Joplin tornado survivors, hospital employees and community members: Reflections of resilience and acknowledgment of pain

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Abstract

Aim: Little is known about the relationship between age and levels of resilience following a major disaster. The aim of this pilot study was to determine self-rated levels of resilience of young, middle-aged and older adult survivors of the 2011 Joplin tornado 3 years’ post-disaster.

Methods: A mixed-methods design of a 25-item survey and focus groups was used to study three distinct adult age groups (young, 18–39 years; middle-aged, 40–64 years; and older, 65 or more years). A total of 182 individuals completed the survey, and 20 participated in one of three age-specific focus groups.

Results: Overall, 162 of the 182 tornado survivors reported normal-to-high resiliency 3 years after the event. However, 20 of the 182 participants had a total mean score of 62 or below, which is consistent with generalized anxiety and post-traumatic stress disorder. No statistical difference was found in resilience according to the three age groups.

Conclusion: Although the majority of participants reported normal-to-high resiliency, a small but troubling proportion of survivors reported difficulty in adjusting to the effects of the disaster 3 years after the event. Age did not appear to be a significant factor in resiliency of the participants.

Key words: coping, disaster, resilience, response, tornado

INTRODUCTION

On May 22, 2011, a devastating tornado, rated EF-5 on the Enhanced Fujita Scale, killed 162 people, wounded over 1000 and left a 15–17 mile long (24.14–27.36 km) and three-quarter-mile (1.21 km) wide area of destruction in Joplin, a southwestern Missouri city (Centers for Disease Control and Prevention (CDC), 2011b; Shin & Jacobs, 2012; The Joplin Globe, 2011). By definition, an EF-5 tornado sustains winds of greater than 200 mph (321.87 kph). The Joplin tornado was the first single tornado in the United States to result in over 100 fatalities since the 1953 “Flint Tornado” that struck Flint, Michigan (Maximuk, 2011). The overall aim of the study reported here is to describe the self-reported resiliency of young, middle-aged, and older adult survivors of the Joplin tornado 3 years after the event. The definition of resiliency used in this study is “the personal qualities that enable one to thrive in the face of adversity” (Connor & Davidson, 2003, p. 76).

Problem

While it is known that disaster survivors exhibit varying levels of resiliency during the recovery efforts and beyond, little is known about levels of resiliency according to age groups. Yet, this is vital information for healthcare professionals who strive to help survivors cope after the occurrence of devastating events. It may be possible that a particular age group lacks coping strategies and, therefore, requires more healthcare support. Healthcare professionals need more information to inform their decision-making processes and to possibly target particular age groups. Therefore, this study was conducted to bridge this informational gap.
Purpose
The purpose of the study is to describe self-reported resiliency of young, middle-aged, and older adult survivors of the Joplin tornado 3 years after the event. More specifically, the research questions are:

1. Do Joplin tornado survivors who are young (18–39 years), middle-aged (40–64 years) and older (65 years or more) adults vary in their degrees of resilience (stress-coping ability)?
2. Do Joplin tornado survivors who are young, middle-aged, and older adults vary in their expressed perceptions of a return to baseline, higher level or lower level of homeostasis 3 years’ post-disaster?

BACKGROUND
Age and resilience
Resilience and the ability to cope in the older adult are attributed to their lifetime experiences (Heppenstall, Wilkinson, Hanger, Dhanak, & Keeling, 2013; Tuohy & Stephens, 2012). Even though older adults have been shown to be resilient, some researchers have reported that older adults are more prone to psychological misery (Chen et al., 2014; Cofini, Carbonelli, Cecilia, & di Orio, 2014). Middle-age adults are believed to be less resilient than their older and younger counterparts after a natural disaster because of multiple responsibilities to society, such as work and family care that render them more vulnerable in the aftermath of a disaster (Li, Xu, He, & Wu, 2012; Xu & He, 2012). Resilience in healthcare workers (presumably young to middle-age) affected by the Joplin tornado was measured by a group of investigators and reported in 2014; they found that of 1,234 healthcare workers, 87.8% returned to work within 1 week of the tornado (Charney, Rebmann, & Flood, 2014). Less is known about resilience in adolescents. A study of the prevalence of post-traumatic stress disorder and major depression in adolescent victims of the Spring 2011 Joplin, Missouri and Alabama tornadoes approximately 8 months after the events, found that the vast majority of study participants had no lasting impairing distress (Adams et al., 2014). However, approximately 7% of the adolescents suffered from post-traumatic stress disorder (PTSD) and/or major depression.

