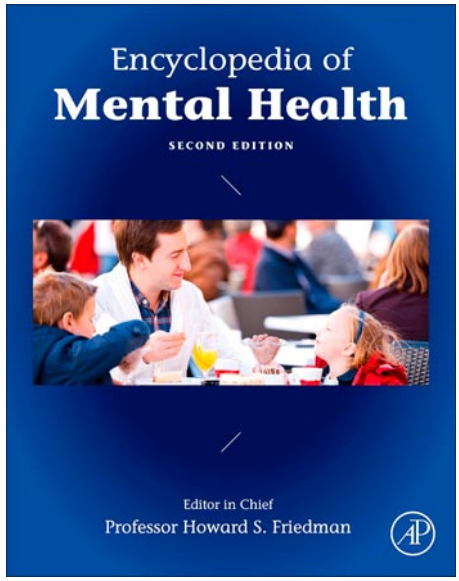

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Terrorism and Health

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Glossary

Indirect exposure Witnessing a collective trauma through media sources or through exposure to personal narratives in the context of one's professional role.

Posttraumatic growth Positive psychological change that occurs after struggling with a challenging life circumstance.

Relative risk appraisal Process that links exposure to an adverse event with subjective appraisal of future risk.

Religiosity Active participation in religious activities or social structures.

Resiliency Capacity of individuals to adapt successfully to disturbances/adversities that threaten the stability of their lives; the ability to 'rebound' when one's ability to function has been impaired to some degree by an adverse experience.

Resistance The ability to withstand or adapt to adversity; 'psychological immunity' to stress.

Secondary stressors Practical strains that occur as a result of a larger negative event.

Definitions and Characteristics

Terrorist attacks are unique community disasters. They are random, uncontrollable, and unpredictable events, perpetrated by humans for the specific objective of generating fear and anxiety in the populace (Silver and Matthew, 2008). Although definitions of terrorism have varied, a 2012 Academic Consensus defines terrorism as a fear-generating tactic with primarily political or ideological undertones, often executed for propagandistic and psychological purposes (Schmid, 2012), even though not uniformly (Silver and Matthew, 2008). In contrast to conventional warfare, terrorist attacks are aimed at civilians rather than military combatants; the 'rules' of warfare are often completely disregarded. Consequently, the injured tend to be innocent and defenseless victims, indiscriminately harmed by brutal and often shocking means. Importantly, terrorism targets the broader population, not only those physically attacked in order to intimidate, frighten, destabilize, and impair societal functioning (Schmid, 2012). This manipulation of the cognitive and emotional mechanisms of the fear response seeks to elicit broad perceptions of a threatening surrounding environment. Such appraisal processes are integral components of the stress process generally (Lazarus and Folkman, 1984) and terrorist acts specifically (Cairns and Wilson, 1989), with potentially long-lasting psychological and physical consequences (Silver, 2011).

Terrorism can be perpetrated by individuals, organizations, and governments. Much of what is discussed in the literature is terrorism perpetrated by individuals or organizations. Although state-sponsored terrorism has received much less attention, it is a tool governments may use to protect their interests and spread their ideology on the international stage. This article will focus on the impacts of individual or organizational terrorism, as it comprises the bulk of the literature on psychosocial responses.

Terrorism impacts the population by: (1) harming the directly attacked, (2) causing illness and injury from debris and other harmful toxins released into the surrounding area (e.g., bombs exploding), (3) creating 'secondary stressors' through disruption of daily life (e.g., access to services such as healthcare and transportation) (e.g., Shalev *et al.*, 2006), (4) causing psychological distress to both the directly exposed and the broader population through indirect exposure, and (5) damaging individuals' physical health as a result of a heightened fear response. As a result of these multifaceted and far-reaching effects, terrorism has challenged clinicians, researchers, and policy makers seeking to best understand population-level reactions to these events. How are individuals and communities affected? What predicts resilience or vulnerability to the negative impacts of these events? What are the long-term repercussions of terrorism? Who is in need of interventions? Which services are most effective in promoting health following exposure to terrorism? How widely and when should services be distributed throughout the population?

