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Immediate and evolving emotions among directly exposed survivors 7 years after the Oklahoma City bombing

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The Oklahoma City bombing in 1995 was one of the most devastating incidents of terrorism in America at that time. Existing research has not examined changes in emotional responses outside of psychopathology to disaster over time. The sample for this study consisted of adult participants randomly selected from a state registry of survivors who were directly exposed to the 1995 bombing in Oklahoma City. The Disaster Supplement to the Diagnostic Interview Schedule was used to collect participants' demographic information and qualitative details of their disaster experience, perceptions, and feelings. A total of 315 items resulted from the coding of responses pertaining to emotions (125 immediately after the disaster event, 140 in the following week, and 50 at approximately seven years postdisaster). The most common emotions in the immediate postdisaster period were shock, fear, and anxiety. In the following week, the most common were sorrow and anger. At seven years, sorrow was the most frequently expressed of all emotions. Understanding the progression of these feelings across time enhances the ability to anticipate responses at different postdisaster timeframes and to intervene in a timely manner.

The Oklahoma City (OKC) bombing in 1995 was the most severe incident of terrorism on American soil at the time. A domestic terrorist detonated a homemade fertilizer bomb inside a rental truck directly in front of the Alfred P. Murrah Federal Building in OKC. The bomb blast killed 167 individuals, including 19 children, and injured 684. Nearly one-half (46%) of individuals who were in the Murrah building at the time of the bombing were killed, and most (93%) were injured. More than 800 building structures in the area were damaged or destroyed.

Few studies have provided both qualitative and quantitative information systematically obtained from survivors of terrorist events. Most disaster studies[1–3] have described postdisaster psychological symptoms along with outcomes and treatment needs in the context of specific psychopathology, especially posttraumatic stress disorder (PTSD). However, some research[4–6] has shown that while emotional responses and strong negative reactions are practically ubiquitous in experiences of such an extreme nature, the majority of disaster survivors neither qualify for a diagnosis of PTSD nor develop other psychopathology. Prior research has not focused on emotional responses outside of psychopathology over time after disaster.

Intense emotions that emerge in the aftermath of a disaster are universally recognized as natural human responses[7]. Exploration of these emotions outside of psychopathological constructs is needed. The literature on postdisaster emotional responses mentions intense feelings of fear, grief, anxiety, guilt, and sorrow[8,9]. Numbness, characterized as a lack of emotions, was reported by many survivors of the Central Italy earthquakes[10]. According to 1 survey study[11], anger was the most salient emotion among both exposed and unexposed U.S. civilians in the early aftermath of the 9/11 attacks. Another study[12] found that severe distress reported by 9/11 survivors was associated with feelings of anger.

Prior studies[13–17] have indicated that feelings such as shock, disbelief, fear, and anxiety tend to decline quickly, whereas sorrow, grief, and guilt generally linger. Some studies[18–21] have suggested that feelings prompted by negative experiences tend to fade more quickly over time than those associated with positive experiences. Other research[22] has proposed that negative emotions tend to persist longer than positive emotions and have greater impact on individuals. The literature generally agrees that emotions within disaster survivor populations typically do not transform from one type to another, although their presence and intensity may change within populations over time.

Most of the research on subjective emotional responses to disaster has been conducted in early postdisaster time frames and used

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quantitative methodology to collect data. Qualitative research has the potential to introduce spontaneous subjective material that may not be captured in quantitative studies. Qualitative findings on emotions from baseline interviews of OKC bombing survivors 6 months after the bombing have already been published[23], but further examination of the longer-term course of postdisaster emotions is still needed. Therefore, the purpose of this study was to examine the natural evolution of emotions from the first week to 7 years post disaster using reflections of emotions among a sample of survivors directly exposed to trauma in the OKC bombing. This study addresses the importance of the powerful postdisaster emotions that are normative and ubiquitous among directly exposed survivors of terrorism beyond the limitations of examining only PTSD and other psychopathologies. It is important to study emotional responses of trauma survivors to inform mental health intervention needs in addition to needs for formal psychiatric care[5,24]. Understanding the progression of disaster-related feelings across time enhances the ability to anticipate responses at different postdisaster timeframes and to intervene in a timely manner.

