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Relative Risk Appraisal, the September 11 Attacks, and Terrorism-Related Fears

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Abstract

There are now replicated findings that posttraumatic stress disorder (PTSD) symptoms related to the September 11, 2001, attacks occurred in large numbers of persons who did not fit the traditional definition of exposure to a traumatic event. These data are not explained by traditional epidemiologic "bull's eye" disaster models, which assume the psychological effects are narrowly, geographically circumscribed, or by existing models of PTSD onset. In this article, the authors develop a researchable model to explain these and other terrorism-related phenomena by synthesizing research and concepts from the cognitive science, risk appraisal, traumatic stress, and anxiety disorders literatures. They propose the new term relative risk appraisal to capture the psychological function that is the missing link between the event and subjective response in these and other terrorism-related studies to date. Relative risk appraisal highlights the core notion from cognitive science that human perception is an active, multidimensional process, such that for unpredictable societal threats, proximity to the event is only one of several factors that influence behavioral responses. Addressing distortions in relative risk appraisal effectively could reduce individual and societal vulnerability to a wide range of adverse economic and ethnopolitical consequences to terrorist attacks. The authors present ways in which these concepts and related techniques can be helpful in treating persons with September 11– or terrorism-related distress or psychopathology.

Keywords

terrorism; September 11, 2001; PTSD; risk appraisal; resilience

After the terrorist attacks of September 11, 2001 (9/11), the presence of widespread posttraumatic stress disorder (PTSD) symptoms among persons not directly exposed to the attacks was documented and replicated in independent cross-sectional and longitudinal prospective studies (Galea et al., 2002; Galea & Resnick, 2005; Neria et al., 2006; Schlenger

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et al., 2002; Schuster et al., 2001; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002; Torabi & Seo, 2004). Schlenger et al. (2002) estimated rates of 9/11-related probable PTSD outside the New York area two months after the attacks to be 4.3% of the adult population, as compared with 11.2% of persons in the greater New York area. Even within the New York area, Galea and Resnick (2005) estimated that the six-month prevalence of PTSD in the directly affected subgroup of New Yorkers was 12.0% (460,000 persons), and in the indirectly affected group, 3.7% (360,000 persons; Galea & Resnick, 2005). This is despite the fact that *directly affected* was broadly defined as being in the World Trade Center (WTC) complex during the attacks, experiencing an injury in the attacks, having a friend or relative killed in the attacks, losing possessions or a job as a result of the attacks, or being involved in the rescue effort. In other words, indirect exposure to the 9/11 attacks appears to have been responsible for causing clinically significant levels of PTSD symptoms in the general U.S. population, with an unknown long-term impact on mental health and functioning, public health, the economy, and society.

These results are dramatically at odds with traditional mental health models of disaster, in which mental health consequences are strongly coupled with proximity to the disaster (the bull's eye pattern). Moreover, after 9/11, research documented widespread exaggerated fears of being personally harmed by terrorist attacks, independent of psychopathology. Six months after the attacks, two independent studies assessed risk appraisal of future attacks in the general U.S. population and found that 40–50% of U.S. adults feared for their safety and that of family members (Silver et al., 2002; Torabi & Seo, 2004). In New York City approximately one year after the attacks, 75% of a systematic sample of primary care patients in a large medical setting in Northern Manhattan reported worries about their family's safety, and 73% reported worries about their own safety (Weissman et al., 2005).

Similar phenomena have been documented in the United Kingdom and in Israel. High rates (55%) of feeling in danger from terrorism were recently reported after the July 7, 2005, bombings of the London underground (Rubin, Brewin, Greenberg, Simpson, & Wessely, 2005). In Israel, since the beginning of the intifada in September 2000, a nationally representative survey found that 16.4% of the population had been directly exposed to a terrorist attack, and 37.3% had a family member or friend who had been exposed (Bleich, Gelkopf, & Solomon, 2003). PTSD was found in 9.4% of a representative sample of the entire population (extrapolating to approximately 610,000 persons). It is notable that the authors found no association between direct exposure and PTSD symptoms. The authors concluded that in national trauma, psychological impact is not limited to those who are directly exposed to the event.

The fact that these replicated findings have been neither adequately explained nor refuted reveals a major deficiency in mental health models of disaster that impedes not only scientific progress but also the development of evidence-informed interventions and policies aimed at effectively reducing the impact of terrorism. The current model linking exposure to psychopathology is a simple and perhaps outdated stimulus–response model, derived from classical behaviorist models, and almost entirely neglects the appraisal process in humans that links an objective event with a subjective response. Specifically, in this article, we argue that the core notion from cognitive science that human perception is an active,

multidimensional process is of central importance in explaining terrorism-related fears and behaviors. Concepts from several related disciplines can inform and update the scientific basis for understanding and combating the effects of terrorism. In particular, our model accounts for the fact that terrorist attacks as a societal trauma have much broader consequences than individual trauma. Distorted fears about the nature of future attacks may play a role in a wide range of adverse psychological, health-related, community, economic, and political consequences.

A number of psychosocial treatments have been shown to be efficacious for adults with chronic PTSD, and they share in common a systematic and directive focus on processing the memory of the traumatic experience. Those that incorporate exposure-based techniques appear most efficacious (Harvey, Bryant, & Tarrier, 2003). All of these treatments are based on the premise that the client's traumatic experiences are in the past (rather than ongoing), so treatment is intended to facilitate cognitive and emotional processing of memories and their associated affects in an objectively safe environment. Unfortunately, little is known about how well these models translate into clinical settings in the context of ongoing terrorist threats. In our experience in New York, widespread perception of heightened threat complicated the treatment process for both patients and clinicians and had to be addressed explicitly in both clinical treatment and community trainings for many months after the attacks.