Historical Perspective

Formal studies of the human psychological impact of terrorism began with studies of the conflict in Northern Ireland. Early inquiries acknowledged the potential for terrorism's long-term negative health repercussions, but lacked methodologically stringent designs (Curran, 1988). Since these early inquiries, there has been a vast expansion of studies examining responses to terrorism and exploring practical and theoretical issues using improved designs such as longitudinal assessments with representative samples. The majority of this work has focused on Israel (e.g., Berger *et al.*, 2007; Gelkopf *et al.*, 2012; Hobfoll *et al.*, 2006; Hobfoll *et al.*, 2009), the Alfred P. Murrah Federal Building bombing in Oklahoma City (e.g., North *et al.*, 2004; Pfefferbaum *et al.*, 2001), and, most prolifically, the 11 September 2001 (9/11) attacks on the World Trade Center (WTC) in New York City and the Pentagon building in Washington, DC (e.g., Schlenger *et al.*, 2002; Silver *et al.*, 2002; Silver, 2011). Other work has focused less extensively on the Madrid bombing of 2004 (e.g., Conejero and Etxebarria, 2007), the 2005 bombings of the London transportation network (e.g., Brewin *et al.*, 2010), among other events. Many of these studies have used epidemiological methods to describe responses throughout the population.

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This flourishing area of research has tangible implications for those seeking to mitigate the physical and mental health burdens often associated with acts of terrorism.

Commonly Studied Outcomes

Posttraumatic stress disorder (PTSD) and Posttraumatic stress symptoms (PTS) are by far the most commonly studied outcomes after terrorist acts (e.g., Shalev *et al.*, 2012). As stated in the DSM-IV-TR (American Psychiatric Association, 2000) (although revisions have been made to diagnostic criteria in the new 2013 DSM-V, since the extant literature uses DSM-IV or DSM-III guidelines for probable-PTSD diagnosis, DSM-V criteria will not be addressed in this article), a diagnosis of PTSD requires direct exposure to a traumatic event involving actual death or injury to oneself or the direct witnessing of such an event to another (Criterion A1), with associated fear, helplessness, or horror (Criterion A2). A PTSD diagnosis also requires at least one reexperiencing symptom (Criterion B; e.g., nightmares, persistent or recurring memories of the event), three or more avoidance symptoms (Criterion C; e.g., difficulty remembering details of the event or emotional numbing), and two or more hyperarousal symptoms (Criterion D; e.g., startling easily and difficulty sleeping). Importantly, given that PTS symptom structure in those both directly and indirectly (e.g., watched media coverage of the event or heard a personal narrative) exposed to terrorist attacks is strikingly similar (Suvak *et al.*, 2008), the utility of relying on Criterion A as a prerequisite for a PTSD diagnosis has been questioned (Brewin *et al.*, 2009). Consequently, to capture symptomatology in the broader population, researchers often examine PTS after terrorist attacks, measuring traumatic stress responses without the use of Criterion A. Such issues are particularly important in the context of terrorism, where the intention is to frighten and intimidate large populations and the vast majority of those impacted are indirectly exposed.

Other commonly studied outcomes include acute stress reactions (e.g., Gil-Rivas *et al.*, 2004; Holman *et al.*, 2008), anxiety disorders (e.g., DiMaggio *et al.*, 2007), general distress (e.g., Shalev *et al.*, 2012), functional impairment (e.g., Neria *et al.*, 2013; Shalev *et al.*, 2012; Silver *et al.*, 2002), depression (e.g., Henrich and Shahar, 2008), ongoing fear and worry about future attacks (e.g., Holman and Silver, 2005; Silver *et al.*, 2002), and changes in political views (e.g., Huddy and Feldman, 2011; Morgan *et al.*, 2011; Torabi and Seo, 2004). Behavioral and attitudinal shifts, which can have important lifestyle and public health implications, have also been examined. For example, after the 2005 London transportation network bombings, 23% of people reported that they felt unsafe on public transit, and 76% intended to travel less as a result of the bombings (Rubin *et al.*, 2005). Similarly, after 9/11, anxiety about future terrorist attacks was positively correlated with choices congruent with a more sedentary lifestyle (e.g., more time spent indoors and tendency to watch more television) (Torabi and Seo, 2004).

Although the majority of research on terrorism has focused on psychopathology and other deleterious psychosocial outcomes, positive and adaptive responses have also been studied. In the wake of a terrorist attack, some report a better appreciation of life, more meaningful personal relationships, changed priorities, and a richer existential or spiritual life (Tedeschi and Calhoun, 2004). For example, in a nationally representative sample, 57% of Americans reported perceived societal benefits (e.g., increased political or religious engagement and prosocial behavior) that occurred following 9/11 (Poulin and Silver, 2009). Similarly, a review by Morgan *et al.* (2011) noted that prosocial behaviors such as donating blood and money and patriotism increased after 9/11.