Results

A total of 315 items resulted from the coding of responses pertaining to emotions (125 immediately after the disaster event, 140 in the following week, and 50 currently at ~7 years postdisaster). Figure 1a–d represents bar graphs illustrating the proportions of each of the 9 emotions across the 3 time periods after the bomb blast. The relatively most common emotions in the immediate postdisaster period were shock, fear, and anxiety. In the following week, the most common were sorrow and anger. At 7 years, sorrow was the most frequently expressed of all emotions.

Fear and anxiety

As demonstrated in Fig. 1a, fear was a relatively common response in the immediate postdisaster timeframe, decreasing in proportions substantially in the following week and not reported at all at 7 years. Anxiety was relatively common only in the early postdisaster periods.

Immediately after the disaster, fear was described with either single-word expressions ("scared," "afraid," or "frightened") or short descriptive phrases. In several instances, fear was associated with thoughts of uncertainty such as "I didn't know what was happening" and "I didn't know what else might happen." One survivor discussed fear in relation to mortality: "Scared, I thought I might die." Extreme anxiety was expressed as "very anxious" or "panicked." Fear and anxiety were both attributed to concerns for their own safety and the safety of other victims.

In the following week, fear was described intensely: "extreme fear" and "never been so scared in my life." Some fear was described in association with specific reminders of the bombing (body parts, loud noises) or associations with the workplace setting (entering buildings, returning to work). At this point, most of the anxiety was attributed to concern about coworkers and friends. Intense expressions of anxiety continued with terms such as "panic attacks," "easily startled," and "jumping at every sound."

At 7 years, fear was no longer mentioned. The only report of anxiety was related to reminders of the bombing and avoidance of them; i.e., anxiety was hardly an issue years later.

Numbness, disbelief, and shock

Figure 1b shows the relative prevalence of numbness, disbelief, and shock over time. Shock was represented by more than a quarter of responses in the immediate period. This proportion declined to less than one-tenth in the following week and disappeared thereafter. Numbness also diminished over