Taken together, these epidemiologic findings and clinical observations suggest the following: (a) current models for understanding the nature of traumatic exposure and reactions to traumatic events do not adequately explain findings concerning the 9/11 attacks, (b) the presence of persistent fears in the general population of being personally harmed in future terrorist attacks is a poorly understood phenomenon that may represent a vulnerability in the general population, and (c) current evidence-based treatment models in PTSD do not adequately address this issue.

Media Exposure as the Vehicle for Criterion A Trauma Exposure After 9/11

Indirect exposure to the 9/11 attacks was largely through the media, and this includes both media coverage of the actual attack and the subsequent weeks of coverage that reviewed in ever greater detail the horrific consequences of the attacks, as well as repeatedly raising the prospect of future attacks on civilians. Investigators have now independently documented strong positive associations between anxiety and PTSD symptoms related to the 9/11 attacks and exposure to television coverage of the disaster in persons across the United States among populations not directly exposed to the attacks (Neria et al., in press; Schlenger et al., 2002; Silver et al., 2002; Torabi & Seo, 2004). We focus our discussion here on national U.S. samples because it is precisely these findings that do not fit traditional disaster models and that have provoked controversy in the field. Most important, a focus on samples outside of the directly attacked communities of New York and Washington, DC, effectively rules out the confounding possibility that the media only affected people who were already symptomatic (i.e., did not cause the symptoms), and this is called the *media exacerbation hypothesis* (Ahern et al., 2002). Schlenger et al. (2002) conducted a national, epidemiologic, Web-based study (N = 2,273) to assess PTSD symptoms using the PTSD Checklist (PCL;

Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). A score of 50 on the PCL in one clinical sample yielded a sensitivity of 0.78, specificity of 0.86, and diagnostic efficiency of 0.82 compared with structured clinician assessments using the Clinician-Administered PTSD Scale (Weathers, Keane, & Davidson, 2001). The prevalence of probable PTSD was 11.2% in the greater New York area and 4.3% across the United States as a whole. This equals approximately 8,640,000 adults over the age of 18 years across the United States (4.3%), calculated from U.S. Census Bureau data (U.S. Census Bureau, Population Division, 2002), as compared with 1,072,500 persons in the greater New York area (11.2%; Galea & Resnick, 2005). The number of hours of television coverage watched in the days after 9/11 was one of four factors that predicted probable PTSD, along with the expected factors of age (being younger increased risk for PTSD), sex (being female increased risk for PTSD), and direct exposure (having been at the attack site).

The finding of PTSD symptoms in a small proportion of U.S. adults who were indirectly exposed to the 9/11 attacks through the media has been replicated by both Silver et al. (2002) and Torabi and Seo (2004). Six months after the attacks, Silver et al. (2002) found that 5.8% of adults in a representative sample met criteria for probable 9/11-related PTSD, defined as meeting Diagnostic and Statistical Manual of Mental Disorders (4th ed.; *DSM–IV*) criteria (one re-experiencing, three avoidance, and two hyperarousal symptoms; American Psychiatric Association, 1994) on the Impact of Events Scale—Revised (Weiss & Marmar, 1997), a widely used and well-validated measure. Using this more stringent definition of the perceived Criterion A event conforms to the *DSM–IV* requirement for PTSD that the traumatic event involve “threatened death or serious injury … to the physical integrity of self or others” (American Psychiatric Association, 1994, p. 427). After Silver et al. adjusted for the presence of this additional requirement, 3.4% of U.S. adults (approximately 7,110,355 persons) still met criteria for probable PTSD six months after the 9/11 attacks. In all 9/11 studies cited here, it is critical to note that all symptoms were assessed specifically in relation to the attacks on 9/11 and therefore cannot entirely be explained as PTSD due to other causes. In these studies, researchers used both structured interviews and self-report data from Internet surveys. Critics have expressed concern that self-reports may yield inflated rates and, in any case, do not have the same validity as structured interviews. This is a common limitation of epidemiologic surveys, and the literature is filled with methodological debates on this issue (Kessler et al., 1999). However, for our purposes, this is a side issue at most, for even if the lower limits of confidence intervals are assumed, these data demonstrate that substantial numbers of persons across the United States were symptomatic after 9/11 with related PTSD-like symptoms. And it is the absolute numbers of persons affected that determine need for services.

It is crucial to appreciate that although debate has centered on the confidence intervals of the data, in theory this clinical phenomenon should not even exist. It is the new fact of indirectly exposed psychopathology after terrorist attacks that we address herein.

Beyond PTSD in Assessing Terrorism Fears and Consequences

Researchers in all studies found, consistent with the previous decade of literature, that the majority of people showed resilience after the 9/11 attacks, even in the greater New York

area (Bonanno, 2005). Our model focuses on those who do not show resilience, with relatively low exposure to the event itself or purely indirect exposure to images of the event, amplified many-fold by the postappraisal media fear mongering.

Given the consistency of PTSD findings across epidemiologic samples, measures, and investigators, the 9/11 findings cannot simply be dismissed because they are inconsistent with conventional assumptions that a disaster should be defined as local and must be directly experienced to cause psychopathology (North & Pfefferbaum, 2002). Some authors have questioned the findings' validity because the trauma does not conform to pre-9/11 assumptions about how traumatic experiences are mediated (a criticism that is actually incorrect, as discussed below; Pfefferbaum, Pfefferbaum, North, & Neas, 2002). Such reasoning makes the error of reifying the *DSM–IV* criteria (American Psychiatric Association, 1994). In fact, the *DSM* and International Classification of Diseases systems are merely intended to summarize the current scientific knowledge base and are therefore subject to revision as more research emerges. No large-scale studies on terrorist attacks were available during the development of the *DSM–IV*.