Research on resiliency (ability to rebound after distress-inducing adversity) and resistance (psychological 'immunity' to the negative impact of adversity) is important given that positive adjustment is frequent (Bonanno *et al.*, 2006; Curran, 1988; Schlenger *et al.*, 2002; Silver *et al.*, 2002). For example, in a population-based study of 2752 New York residents conducted approximately 6 months after 9/11, resilience was common; high resilience was indicated in 65.1% of the sample, and 33% failed to endorse more than one symptom of PTSD (Bonanno *et al.*, 2006). Yet not all studies have found such widespread positive adaptation. In a longitudinal, representative sample of Israeli Jews and Arabs during the Second Intifada (2004–05), a time of heavy terrorist and rocket attacks, only 22.1% of participants exhibited resistance, a minority exhibited resilience, and the majority (54%) exhibited a chronic distress trajectory (Hobfoll *et al.*, 2009). Variability in these profiles could be explained by a number of factors; better outcomes were associated with being male, Jewish (i.e., not the minority in Israel), higher income, higher education, less psychosocial resource loss, and less economic loss (Hobfoll *et al.*, 2009). These findings may provide useful information to help capitalize on people's natural strengths in the aftermath of terrorism and may help identify people less likely to exhibit resilient or resistant responses. This may help guide the design, implementation, and distribution of interventions to increase adaptive responses in the population.

In a related vein, posttraumatic growth (PTG), or positive psychological change experienced as a result of struggle with highly challenging life circumstances, has been documented after terrorist attacks (Pooley *et al.*, 2012; Tedeschi and Calhoun, 1996). Of note, while PTG and resilience might both be viewed as 'positive outcomes' associated with exposure to negative events, they are best viewed as distinct concepts. As indicated in a study of adolescents, citizens, and army personnel exposed to terror in Israel and after the second Lebanon War, PTG and resilience were inversely correlated (Levine *et al.*, 2009). This suggests divergent processes driving such outcomes, and that perhaps the process of managing distress symptoms and overcoming them leads to enhanced psychological development.

Every terrorist act, by definition, has directly and indirectly exposed targets. As a result, it is important to consider the impact of these acts on directly *and* indirectly exposed people. Without considering the full range of intended targets, we cannot accurately understand the toll terrorism takes on human mental and physical health.

Effects of Direct Exposure

Those directly exposed to terrorist attacks are at risk for mental and physical health problems – effects that are frequently

linked (Holman *et al.*, 2008; Nair *et al.*, 2012) and may influence each other in a bidirectional manner (Robinson, 2003; Sharp and Harvey, 2001). After the 9/11 terrorist attacks, many rescue workers were involved in clean up and recovery efforts and subsequently developed associated mental health problems. In a study of 28 962 WTC disaster workers, prevalence of PTSD was 12.4%; greater risk was correlated with less preparation and training, earlier start date, and longer duration of service (Perrin *et al.*, 2007). After 9/11, of those enrolled in the WTC Health Registry (described above), 24.5% reported both lower quality of life and more unmet mental health needs (Nair *et al.*, 2012). After controlling for demographic and 9/11-related exposures, participants with lower respiratory symptoms were more than 4 times as likely to have met criteria for PTSD; those with poorer quality of life 2–3 years after 9/11 were more likely to have died 5–6 years post-9/11. Such findings illustrate the link between physical health problems, stress physiology, emotional states, and psychopathology.