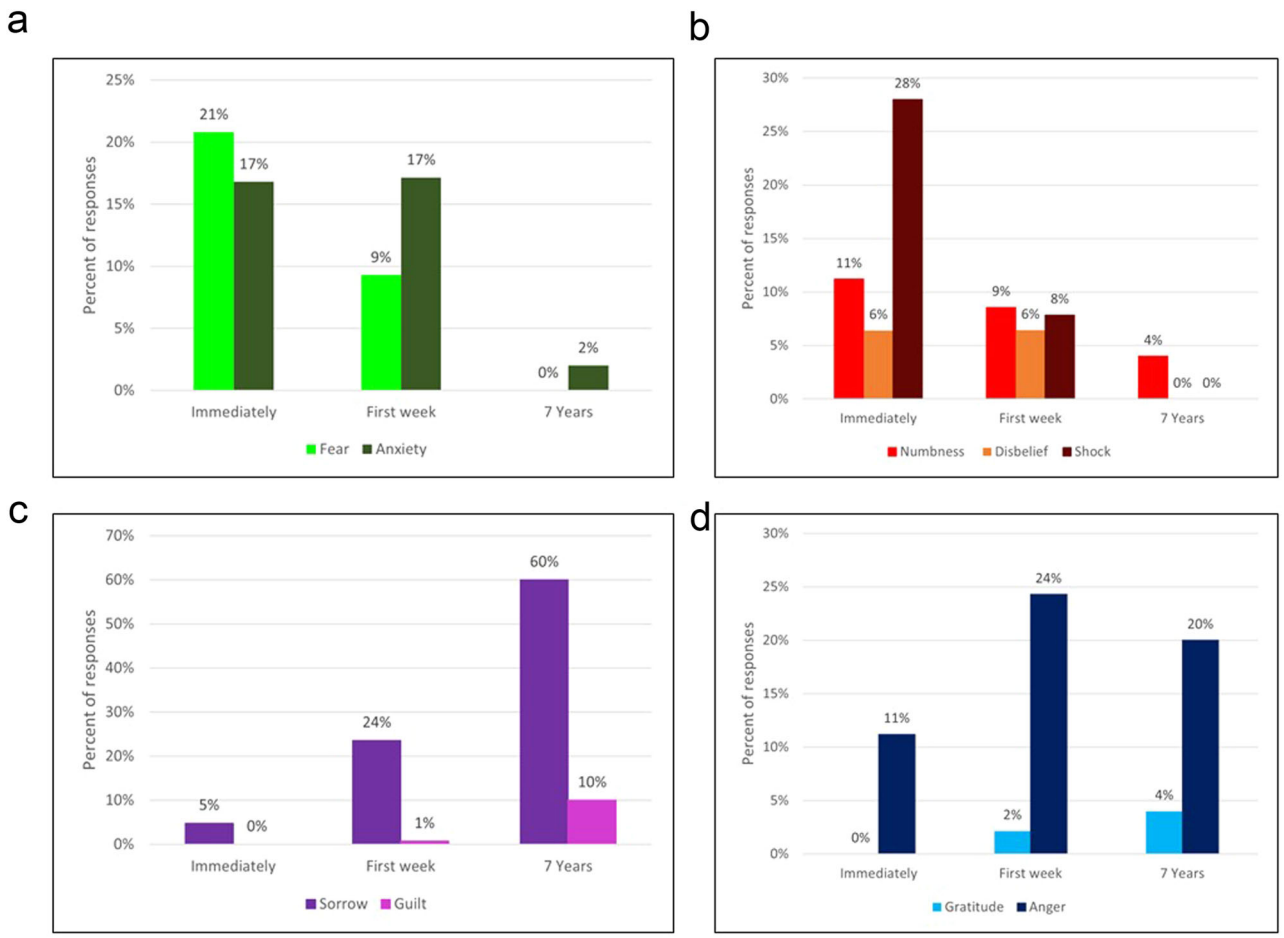

Fig. 1 | Survivors emotions across time. a–d Percent of respondents that expressed specific feelings immediately, the first week, and at 7 years post bomb blast.

time. Disbelief was relatively uncommon in the early postdisaster period and was no longer present at 7 years.

Most emotions expressed in the immediate period were phrased as single-word statements or short clauses, such as "disbelief" or "numb." Several survivors associated their shock with confusion: "shock, confusion" or "confusion and bewilderment." A few attributed their feelings of shock to a sense of disorientation: "I lost track of time" and "I couldn't remember anything until the evening." A few others connected their numbness to an inability to integrate information: "Numb. I couldn't make any sense of what was happening. Things weren't sinking in" and "I was numb – in denial. I didn't think that I was in danger." Similarly, they attached their disbelief to an inability to comprehend that the event happened, questioning whether the bomb blast was "real or a dream."

In the first week after the bombing, many survivors were "still in shock." Disbelief was typically conveyed by single-word descriptions. Numbness was also generally expressed as a single word ("numb" or "unemotional"). A few individuals depicted their numbness as detachment from personal emotions: "I didn't feel as much as I would have thought I would feel or that others were feeling." Numbness was also characterized as a loss of self-awareness: "I felt low, numb, like a zombie," and "Like living in a haze – I went through motions, not really living or conscious of what I was doing."

Seven years after the disaster, there were no reports of shock or disbelief and very few responses representing numbness. One survivor explained, "I have always felt kind of numb about it" and in the same statement, acknowledged little anger toward the bomber. Another survivor commented, "I don't feel as much as others," which enabled that individual to return to work.