The cognitive function of relative risk appraisal is an active, multidimensional process that mediates the relation between environmental events and the individual's meaningful appraisal of them. Risk appraisal is influenced by such variables as cognitive schema, prior experience, personality, and coping style traits, as well as social and demographic factors (Creamer, McFarlane, & Burgess, 2005; Ehlers & Clark, 2000; Ginsburg et al., 2002; Folkman, Lazarus, Gruen, & DeLongis, 1986; March, 2003). The *DSM–IV* (American Psychiatric Association, 1994) identifies a stimulus (i.e., traumatic event, Criterion A.1) and an emotional reaction (Criterion A.2, "fear, helplessness, or horror") but leaves the appraisal process as a black box. This error of omission is found more deficient by new research showing that a wider range of emotional responses to trauma can result in PTSD, including intimidation, rage, intense guilt, and shame (Brewin, Andrews, & Rose, 2000; Carlier, Lamberts, & Gersons, 2000; Ehlers & Clark, 2000).

Despite the fact that a focus on PTSD alone has provided considerable new knowledge, the relative risk appraisal model predicts that psychological reactions to terrorism, being mediated by multifactorial processes, will also manifest in a much broader range of symptoms and behaviors that are maladaptive (Figure 1). Isolated symptoms that can nevertheless affect functioning (e.g., impairment-related symptoms include insomnia and poor concentration at work) usually are not even assessed in epidemiologic studies because many use skip-out rules if a participant does not show the cardinal features of the disorder.

Scientific progress in this relatively young discipline and, in particular, in the study of the consequences of terrorism will only be possible if investigators are willing to revise theoretical assumptions on the basis of empirical evidence, even if—and especially if—they contradict current dogma. Independent replication is the highest standard of validity in science, and it is replication that lends validity to these observations and requires explanation.

Relative Risk Appraisal

The function of risk appraisal for an organism is to determine a response to the environmental event or situation. Throughout this article, we use the term *relative risk appraisal* because it emphasizes the comparative process through which an environmental event is appraised in relation to prior experiences and risk expectations.

In evaluating a given new environment or event, an organism is acutely sensitive to indicators of potential threat. Risk appraisal research over the last two decades has shown that the process of evaluating risk involves intuitive judgments (rather than consciously reasoned and analyzed judgments) based on affective responses to the situation and expectations about possible outcomes derived from past experience (Slovic, Finucane, Peters, & MacGregor, 2004; Zajonc, 1980). Perceived risk is a global judgment, not a rational calculation. Research has shown that perceived risk is influenced by factors such as personal standards for acceptable risk (thus the qualifying term *relative*), reward (utility), and prior experience (or lack thereof) with situations judged to be similar in risk.

Recent investigations present a model of human risk appraisal that makes use of adaptive cognitive shortcuts (called *heuristics*) that collapse multiple concerns into a few dimensions. This model is much more complex and nuanced than the rational model that assumes persons consciously assess mortality and morbidity estimates before determining a course of action (Tversky & Kahneman, 1974).

Research dating from the 1960s established that human risk appraisal shows characteristic distortions that are consistent across many types of situations (Sowby, 1965; Starr, 1969). For events that are relatively familiar, the likelihood of small risks is overestimated (e.g., catching the flu), and that of large risks is underestimated (e.g., getting killed in an automobile accident; Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978; Sjoberg, 2000). For low-frequency risks that are both unfamiliar and very frightening, individuals tend to greatly overestimate risk of being personally harmed.

Slovic (1987) identified two factors that influence such appraisal heuristics (Figure 2). The first, called *Dread Risk*, concerns the catastrophic, uncontrollable, and inequitable aspects of hazards. Nuclear weapons and nerve gas accidents are examples of hazards that score high on this factor. The other factor is *Unknown Risk*, which captures characteristics such as not being observable, not knowing when one is exposed, and not knowing the mechanism of potential injury. In the 1980s, DNA technology (e.g., genetically engineered food), microwave ovens, and water fluoridation scored high on this factor. These studies culminated in the widely cited “map of hazards” (Figure 1 in Slovic, 1987, p. 282), which plots 81 hazards by these two factors. These factors predicted attitudes towards the risks such as willingness to pay for safeguards and demands for regulation (Slovic, 1987). We predict that for many individuals, terrorism fears also will score high on both the Dread Risk and Unknown Risk factors, and that this helps explain many of the intense psychological, political, and societal consequences of the 9/11 attacks.

Slovic (1993) also noted that certain kinds of risk-related events had huge ripple effects in society—that is, an impact that went far beyond the harm to the direct victims—as was also

seen after the 9/11 attacks. An earlier example was the Three Mile Island accident, which caused no fatalities immediately and few, if any, delayed, documented cancer deaths. Yet the accident devastated the nuclear industry and contributed to the further erosion of the public's trust in technology in general (Slovic, MacGregor, & Kraus, 1987).

These phenomena are captured in the concept of *signal potential*. An event with high signal potential functions as a warning signal that a new ongoing threat has entered the environment (Slovic et al., 1987). Slovic found that events high on both Dread Risk and Unknown Risk were most likely to carry high signal threat. For example, the collapse of a skyscraper because of structural flaws would be unlikely to carry much signal potential in the United States because the public will assume it is an isolated incident and will believe they understand the causes and mechanisms of such events. In contrast, we propose that the 9/11 attacks signaled a perceived new threat—that foreign terrorists had penetrated the U.S. environment and could cause death and destruction—a danger that was also poorly understood by the public and was therefore unpredictable. Multiple signals from the government and the media reinforced these appraisals, and the hazard was thus judged to be high risk and ongoing. Because media channels focus on novel information and novelty increases the fear response, they inevitably promote the distortion of signal intensity, thereby amplifying it throughout the communication-saturated environment of the United States.