Mental Health

A growing body of research has demonstrated the lack of a clear dose–response relationship between exposure to terrorist attacks and mental health outcomes. In a study of residents from two suburbs of Jerusalem (one directly exposed to terrorist attacks and one indirectly exposed), both communities reported financial burdens, interruption of daily life, trauma exposure (although the directly exposed community reported more), and PTS symptoms (Shalev *et al.*, 2006). Importantly, this study did not find a proximity effect; that is, rates of PTSD were not statistically different in directly and indirectly exposed populations. However, the authors acknowledge the potential for a 'ceiling effect,' as both cities were located relatively close to Jerusalem, where terrorist attacks frequently occur. Similarly, degree of exposure to terrorism was unrelated to traumatic stress-related symptoms in a nationally representative sample of Israeli adults (Bleich *et al.*, 2003). As was true in Ireland, where a long history of terrorism exists, cultural factors or habituation may offer a partial explanation for these findings. Most recently, researchers demonstrated that extended exposure to media coverage of the Boston Marathon bombings (3 or more hours per day in the week following the attack) was associated with higher levels of acute stress symptoms than was direct exposure (being at or having a loved one present at the bombings; Holman *et al.*, 2014). These findings raise questions about the meaning and impact of 'direct' exposure and suggest the need for a more nuanced definition of exposure to terrorist attacks and other collective traumas.

After exposure to any traumatic event, including terrorist attacks, many people's psychological distress will abate over time. However, for others, symptoms will persist or subsequently emerge. For example, in a longitudinal study of survivors of the 1974 terrorist attack on Ma'a lot, Israel, where a group of high-school children were taken hostage, a vast majority of survivors reported persistent event-related PTS over 17 years later (Desivilya *et al.*, 1996). Similarly, while WTC disaster recovery workers exhibited substantial reductions in distress between assessments taken at 1–2 years, 3–4 years, and 5–6 years postattack, many workers continued to present with symptoms and others experienced delayed-onset PTSD (Cukor *et al.*, 2011). A study of firefighters and emergency medical service workers 7–9 years post-9/11 found that 7% still met criteria for probable-PTSD and 19.4% had probable depression (Webber *et al.*, 2011). Ongoing exposure may be especially distressing over time: in a sample of 709 Israeli Jews and Arabs, exposure to ongoing terrorism following the second intifada was associated with chronic distress in a majority (54.1%) of participants (Hobfoll *et al.*, 2009).

Physical Health

Terrorist attacks cause physical injury to the individuals who are the direct recipients of the violent act. Before 9/11, the Murrah Federal Building bombing killed more people than any previous act of terrorism on American soil: 167 people died and 592 sustained injuries (Mallonee *et al.*, 2013). However, the 9/11 attacks were unprecedented in terms of the number of casualties, physical injuries, and damage to the physical landscape. The plane crash, subsequent collapse of the twin towers, smoldering fires, and removal of debris spewed chemical contaminants, glass, steel, cement, fires, and jet fuel over the densely populated Manhattan area, impacting the respiratory health of those exposed (Landrigan *et al.*, 2004). The people most at risk included firefighters and other first responders, although residents from the surrounding areas were also impacted. A survey conducted on 2812 residents approximately 12 months after the attacks found that 55.8% of residents in the highly exposed area closest to Ground Zero developed respiratory problems, compared to 20.1% in a control area (Reibman *et al.*, 2004). Of relevance to mental health outcomes, environmental contaminants may have interacted with the psychological stress of experiencing the terrorist attacks, as indicated by studies linking 9/11-related PTSD and respiratory problems (e.g., asthma) (Fagan *et al.*, 2003). Such effects did not necessarily wane over time. Exposure to 9/11 was associated with both asthma and PTS symptoms 5–6 years after the WTC collapse; in analyses of a longitudinal cohort study that drew on data from the World Trade Center Healthy Registry (the largest post-disaster registry in the United States history, N=71 437), asthma and PTS symptoms often cooccurred in individuals directly exposed to the attacks (e.g., office workers, those involved in the rescue efforts, and passersby) (Brackbill *et al.*, 2009; Nair *et al.*, 2012).

Data from the WTC Health Registry study further suggest that standardized mortality ratios for rescue workers and nonrescue workers were actually lower than those for the New York City region overall. However, exposure to dust near the WTC attacks was associated with increased risk for severe headaches, skin rash, heartburn, heart disease, and stroke when respondents were compared to those who had not been exposed to the dust (Brackbill *et al.*, 2006; Jordan *et al.*, 2011a,b). Indeed, respondents who (1) were not involved in the rescue/recovery and (2) reported intermediate/high levels of WTC dust/debris exposure had higher mortality when compared to respondents with low exposure. This finding appeared to be driven largely by greater cardiovascular mortality in the highly exposed group. These findings need to be considered cautiously,