A noteworthy finding was that many of the descriptions of these 3 emotions in the immediate period consisted of or were embedded with words or statements containing cognition such as "trying to figure out what happened," "I didn't know what else might happen," and "I wanted a tetanus shot." This initial intertwining of cognition and feeling dwindled over time as responses in the subsequent time periods represented more unqualified expressions of emotion.

Sorrow and guilt

Figure 1c reflects the progression of the proportions of sorrow and guilt responses over time. The percentage of sorrow responses was very low immediately after the disaster but increased to a maximum at 7 years when it represented majority of all emotional responses. Guilt was not present immediately and little represented thereafter.

Not only did the percentage of these emotions vary over time, but the qualitative content evolved as well. Sorrow immediately after the disaster was described as "extreme sadness" associated with an obsession with television coverage of the bombing. One survivor described "crying for people." Sorrow was also expressed as grief, generally related to the loss of countless innocent lives in the bombing.

In the following week, strong feelings of sorrow were still noted: "very sad" and "crying a lot." A majority of the expressed emotions represented sadness that was still related to the loss of loved ones and other victims. One survivor recalled "going to funerals every day" and struggling with "real personal losses." There were several mentions of sadness described as "depression," a term not used in the immediate postdisaster period. Only one individual expressed guilt over having survived: "I was so elated I was alive, I felt guilty."

At 7 years, sorrow was highly pervasive. It was generally discussed in relation to the loss of lives in the bombing and the fact that a "U.S. citizen could do such a thing to fellow men." A few noteworthy survivors indicated that their sorrow had subsided or was resolving: "I tried to get out of the anger and sadness….It does not bother me now" and "Sad, but after that I met a lot of nice people and sometimes feel good." A handful of comments invoked the 9/11 attacks as precipitating a resurgence of sadness: "I was okay till the September 11 attacks and then I felt it all over again" and "9/11 brought up the sadness about being unable to help people more." The few instances of expressed guilt were attached to remorse for having survived the disaster when others perished or for failing to help more victims in the bombing. Some of this guilt had decreased in intensity: "I don't feel as guilty now as then."

Gratitude and anger

Figure 1d shows the progression of proportions of gratitude and anger responses over time. Gratitude responses were relatively uncommon. Anger responses remained relatively prevalent across time, peaking in the first postdisaster week and still represented by approximately one-fifth of all emotional responses at 7 years.

Immediately after the disaster, intense anger was described as "overwhelming rage," and "angry, just angry." Survivors attributed their anger to physical injuries and property damages caused by the bomb blast: "My whole life was totally screwed up, my work, my car." One survivor expressed outrage over the detonation of the bomb close to a daycare center in the Murrah Building. No gratitude was expressed.

In the following week, intense anger was expressed as "pissed," "so angry," and "anger, hate" accompanied by "lots of crying" and "yelling." The bomber was the target of much of this anger. Other anger was directed to company layoffs and being forced to return to work. The rare instances of expressed gratitude were attributed to having survived the bombing: "I felt fortunate to be alive."

At 7 years, anger was still expressed, but it lacked the earlier intensity. For example, anger was described as "still some anger" and just "mad" at the perpetrator. Some of the anger had resolved: "I'm not angry anymore." Survivors expressed "hatred for people who do these kinds of things" and despair "that terrorism can hurt so many people." Gratitude responses were more prominent, although still directed toward having survived.

Discussion

This 7-year follow-up study examined the feelings of survivors directly exposed to the OKC bombing and the evolution of these feelings as the survivors processed their disaster-related experiences over time. Survivors recalled their emotional responses to the bombing in the earlier periods (immediately and 1 week) and at 7 years ("now" or currently at the time of the interview) and identified 9 core feelings: fear, anxiety, shock, numbness, disbelief, sorrow, guilt, anger, and gratitude. The prevalence of these emotions changed across the 3 time periods.