A recent example dramatically illustrates the effects of the relative risk appraisal model on the general public in a different context—that of government communications about safety. Since March 2004, when the Federal Drug Administration required a black box warning on SSRI antidepressants for children, there has been an estimated 20% decline in their use in this population (Marshall, Posner, & Greenhill, 2006). Despite the subtlety and inconclusiveness of the actual data supporting this warning, the black box itself is functioning as a high-signal-potential event that is having a profound effect on physician and patient behavior. The outcome on treatment practices is unknown at present, but if this results in increased suicidality in children because of underutilization of effective treatment, counteracting this message likely will be extremely difficult, because simply providing more information is unlikely to neutralize such a strong fear-promoting message among the general public.

Relative Risk Appraisal and the Exposure Dimension After Terrorist Attacks

Risk appraisal plays a theoretically important although implicit role in the current etiologic model of PTSD. The *DSM–IV* defines the traumatic event that gives rise to PTSD in the following way: "the person experienced, witnessed, *or was confronted with* [italics added] an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (American Psychiatric Association, 1994, p. 427). The definition contains an ellipsis, in that what is operative is the perception of threatened death or physical injury. Otherwise, the diagnosis would hinge on the clinician having to make an objective evaluation of the dangerousness of the event in determining if Criterion A.1 was met.

What, then, are the psychological mechanisms through which being confronted with the 9/11 attacks through the media precipitated a subjective response (Criterion A.2) severe enough to produce PTSD symptoms in U.S. residents who were not directly threatened with death or physical injury on 9/11? What distinguishes media viewing of this disaster from other disasters among these persons?

In the case of 9/11, we propose that the characteristics of human relative risk appraisal may explain the relationship between media exposure and symptomatic response among those indirectly affected by the attacks. That is, unlike most media coverage of disasters, specific aspects of the 9/11 attacks—its scale, unpredictability, novelty as a threat, and implications for future safety, together with media saturation of graphic images and frequent government warnings of future attacks—carried the signal potential that there was a significant ongoing threat, with greatly elevated risk for being harmed in additional attacks. Being confronted with a traumatic event through the media rarely results in PTSD precisely because there is no perception of threatened death or serious injury to the media viewer; that is, it has no signaling potential. However, a minority of U.S. adults felt sufficiently threatened by the meaning of 9/11 and the subsequent weeks of fear and uncertainty that media viewing of these events produced the subjective response of fear, helplessness, or horror in relation to the self or loved ones with respect to future terrorist attacks. In cognitive terminology, these viewers engaged in catastrophic secondary appraisals of the attacks. Terrorist attacks, and the 9/11 attacks in particular, nearly always have these characteristics and appear engineered precisely to carry such a signal of ongoing threat (Neria et al., 2005; Susser, Herman, & Aaron, 2002). This may account for the consistency of findings across the U.S., United Kingdom, and Israeli studies.

Because the etiology of PTSD is multifactorial, an interaction between media exposure and other risk factors is likely (Kessler et al., 1999; Yehuda, 2002). We hypothesize specifically that indirect media exposure to the events of 9/11 was a relatively low-intensity exposure, such that risk factors for PTSD were disproportionately present in persons found to meet criteria for probable PTSD, compared with persons who developed PTSD due to direct exposure. Consistent with this view, Neria and colleagues (Neria et al., 2006) studied PTSD rates in a primary care sample in upper Manhattan. Proximity to the epicenter of the attacks was found to be associated with probable PTSD, as expected, with a monotonic increase in the likelihood of PTSD: from 1.15% among patients who were outside of New York City to about 5% among patients who were in New York City or the New York City area to 8.6% among patients who were in the WTC or lower Manhattan area during the attacks. The investigators then examined the interaction of vulnerability characteristics and exposure. Among the 178 participants who did not have (a) direct exposure to the epicenter of a disaster (being in the WTC or below 14th Street at the time of the attacks), (b) family psychiatric history, and (c) traumatic experiences prior to the index trauma (any trauma prior to 9/11), none reported probable PTSD symptoms related to the 9/11 attacks. In summary, it is both psychologically plausible and consistent with current research that the subjective reaction to being exposed to a terrorist attack is a function of perceived risk, and perceived risk is determined by multiple variables in addition to actual proximity.

When Fear Is Both Normative and Maladaptive: Relative Risk Appraisal as a Mediator of Persistent Fears of Terrorist Attacks in the U.S. Population and Economic Effects

In addition to symptomatic reactions in a minority of persons, substantial anecdotal evidence documents both widespread fear and avoidance in U.S. citizens related to future attacks (Lester, 2004; Schwarz, 2002). The downturn in domestic air travel in the year after the 9/11 attacks is a useful example of how exaggerated risk appraisal influenced avoidance behavior that was not necessarily pathological at the individual level but was socially harmful at the aggregate level. In 2001, after a decade of yearly increases, the number of passengers traveling by air declined by approximately 6.5% (from 665 million to 622 million) because of a 20% decline in air passenger travel in the last four months of the year (Bureau of Transportation Statistics, n.d.). According to one estimate, during this time period, there were 1,000 more road fatalities than expected during the three months October 2001–December 2001 as a result of the increase in the number of people choosing to drive rather than to fly to their domestic travel destinations (Ropeik, 2004). These data illustrate the societal and economic importance of studying risk appraisal as a way to mitigate the consequences of terrorist threat (Fischhoff, de Brin, Perrin, & Downs, 2004).

The mortality risks for a range of common circumstances are portrayed in Figure 3. As a reference point, note that 47,288 people died in U.S. road accidents in 2001. The figure illustrates the well-known fact that the general population is exposed to a wide range of relatively low-risk threats. The risks of being killed in automobile accidents, homicidal assault, pedestrian accidents, and accidental choking were greater than that of being killed in the 9/11 attacks. Even in the year 2001, it was more than 850 times safer to fly than to use automobile transportation.