however, as the convenience sample included only 14% of eligible respondents, all of whom volunteered for the study. Importantly, the 'pre-9/11' health data were retrospectively recalled 2 years after the 9/11 attacks (Brackbill *et al.*, 2006). Nonetheless, these results suggest important implications for healthcare service utilization, which may increase throughout the population following acts of terrorism (Holman and Silver, 2011). For example, a study of 444 Manhattan residents examined hospital administrative records and found that health service utilization, outpatient visits, and functional impairment increased the year following 9/11; greater loss was correlated with worse outcomes (e.g., more missed work and greater psychological distress) (Neria *et al.*, 2013). More directly, terrorist attacks often target healthcare facilities, creating an immediate impediment for those seeking treatment, and halting treatment for people who may have been under medical care prior to the attacks. In Ireland in the 1980s, terrorists frequently used this tactic, targeting healthcare workers and hospitals, which resulted in broad and detrimental health consequences throughout the community (Zwi and Ugalde, 1989). Moreover, besides directly harming the physical health of those in need of healthcare, such actions generate anxiety in the population regarding the ability to access necessary services.

Effects of Indirect Exposure

Terrorist attacks, when considered in the context of the increasingly media saturated nature of our society, stand in stark contrast to traditional warfare. People geographically distant from terrorist events are indirectly exposed through radio, television, print, and social media. This allows for events to be transmitted rapidly and as they occur (Silver and Matthew, 2008) and for repeated exposure to disturbing images (Ahern *et al.*, 2002). Indeed, over 60% of Americans watched the 9/11 terrorist attacks occur live on television (Silver *et al.*, 2002). Many repeatedly saw the planes crashing into the WTC or people falling or jumping from the towers in postattack news coverage (Ahern *et al.*, 2002). Such indirect exposure can have striking physical and mental health consequences. Research conducted after the Oklahoma City Murrah federal building bombings first provided convincing evidence that individuals indirectly exposed to terrorism could exhibit symptoms typically associated with direct exposure to traumatic events. Seven weeks after the bombing, television exposure was correlated with PTS in middle school students without physical or emotional exposure to the event (Pfefferbaum *et al.*, 2001); these effects extended to print media as well (Pfefferbaum *et al.*, 2003).

Mental Health

Research conducted after the September 11th terrorist attacks significantly expanded this research and stood in stark contrast to traditional views of post-disaster mental health, which predict a linear relationship between proximity to a traumatic event and psychological distress (Marshall *et al.*, 2007). The psychological effects of 9/11 were evident across America and even extended to other continents, as school children in London reported PTS associated with 9/11-related television exposure (Holmes *et al.*, 2007). Throughout America, increased 9/11 television coverage, as well as specific gruesome images, were positively associated with 9/11-related PTS (Ahern *et al.*, 2002; Bernstein *et al.*, 2007; Schlenger *et al.*, 2002). Effects persisted for years after the attacks; the amount of television exposure in the week following 9/11 was positively associated with PTS symptoms and physical health problems 2–3 years later (Silver *et al.*, 2013). Furthermore, terrorism-related media exposure may promote distress long after the event's initial occurrence. For example, those who watched more anniversary coverage of 9/11 exhibited higher PTSD and were more at risk for developing delayed-onset PTSD 1 year postattacks (Bernstein *et al.*, 2007). Research conducted after other terrorist attacks echoed these findings, although not conclusively. For example, after the 2005 London transportation network bombings, 31% of people in a representative sample of Londoners reported substantial stress (Rubin *et al.*, 2005). In contrast, two days after the Dimona bombings in Israel, researchers conducted a telephone survey of randomly sampled adults, stratified by proximity, and found that distress symptoms (anxiety, stress, and fear) were higher in those geographically closer to the event (Amital *et al.*, 2012). These findings suggest that geographic proximity may have a stronger effect in the immediate aftermath of a terrorist attack, perhaps due to secondary stressors that interrupt daily life and essential services or a variety of other factors. Proximity may matter less after the debris has been cleared and basic services restored, but the psychological residue remains (Amital *et al.*, 2012). Taken together, these findings have important implications for post-disaster intervention: in the immediate aftermath, it may be important to focus efforts on restoring basic services, whereas other forms of psychosocial intervention should be distributed more widely as time progresses.