Fear and shock were initially highly represented among emotions, but by 1 week, proportions of both plummeted. Other immediate responses such as numbness, anxiety, and disbelief changed relatively little by 1 week, which might suggest that these emotions took more time to process compared to fear and shock. Most fear/anxiety and numbness/disbelief/shock had resolved by 7 years, which is consistent with findings of other studies[13,14,17]. Sorrow and anger, unlike the other feelings, were rarely reported immediately after the bomb blast. Sorrow and anger grew in proportions over time and lingered into the current time frame, constituting the majority of emotional responses currently at 7 years. These patterns of immediate postdisaster emotional reactions have been observed in prior studies[8–10,15]. Sorrow eclipsed the expression of all other emotions at the 7-year time point. Prior longitudinal studies[15,16] have also noted the persistence of sorrow several years after a disaster. Previous studies[11,12,25] have similarly revealed prominent anger among individuals exposed to large-scale violent events. In contrast, research on emotional responses to the 2015 Paris terrorist attacks found that anger was less frequently expressed than anxiety and sorrow; these data, however, were collected from social media comments posted by mostly disaster-unexposed individuals[26].

Qualitative descriptions of current feelings at 7 years differed from those at 6 months[23] as exemplified by relevant quotations, suggesting that feelings evolved over time qualitatively as well as quantitatively. In describing their emotional responses to the disaster at 7-year follow-up, survivors struggled to elaborate upon their feelings during the initial chaos and commotion: emotions such as shock and fear were primarily expressed as immediate reactions without additional description. Despite increasing numbers of anger responses from the immediate postdisaster period to later

timeframes, the qualitative intensity of anger responses diminished over time. Low amounts of sorrow/sadness were expressed in the immediate postdisaster period, which could well be a reflection of little loss of "close associates" or "loved ones" in this sample's experience as defined by *DSM* criteria for PTSD trauma exposure criterion A. Qualitative descriptions of sorrow evolved from an early focus on personal losses as the greatly increased sorrow responses over time apparently overwhelmed more personal early responses with an increasing focus on the general collective loss of innocent lives in a random and senseless act of violence. One other qualitative study[15] that examined the emotions of survivors of the 2011 tornado outbreaks in Tuscaloosa, Alabama, and Joplin, Missouri, found that feelings of sadness remained intense several years after the disaster, but it did not explore their feelings beyond 4 years.

The decrease in relative numbers of negative emotions of fear/anxiety and numbness/disbelief/shock over time is consistent with findings from literature reviewed in this article's introduction. Findings were mixed regarding negative emotions of sorrow and anger in this study, with a reduction of the intensity of these emotions but a relative increase in number of responses. This study also found a relative increase in positive emotions of gratitude over time, not inconsistent with prior research.

Comparison of findings of the current 7-year follow-up study to those of the 6-month baseline study of this sample[23] reveals consistency in directional changes in terms of numbers of emotional responses reported over time, with both studies finding general decreases in not only fear and anxiety but also numbness, disbelief, and shock responses, and general relative increases not only in sorrow and guilt but also in gratitude and anger responses. However, early postdisaster numbness and disbelief were recalled by many at 6 months in the baseline study but mostly not mentioned at 7 years, suggesting fading of memory for these early postdisaster emotions over the years. Early postdisaster anxiety in the immediate and 1-week periods was more prominent in the 7-year follow-up interviews than in the 6-month baseline interviews. This suggests that as time passed, survivors may have overestimated their immediate anxiety, with their more remote memories possibly contaminated by continued anxiety at 7 years. Survivors' qualitative descriptions of their feelings in the first week generally appeared consistent in types of emotions expressed between 6-month (baseline) and 7-year (follow-up) interviews, perhaps in part reflecting repetitive rehearsal of their disaster experience.

This study had several methodological strengths. One important feature was the random selection of individuals who were highly exposed to the bomb blast with a high participation rate, forming a sample population that is highly representative of bombing survivors. In addition, the 7-year interval between data collection points provided unique perspective insight into changes over time in perceptions of disaster-related emotional experiences. Other major strengths included the systematic data collection including open-ended responses to specific questions regarding their feelings about the disaster, allowing survivors to articulate their emotional responses broadly in their own words.