Relative Risk Appraisal as a Mediator of Societal Trauma and Hate Crimes

Since Walter Cannon’s pioneering work in the 1920s, it has been assumed that the function of well-integrated and rapidly responsive neurobiological systems activated by perceived threat serve the evolutionary function of protecting the organism or something highly valued by it (such as a mate, offspring, or social status; Cannon, 1929; Marshall & Klein, 1999). After terrorist attacks, however, the impulse to respond aggressively can be manifested in society as racism and hate crimes.

A comprehensive LexisNexis database survey of U.S. newspaper reports between September 1 and October 11, 2001, found an increase in hate crimes toward persons believed to be of Middle Eastern descent (from 1 to 100 events involving 128 victims and 171 perpetrators) across 26 states (Swahn et al., 2003). Most occurred within the period 10 days after the 9/11 attacks, between males, and in public places; 68% involved use of a weapon. Fourteen murders were committed. Only 42% of the victims were of Middle Eastern descent. Attacks against persons of color who are perceived to be vaguely reminiscent of the 9/11 terrorists demonstrate that indiscriminant racism still exists in this country and could have profound adverse consequences on the Muslim community as well

as on many other communities of people with brown skin in the United States, echoing the impact of racism and hate crimes on African Americans in the United States (Clark, Anderson, Clark, & Williams, 1999; Comas-Diaz, 2000). The widespread experience of racism in ethnic communities in the weeks and months after the 9/11 attacks demonstrates the power of societal trauma to evoke terrorism and racism in response and the importance of addressing this consequence as a part of any public health or government initiative.

Risk Appraisal as a Mediator of Psychopathology

Current cognitive models posit that psychopathological responses are strongly mediated by perceptions of a traumatic event and its aftermath (Ehlers & Clark, 2000; Warda & Bryant, 1998). The perception that a traumatic event is life threatening predicts subsequent PTSD. Catastrophic appraisals about oneself in the period immediately after trauma exposure predict subsequent PTSD (Ehlers, Mayou, & Bryant, 1998; Engelhard, Van den Hout, Arntz, & McNally, 2002). Prospective studies indicate that attributing responsibility to another person (Delahanty et al., 1997) and attributions of shame (Andrew, Brewin, Rose, & Kirk, 2000) in the acute phase are also associated with later PTSD.

Distortions in risk appraisal are a common feature of anxiety disorders, including acute stress disorder (ASD) and PTSD as well as other anxiety disorders. Persons with ASD exaggerate both the probability of future negative events occurring and the adverse effects of these events (Warda & Bryant, 1998) and display cognitive biases for events related to external harm, somatic sensations, and social concerns (Smith & Bryant, 2000). This pattern contrasts with evidence that individuals with panic disorder display cognitive biases that are specific to physiological arousal but not to other stimuli (McNally, Hornig, Otto, & Pollack, 1997) and that individuals with social phobia exhibit catastrophic appraisals about social events but not of nonsocial events (Foa, Franklin, Perry, & Herbert, 1996). Experimental studies indicate that individuals with ASD respond to a hyperventilation task with more dysfunctional interpretations about their reactions than do individuals without ASD (Nixon & Bryant, 2005).

Avoidance of external situations is driven, in part, by heightened perceived risk of harm. Avoidance is also driven by the fear that situations will activate internal states, such as memories and affects that are intrinsically painful. In PTSD, this has been understood as an expectation that future experiences will have the same harmful outcome as past traumatic experiences, and this preconscious belief is reinforced by reexperiencing symptoms. This phenomenon, usually referred to in the literature as *overgeneralization*, impairs more flexible evaluation of actual risk and thus rigidly and adversely influences the patient's judgments about safety.

For many patients with PTSD, hypervigilance is also experienced as necessary to guard against future traumatic experiences. In other words, persons with PTSD believe that vigilance is protective of their personal safety. This cognition associated with hypervigilance has received little attention in the clinical literature, but new research that links negative affect states with risk appraisal suggests that this relationship may deserve more attention (Lerner & Keltner, 2000, 2001; Loewenstein, Weber, Hsee, & Welch, 2001). Perhaps one of

the clearest indications of widespread hypervigilance after 9/11 was the reported incidence of insomnia. After the 9/11 attacks, surveys estimated that 25% of New Yorkers, or approximately 3,375,000 people, were suffering from clinically significant insomnia, whereas far fewer of these persons actually had PTSD (Galea et al., 2002; Schlenger et al., 2002). Difficulty sleeping is a cardinal symptom of hyperarousal, as well as a reflection of being in a heightened state of vigilance that is alert to possible threat.

Relative Risk Appraisal in Psychiatric Disorders: Clinical Treatment Considerations

Descriptions given by patients with diagnoses of anxiety often include quotations such as, “I know that nothing terrible is going to happen, but I can’t stop worrying about it.” For insightful patients, this realization can be an important starting point for the treatment of the fear and anxiety seen in social phobia, panic disorder, generalized anxiety disorder (GAD), and PTSD. In cognitive–behavioral therapy (CBT), it functions as a collaborative assumption about causality—that the client’s problem is related to exaggerated, disproportionate fear—that allows a productive focus on reversing these patterns of thinking and behaving (Borkovec & Ruscio, 2001). A considerable knowledge base is emerging from research on GAD and health anxiety that informs psychotherapists about how they can assist people to realistically appraise the level of threat that they confront. For example, consider the similarity between an individual who is preoccupied with contracting disease from anthrax-contaminated mail and one who frequently ruminates about having a serious illness (hypochondriasis) or of contracting AIDS from public restrooms (obsessive–compulsive disorder). In these cases, psychotherapeutic intervention aims to teach the individual to identify and correct maladaptive interpretations, reduce safety behaviors that foster anxiety and hypervigilance, engage in behaviors that undermine the need to reassure themselves about the worry, and reduce rumination (Salkovskis, Warwick, & Deale, 2003). It is important to note that there is strong evidence that these approaches reduce this excessive worry and the associated precautionary behaviors that interfere with people’s functioning (Barsky & Ahern, 2004).