Indirect exposure can occur through other methods besides media exposure. For example, in a sample of relief workers who were either directly exposed or indirectly exposed through survivor narratives, acute PTSD (less than 3 months) was found in 4.6% of those who heard survivor narratives and 6.4% of those directly exposed; 6–8 months later, none met criteria for full PTSD (Zimering *et al.*, 2006). Such striking resilience could be explained by a combination of intervention, pre-9/11 trainings, and the personal disposition of those who choose to be recovery workers. Future research on the relationship between indirect exposure and response is essential given this body of evidence.

Physical Health

As the connection between mental states and physical health is increasingly accepted, it is important to consider the link between terrorism-related distress in indirectly exposed individuals and subsequent physical health consequences. For example, after 9/11, healthcare utilization increased dramatically, and not just for the direct victims of the attacks (Holman and Silver, 2011). Psychological reactions in the immediate aftermath of an event may have long-term implications for physical health: among those both indirectly and

directly exposed to 9/11, more severe acute stress reactions predicted significantly increased incidence of cardiovascular problems 3 years after the attacks (Holman *et al.*, 2008). Early indirect television-based exposure to reports about the 9/11 attacks was associated with increased incidence of physical ailments over the 3 years following 9/11 among respondents living all across the United States (Silver *et al.*, 2013). These findings are unique in that health status collected before 9/11 was included in the analyses, thus demonstrating increases in physical health ailments over 3 years following the attacks. The consequences of terrorism may even extend to fetal health: gestation during 9/11 was associated with increased male fetal death (Bruckner *et al.*, 2010); also, a cohort study indicated higher incidence of schizophrenia in babies born to mothers who were exposed to 3 days of aerial bombardment in their second trimester during the Arab–Israel war of 1967 (Malaspina *et al.*, 2008). In sum, there is a growing body of research demonstrating the negative health impacts of indirect exposure to terrorism. These findings suggest that widespread psychological terror does more than intimidate and instill fear. It may also translate into physiologic stress responses strong enough to trigger pathophysiology consistent with stress-related diseases.

Mechanisms of Adverse Responses

An important theoretical and practical issue relates to the process by which exposure to terrorism is translated into physical and mental health outcomes. Drawing from perspectives from the cognitive sciences, risk appraisal, traumatic stress, and psychopathology literatures is the theory of relative risk appraisal, defined as the psychological processes linking exposure to terrorist events and subjective responses (Marshall *et al.*, 2007). As viewed in the cognitive sciences, human perception is a multidimensional process, as we are actively engaged in interpreting information from the environment. A 'dose–response' perspective linking proximity and response implements a classical behaviorist 'stimulus–response' model that fails to account for the role of other factors that influence health outcomes (e.g., individual differences, social surroundings, prior experiences, and demographic factors) in the wake of a terrorist event. Through 'catastrophic secondary appraisal,' information from the environment (which includes both direct and indirect exposure to an event) alters our views of potential threat. These catastrophic appraisals immediately following an event may predict subsequent PTSD (Engelhard *et al.*, 2002). Another characteristic of terrorism that may influence cognitive processes and postattack distress is that an individual or group of individuals are blameworthy in perpetrating terrorist acts; prospective research from the stress and coping literature has indicated that attributing responsibility for a negative event to another person is associated with greater likelihood of subsequent PTSD and greater distress.

A large body of research suggests that biological mechanisms may partially explain variability in health outcomes. Such ideas stem from landmark work done in the 1920s indicating that neurobiological systems are rapidly activated by an individual's perception of threat and by strong emotions (Cannon and Britton, 1925). Terrorism may simultaneously act as both an acute and chronic stressor, generating physiological symptoms associated with the acute stress responses (immediate feeling of danger during and immediately after the attacks) and chronic stressors (which may occur as society deals with practical problems resulting from the destructive acts as well as ongoing feelings of dread). As people appraise the environment as threatening, multiple components of the stress response may be activated (McEwen, 1998; 2007); such appraisals may similarly occur for both directly and indirectly exposed individuals. Variability in these responses is likely to have a genetic component that may help explain why some people react strongly and experience physical health problems as a result of their acute stress response while others adapt more easily (Holman, 2012). Indeed, one need not experience terrorism directly to demonstrate genetic susceptibility to stress-related mental and physical health problems (Holman, 2012).