Limitations of this study included the loss of slightly more than one-third of the baseline sample, resulting in a lower proportion of unmarried individuals in the follow-up sample, which may have created biases limiting the generalizability of the findings. A major limitation of this study was the collection of the data for this study 7 years after the bombing, and thus the responses pertaining to early postdisaster periods are retrospective over years, introducing potential for inaccuracies of memory over time, though this weakness is addressed in comparisons with the earlier study's findings. Additionally, the qualitative data collected were reported by the survivors to the interviewers who handwrote the responses rather than using audio recordings and transcription of actual responses. Interviewer paraphrases of survivors' responses may have resulted in loss of information, inaccurate recording, and incorrect interviewer interpretation of responses. Finally, the data for the current study were collected more than 2 decades ago; however, it is established that the age of a database does not necessarily detract from its value[27,28]. This valuable database yields new knowledge with substantial applicability regarding emotions of survivors of terrorism across the years.

The results from this analysis revealed potential directions for future research. Because this study did not compare emotional responses with demographic characteristics such as age, race, socioeconomic status, and educational attainment or other variables such as social support and preexisting and postdisaster psychopathology, it could be useful for future studies to investigate these associations. Further analysis specifically comparing data for the early postdisaster emotional responses reported within individuals at 6-month baseline interviews and 7-year follow-up interviews was beyond the scope of this study, warranting separate treatment in future research dedicated to this analysis. Similarly, additional analysis specifically comparing different emotions reported together among individuals warrants future study to produce knowledge about co-occurrence of disaster-related emotions. Further study is also needed to examine the course of postdisaster emotions over periods longer than 7 years to determine subsequent effects on the lives of survivors.

Both general reductions in negative emotions (numbers of fear/anxiety and numbness/disbelief/shock and intensity of sorrow and anger) and the simultaneous increase in the positive emotion of gratitude among survivors directly exposed to large-scale terrorist events suggest progression toward emotional resiliency. Even though strong emotions are likely to be encountered among survivors of disasters as demonstrated by the findings of this study, only a minority of survivors will present with diagnosable psychopathology[6,29] and powerful emotions are likely to be encountered long before most postdisaster psychopathology can be diagnosed (more than 1 month for PTSD and 2 weeks for major depressive disorder). This study also has potential implications for guiding interventions over evolving postdisaster timeframes. For example, early postdisaster interventions can be advised to be prepared to focus on fear/anxiety and numbing/disbelief shock. Later interventions will need to be prepared for an onslaught of anger and sorrow. Gratitude can be expected to occur naturally only as the years go by, suggesting that while it might be advantageous to cultivate gratitude early after disaster, it might be inappropriate to try to do so before its time of readiness. This study's findings demonstrated that clinicians responding to disaster survivors need to be prepared to address prevalent and intense negative emotions, especially early after disaster, and to be able to differentiate these from psychopathology in selecting the most effective interventions. Formal evaluation and treatment are needed for psychopathology and reassurance and social support for the majority presenting with nonpathological emotional responses.

Methods

Sampling

More details of the research methods for this study and demographic characteristics of the baseline sample are provided in previous articles[5,6]. The sample for this study consisted of adult participants randomly selected from a state registry of survivors who were directly exposed to the 1995 bombing in OKC. All participants were personally contacted and interviewed by members of the research team in research offices or at private locations preferable to participants, who were offered modest monetary remuneration for their effort. The participation rate in the baseline study[5] conducted at 6 months post disaster was 71%. At the time of the bombing, all members of the sample were located in buildings that were severely damaged and where deaths occurred or in nearby outdoor locations, and thus all were directly exposed to the bombing; 87% were injured in the bombing, many severely. Additionally, 45% knew someone killed in the bombing, but only 1% lost a family member. Of the 182 participants at baseline, 113 (62%) were reinterviewed in a follow-up study conducted ~7 years after the bombing. The 7-year follow-up sample had nearly equal proportions of men (49%) and women (51%), was 42 median years of age, and was predominantly Caucasian (93%). More than two-thirds (70%) were married, and many (29%) were college-educated. A significantly higher percentage of nonrespondents were divorced/separated (34% versus 15%; $\chi^2 = 8.48$, $p = 0.004$) compared to the reinterviewed group at 7 years. This study was

approved by the Washington University Institutional Review Board (IRB) #00-0922 with initial approval on date 11/1/00 and University of Texas Southwestern Medical Center IRB #082006-033 (exempt) with initial approval date on 8/31/2006, and written informed consent was obtained from all participants at time of enrollment.