Treatment Principles for Patients With Terrorism-Related Anxiety and PTSD

After 9/11, the Center for the Study of Trauma and Resilience at Columbia University and the New York State Psychiatric Institute developed a large-scale dissemination program for licensed clinicians that provided training to approximately 1,000 licensed mental health professionals over two years in the core techniques of prolonged exposure therapy (Foa & Rothbaum, 1998; Marshall, Amsel, Neria, & Suh, 2006; Marshall & Suh, 2003). A major challenge in this process was translating CBT techniques that had been developed in the context of discrete traumas (e.g., rape, motor vehicle accidents) to settings that were dealing with the prospect of future terrorist attacks. Therapists were acutely aware of sharing similar concerns about safety with their patients with respect to relative risk appraisal and the threat of ongoing attacks. This presented a major problem for psychotherapists, in that there was a risk of therapeutic impasse due to collusion with the client’s fearful avoidance.

The dilemma for therapists working in communities that are under terrorist threat is in finding common ground with the client for realistic risk appraisal and then agreeing on what constitutes acceptable risk. Moreover, in the context of the ongoing international terrorist threat, the shared responsibility that comes from encouraging clients to enter situations that may, in fact, be of uncertain risk, such as taking public transportation or working in or near potential attack targets (such as a landmark or major financial institution), can weigh heavily on an ethical therapist. In New York after 9/11, most therapists we encountered felt at a complete loss for a framework of safety from which to treat patients.

Lindy and Lindy (2004) used the term *empathic strain* when describing the difficulty therapists experience in managing emotional reactions in treating trauma patients. Among clinicians in New York after 9/11, we observed powerful stress reactions that could be linked both to identification with the victims of 9/11 and to therapists' concerns about their own personal safety. In this situation, it is especially important that therapists confront and process their own fears about this new, uncertain threat.

How, then, does the therapist decide when patient fears are exaggerated? Little has been written about this process. Our work before 9/11 proceeded on the possibility of easily reaching shared assumptions between therapists and patients on the basis of common sense. Presumably therapists use their own assessments of risk in a wide range of situations as a standard of relative risk appraisal. Another technique involves asking patients to assume risks (such as driving) that they were willing to assume prior to the trauma. But this approach completely fails if patients are convinced that relative risks have changed because of a new threat in the environment, as predicted by risk appraisal models.

As with many such therapeutic dilemmas, unclear boundaries become sharpest at the extremes. Most psychotherapy practitioners would probably agree that not leaving one's home for fear of being injured or living one's life without any concern for additional new risks are the two extremes of anxiety and denial. But what about the forms of phobic avoidance after 9/11 that were extremely common: avoiding airplane and subway travel, the crossing of bridges and tunnels, large gatherings of people in the city, and national landmarks? In the traditional empirically validated therapies for PTSD, therapist neutrality toward such behavioral goals is not an option.

The following principles, based on our experience in working with terrorism survivors in New York City, Australia, Indonesia, and Israel, may be useful when treating anxiety in clients living in the context of ongoing threat.

1. Clarification of the Patient's Beliefs

Before a patient's assumptions can be questioned, they must first be elicited. Because these assumptions are often preconscious, it is important to encourage full articulation of such beliefs (using the Socratic method) before educational or interpretative interventions are attempted. Anxious or less experienced therapists will sometimes rush too quickly to debate the validity of a patient's assumptions before he or she is fully cognizant of them. Additionally, it is important to establish with the client that the therapist understands the

validity of the experience underpinning the belief. One must be careful to not minimize the reality of the trauma or the reality of the threat that may exist in the environment.

We observed among many clients the development of what appeared to be superstitious beliefs about safety that could be directly traced to details about the 9/11 attacks. For example, persons limited their functioning and perpetuated their fears by refusing to go to work in tall office buildings, insisting on wearing running shoes all day at work, refusing to start work early in the morning, checking news Web sites obsessively throughout the day, or taking many personal days because of government alerts or new developments in world politics. Once all of these behaviors and fears have been elicited, they can be interpreted as a fear that the risk of being harmed or killed in a future attack is extremely likely and that future attacks will occur in exactly the same way as the 9/11 attacks (a catastrophic appraisal).

2. Questioning the Validity of the Beliefs

As is standard practice in CBT, the beliefs can then be gently challenged. Where there is ongoing threat, clients and the general public may need to be oriented to “acceptably risky” rather than “objectively harmless.” Acceptable risk should be defined by the client, and exploration of typical low-risk behaviors such as driving an automobile can help reveal this principle.

There is an imperative for ongoing functioning that therapist and client can agree that some levels of risk are acceptable, mainly because the likelihood of adverse outcomes are absolutely low, even though they may be higher than at some previous time. This is an important premise to understand and make explicit. The most common relative risk appraisal distortion that can be shared by both therapists and clients is that one should be fearful for one’s own safety simply because of a vague perception that there is an increased level of societal threat. This situation is often exacerbated by vague government warnings linked to possible terrorist activity, especially if the now infamous color-warning alert status is increased. These warnings can serve to heighten people’s inaccurate perception that the absolute level of threat is high to them personally.