Coping

Individuals exhibit wide variability in coping strategies after a traumatic event (Wortman and Boerner, 2007; Wortman and Silver, 1989). Coping after a terrorist attack may be a product of culture, individual differences, and available resources. A common response is seeking support from other people. After the Nairobi bombings in Kenya, the vast majority (93%) reported using relatives and friends for emotional support; other common responses included seeking professional healthcare services (64%), turning to religion (48%), medication (35%), and alcohol use (11%); most used more than one source (Zhang *et al.*, 2013). After the London subway bombings, 75% of people reported a desire to contact others (Rubin *et al.*, 2005). Such support seeking may be quite adaptive. Social support appeared to buffer Israeli middle school students from depression following terror attacks by Qassam rockets (Henrich and Shahar, 2008). In a related vein, Mehl and Pennebaker (2003) found, perhaps surprisingly, that after 9/11, the number of daily social interactions did not increase. However, dyadic and in-person interactions increased, suggesting specificity in the use of social support following acts of terrorism (Mehl and Pennebaker, 2003).

Use of various coping strategies has been differentially associated with positive and negative outcomes. Spirituality (an individual's self-perceived commitment to spiritual practices) and religiosity (active participation in religious social structures) predicted more positive physical and mental health outcomes in a national sample of Americans after 9/11 (McIntosh *et al.*, 2011). Other strategies have been associated with negative outcomes. Silver *et al.* (2002) found that after 9/11, avoidant coping (e.g., giving up, denial, and self-distraction) and disengaging from coping strategies predicted subsequent PTS. Moreover, the efficacy of coping strategies may be culturally specific. In a study of 913 Israeli adolescents exposed to terrorist attacks, problem solving strategies were correlated with positive outcomes, whereas emotion focused coping was associated with PTS and mental health problems (Braun-Lewensohn *et al.*, 2009). The authors note that problem-focused coping might be particularly adaptive in places like Israel where there are constant threats of terrorism.

Associations with Subsequent Stressors

Reactions to terrorism may also be impacted by negative life events that occur after the event and may also influence reactions to future collective stressors. After 9/11, delayed-onset PTSD and non-remittance of symptoms was predicted by negative life events that happened since the initial attacks (Adams and Boscarino, 2006). Reactions to 9/11 have also been linked to responses to subsequent stressors: in a nationally representative sample of 975 Americans, 9/11-related PTS 7 years postattack predicted distress following the 2008 economic meltdown.

Policy Implications and Future Directions

The past several decades have seen a proliferation of research examining predictors of physical and mental health outcomes following acts of terrorism. Advances have been made in describing prevalence of, and variability in, maladaptive and adaptive responses. Such research has the potential to advance theories regarding exposure to traumatic events more generally, and may help inform the design of evidence-based interventions and more appropriately distributed post-event relief services. Identifying predictors of resilience, resistance, and long-term distress is important as policy makers and healthcare providers seek to mitigate the far-reaching effects of these heinous acts. A number of advances have been made in the development of evidence-based practices and interventions following terrorist acts, as detailed in a recent review by Watson *et al.* (2011). Examples include psychological first aid which seeks to reduce distress and provide practical information after a disaster (see Watson *et al.*, 2011), and community-based cognitive therapies, effective in Northern Ireland after the Omagh bombing (Gillespie *et al.*, 2002). More general practices may include ongoing assessments, case management, and the design of treatment portfolios for affected individuals (Neria *et al.*, 2013).

Future research on terrorism should include more assessments in third world countries, where terrorist attacks are more frequent but less often empirically studied (Zwi and Ugalde, 1989). Work on long-term effects should continue and grow to include more long-term assessments of potential physical health consequences of both direct and indirect exposure. Exploring biological or genetic differences is a particularly exciting area of future research that may help further explain variability in responses. Future research needs to push the boundaries defining 'exposure' to include the myriad ways mass media is prolonging our terror-related experiences and potentially enhancing the risk for mental and physical health impacts (Holman *et al.*, 2014). Building population resistance and resilience to terrorism's negative health effects requires clarification of the many interacting biological, personal, interpersonal, and societal processes affecting individual and community-level responses. Armed with this broader contextual understanding of the many ways terrorism affects us, we can develop targeted public health interventions that prevent its far-reaching and long-lasting effects.

See also: Anxiety, Panic, and Phobias. Coping. Culture and Mental Health. Demography of Mental Health. Depression. Posttraumatic Growth. Posttraumatic Stress Disorder. Religion, Spirituality, and Mental Health. Resilience. Social Support and Mental Health. Stress. Stress-Related Growth. Toxins, Pollutants, and Mental Health

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