Interviews

The Disaster Supplement to the Diagnostic Interview Schedule[30] was used to collect participants' demographic information and qualitative details of their disaster experience, perceptions, and feelings. Direct exposure to the disaster was defined according to *DSM* (Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association) criteria for PTSD. The Disaster Supplement included 3 open-ended questions inquiring about the survivors' emotional responses to the bombing at 3 postdisaster periods: "directly following" (i.e., immediately), "in the following week," and "now." These questions provided the qualitative material for this analysis. The interviewers recorded participants' answers verbatim during the interviews. The interviewers' handwritten responses were later typed into electronic text documents for qualitative analysis. This procedure was successfully used in prior disaster research articles[12,31–33] published by this research team. Because the interviews were not audio recorded, the illustrative quotes do not necessarily represent word-for-word transcriptions.

The data for this 7-year follow-up study were provided by interviews conducted at the 7-year data collection. Thus, responses to the questions were examined separately across the 3 time periods as reported at 7 years. This analysis does not include qualitative baseline data for direct comparison. Participants' responses to the 7-year interview questions "directly following" and "in the following week" represent their current memories and perceptions of their postdisaster experience in the early postdisaster time frames 7 years ago. The "now" period refers to feelings present at the time of the interview at 7 years after the bombing.

Data analysis

The content in response to these questions was reviewed by a researcher on the team for identification of separate feelings. Nine feelings emerged: fear, anxiety, disbelief, numbness, shock, sorrow, guilt, anger, and gratitude. Descriptions for each feeling were developed to allow systematic coding of content. Multiple types of feelings were allowed in coding responses at each time frame. Two researchers independently rated a series of responses to identify feelings represented in participants' responses, achieving excellent interrater reliability (kappa ≥ 0.80) for each feeling with a Cohen's kappa score range of 0.80–1.00[34]. Interrater differences were resolved during this process through discussion to achieve consensus and formulation of inclusion and exclusion criteria for each feeling as agreed upon by both researchers. After interrater reliability was achieved, the electronic interview text documents were imported into ATLAS.ti for coding of feelings expressed in the responses.

Feelings were grouped within figures created from the data for purpose of displaying the proportions of responses for each emotion type in the 3 timeframes. Fear and anxiety were included in the same figure as they parallel the hyperarousal symptom cluster of PTSD. Sorrow and guilt were paired in a figure as they are reminiscent of depressive symptoms. Numbness, disbelief, and shock were grouped together in a figure as they resemble the numbing symptoms of PTSD. The remaining 2 emotions, anger and gratitude, were included in a final figure. Qualitative content for each feeling was organized conceptually by the research team and presented for each feeling by specific time period, with concepts described and highlighted with illustrative quotes.

Data availability

The data for this manuscript are available to researchers upon specific request.

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Author contributions

Whitney Pollio: Performed coding, assisted with qualitative methods, contributed to the writing of the manuscript. Helena Zhang: Transcribed the data, performed coding, contributed to the writing of the manuscript. Alex Gajewski: Performed coding, contributed to the writing of the manuscript. Samir Abu-Hamad: Performed coding, contributed to the writing of the manuscript. Katy McDonald: Oversaw the coding, contributed to the writing of the manuscript. David E. Pollio: Methodologist contributed to the writing of the manuscript. Carol S. North: PI and designer of the project, collection of data, assisted with qualitative methods, contributed to the writing of the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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