In psychotherapy, it can be useful to distinguish between two questions. The first question, “How likely do you believe it is that the United States will be attacked again by terrorists?” can be answered as “100% likely.” The second and more important question is the following: “How likely do you believe it is that you personally will be injured in this attack?” By focusing attention on the evidence regarding the answer to the second question, psychotherapists can assist many clients in developing a more realistic relative risk appraisal. For example, a client of one of the authors will literally do the calculations after a media-provoked fear. She calculated that a subway attack similar to that in London would kill 40 persons. With 4,500,000 daily subway riders, the risk is 40/4,500,000, or .0011%, which is 1 in 100,000 that day. If one attack occurs per year, the risk is 1 in 30 million, or essentially zero.

3. Motivational Interviewing

In some cases, clients can believe strongly that an actual attack (vs. an ongoing threat of attack) is imminent and find it difficult to entertain evidence that suggests otherwise. In the context of terrorist threat, when reminders of threat may be ubiquitous, clients may draw on this readily available evidence (e.g., security warnings, media stories) to support their belief that an attack is imminent. In these cases, rather than attempting to address the assumptions and distortions in the client's risk appraisal, it can be useful to highlight the benefits and losses associated with his or her belief that an attack is going to happen. For example, avoiding Manhattan, declining to enter any high-rise building, or refusing to take public transportation may provide short-term relief of anxiety but eventually lead to the loss of a job, curtailed career advancement, reduced social interaction, and financial losses. Therapists may find it very useful to allow clients to decide if they wish to suffer the considerable consequences of their frightening and debilitating risk appraisal. Considerable evidence supports the efficacy of motivational interviewing for a range of patients (Walitzer, Dermen, & Conners, 1999), and it could be a viable means of encouraging clients to recognize that persisting with risk appraisals that limit their functioning is not in their best interest.

4. In Vivo Exposure and Behavioral Experiments

It is imperative to establish the new learning of appropriate risk appraisals by structuring a series of experiments in which the client can engage and in which he or she learns that he or she was not harmed. For example, a therapist may require a client to remain in the upper levels of high-rise buildings to ensure that the client learns that his or her feared outcomes do not eventuate. In doing this, it is important to ensure that any safety behaviors (e.g., scanning the skies, ringing friends on cell phones) are eliminated so the client learns that his or her reduced anxiety is attributed to adaptive behavior rather than to his or her hypervigilant and excessive precautions.

5. Explicit Acknowledgment of Living With Uncertainty

In communities that are under attack in wartime or when terrorist attacks are ongoing, false or minimizing reassurances about future events will undermine a therapist's credibility. In these cases, the therapist must not only acknowledge the increased risk but also, again, explore the patient's beliefs about absolute risk (it is increased but not certain) and support the values and social networks that will help the client with adaptive coping in the face of danger. There is also the risk for discrepancy between the therapist's view and public announcements made by government or media agencies. Government agencies may strategically elevate the level of perceived risk in the pursuit of other agendas.

One survey found that, by 2003, 40% of persons living in lower Manhattan (Battery Park City) had left (Rogers, 2003). Others chose to stay, and still others did not have the option of leaving without incurring excessive financial hardship. Each of these could represent reasonable decisions in difficult, uncertain circumstances. What should be emphasized from a psychotherapeutic perspective is the process of making the decision, considering its consequences, and coming to terms with the limitations of knowing the future and what risks it will present.

6. Encouraging Conscious Decisions About Relative Risk Appraisal and Personal Values, or Acceptance of Circumstances Beyond One's Control

In the end, when the risk of trauma is relatively high, as in law enforcement, government work, wartime, or situations with ongoing terrorist threats, functioning without disabling levels of anxiety requires more than just the abatement of anxiety symptoms. It requires conscious decisions about accepting such risks, together with enhanced resilience. Examples are persons who choose to live in politically volatile nations for religious or ideological reasons; whose commitment to their vocation overshadows the realistic risk it entails; who have no choice about relocating out of impoverished and crime-ridden neighborhoods; and who chose to remain in their homes in lower Manhattan and endure months of daily reminders, toxic air, a heightened police and military presence, and restricted movement within the neighborhood for security purposes.

Conclusion

Replicated findings of relatively high rates of anxiety and PTSD symptomatology in persons indirectly exposed to the 9/11 attacks through the media require revision of current models of the consequences of large-scale terrorist attacks and terrorist threat. We propose that the concept of relative risk appraisal might prove a powerful, relatively unstudied concept that helps to explain these observations. We believe ample data suggest that PTSD can occur under some conditions in which the traumatic exposure was mediated by indirect witnessing of the event (especially through the repeated broadcast of the event in the visual media) and hypothesize that these persons have vulnerability factors that contribute to the development of chronic PTSD. However, the presence of persistent fears in the general population of being personally harmed in future terrorist attacks is also a manifestation of distortions in risk appraisal that spawns fear and adverse consequences at the societal level and therefore should be a focus of ongoing research and potential public health interventions using models other than the language of psychopathology. High-impact events with high negative signaling potential may be the exceptional events that can produce such effects through indirect exposure. Current models of PTSD continue to be based on Kolb's model of PTSD in which traumatic exposure was hypothesized to produce cortical and synaptic changes through the mechanisms of conditioning, sensitization, and failure of normal habituation (Kolb, 1987). The physiologic disturbance was regarded as primary, and the psychological symptoms were viewed as the consequence of recurring, severe, uncontrollable symptoms of hyperarousal and intrusive memories.

Relative risk appraisal theory can add to and extend this model in several ways. It accounts for appraisal responses in the context of ongoing terrorist threat; it accommodates the wide range of reactions seen after trauma that nevertheless can cause PTSD; and it accounts for societal trauma effects, both pathological (hate crimes) and normative (avoidance of air travel). Risk factors and mechanisms are proposed herein but require future empirical study. In future studies of the consequences of terrorism, researchers should examine a broad array of possible reactions that lead to behavioral impairment, poor decisions about one's present and future, or other clinically significant symptoms related to fear and worry (e.g., GAD) in the general population. Therapeutic models could be modified to accommodate these new

data-based observations by drawing from the treatment research in anxiety disorders and generalized anxiety in particular. Finally, an emphasis on PTSD may incorrectly attribute mental disorder to many understandable concerns that people have in the context of terrorism. A broader conceptualization that encompasses the concerns that people have about terrorism, without the connotations of psychiatric disorder, will facilitate more constructive theoretical advances and, we hope, public health applications.

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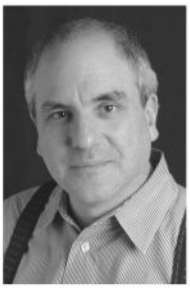
Biography

Randall D. Marshall

Richard A. Bryant

Lawrence Amsel



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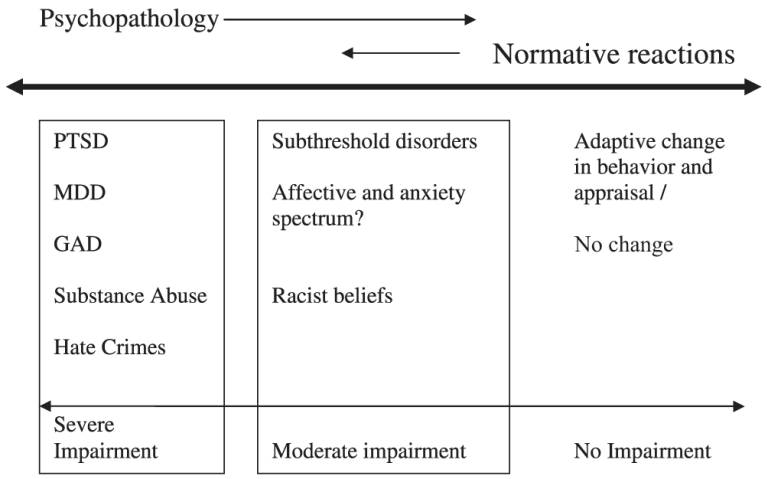

Figure 1. Continuum of Reactions to Terrorist Attacks

Note. PTSD = posttraumatic stress disorder; MDD = major depressive disorder; GAD = generalized anxiety disorder.

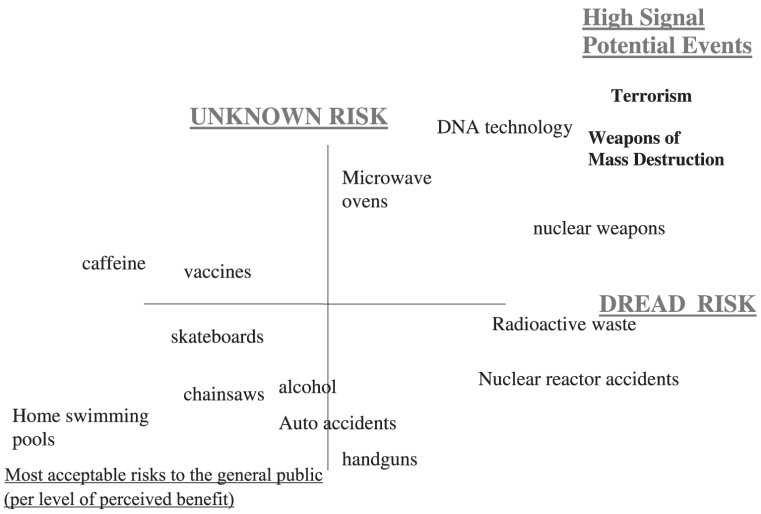

Figure 2. Dread Risk and Unknown Risk

Note. Based on Figure 1 from "Perception of Risk" by P. Slovic, April 17, 1987, *Science, 236*, p. 282. Copyright 1987 by American Association for the Advancement of Science. Adapted with permission.

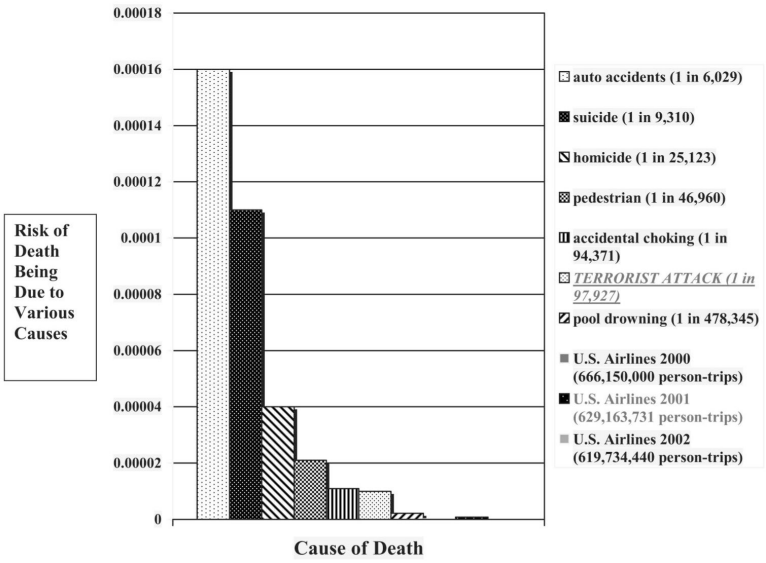

Figure 3. Risk of Death From Various Causes in the United States in 2001 or Comparison Year Stated

Note. Total deaths in 2001: 2,403,351; total 2001 population estimated: 285,093,813. Not shown is the risk of dying of heart disease in 2001: 1 in 405. Data are from U.S. Census Bureau (2002), Weed (2003), and Bureau of Transportation Statistics, Office of Airline Information (n.d.).