Resilience framework
Richardson, Neiger, Jensen, and Kumpfer (1990) proposed the “Metatheory of Resilience and Resiliency” to describe the variability of human response to change or other stressors, also referred to as “disruptions” that occur in life. These disruptions can be positive, such as getting married, having a baby, retiring or going off to college, or negative events or changes, such as job loss or surviving a tornado. Richardson et al. (1990) identified four potential levels of resiliency that may occur in response to disruption. Individuals may experience an increased strength or growth in resilient qualities or “resilient reintegration”, a return to normal or baseline “homeostasis”, reduced levels of coping and adaptation or recovery as “reintegration with loss”, or a “dysfunctional reintegration” (Richardson, 2002). Richardson et al. (1990) metatheory is used in the study reported here as a framework for examining and determining the resilience levels of the study participants. Refer to Figure 1 for the lead author’s adaptation of Richardson’s model to demonstrate the continuum of the stress-coping ability of tornado survivors.

METHODS
Prior to initiation of the study, institutional review board approvals were received from the principal investigator’s (PI) university and the cooperating Joplin hospital. Consent was implied with completion of the quantitative survey; written consent was obtained from participants of the three age-specific focus groups.

Design
A mixed-methods pilot study consisting of the administration of a quantitative resilience scale and participation in qualitative focus groups was employed. “The purpose of conducting a pilot study is to examine the feasibility of an approach that is intended to be used in a larger scale study” (Leon, Davis, & Kraemer, 2011, p. 626). Focus groups were added to the study design to enhance the quantitative findings by exploring the concept of resilience through the focus group participants’ spoken expressions. Given that the project was a pilot study, the number of focus groups was limited to three.

Measurements
Connor–Davidson Resilience Scale
Resilience was measured using the 5–10 min, 25-item Connor–Davidson Resilience Scale© (CD-RISC©), which is a measure of resilience within individuals (Connor & Davidson, 2003). The full scale was used, which has adequate test–retest reliability (r = 0.87) and construct validity (Connor & Davidson, 2003; Roy, Sarchiapone, & Carli, 2007; Nrugham, Holen, & Sund, 2010; Roy, Carli, & Sarchiapone, 2011; Youssef, Green, Beckham, & Elbogen, 2013a; Youssef et al., 2013b). For each of the
25 items on the scale, participants rated the degree to which the item applied to them over the last month using a five-point scale (0 = not true at all to 4 = true nearly all the time). The item scores were summed; total scores could range from 0 to 100, with higher scores indicating greater resilience. Since the tool’s development, a number of studies using the CD-RISC have been published, which demonstrated that mean scores of resilience can differ by study population, including variation by age, gender, ethnicity, traumatic experience, geographic region, and disease or condition (Connor & Davidson, 2013) (Table 1).

Focus groups
The focus groups were conducted to address the second research question regarding the tornado survivors’ (1) self-described levels of coping as returning to homeostasis; (2) achieving a higher level of homeostasis; and (3) suffering a lower level of homeostasis or dysfunctional state 3 years’ post-disaster. All four levels of resilience as identified by the metatheory of Richardson et al. (1990): “resilient reintegration”; return to normal state, “baseline homeostasis”; experience reduced levels of coping/loss, “recovery with loss”; or experience a “dysfunctional state”, were demonstrated in responses obtained during the focus group sessions.

Sample and participant selection
This was a convenience sample of individuals who were primarily hospital employees and community-dwelling older adult attendees of a regularly scheduled senior group who met in a community setting. All participants self-identified as Joplin tornado survivors. Inclusion criteria were: English speaking, at least 18 years old, and have the ability to give informed consent, participate in the study, complete an electronic survey or a paper-and-pencil survey with no greater than verbal cues from the researcher, complete at least 75% of the questions on the survey; tolerate a 15–30 min seated meeting for the in-person survey; and a 50-min seated meeting for the optional focus group. Survey participants were informed

| Table 1 | Connor–Davidson Resilience Scale© mean scores |
|---------|-----------------------------------------------|
| Population | Mean score | Reference |
| U.S. community sample | 80.4 | Connor & Davidson, 2003 |
| 3-year Joplin tornado adult sample | 76.7 | Current study sample |
| Individuals with multiple sclerosis | 73.44 | Senders, Bourdette, Hanes, Yadav, & Shinto, 2014 |
| Primary care outpatients | 71.8 | Connor & Davidson, 2003 |
| General psychiatric outpatients | 68.0 | Connor & Davidson, 2003 |
| Patients with generalized anxiety disorder | 62.4 | Connor & Davidson, 2003 |
| 5-year male survivors of the 2008 Sichuan earthquake | 61.25 | Ni, Chow, Jiang, Li, & Pang, 2015 |
| Hong Kong general population | 59.99 | Ni et al., 2016 |
| 5-year female survivors of the 2008 Sichuan earthquake | 58.0 | Ni, Chow, Jiang, Li, & Pang, 2015 |
| Clinical trial participants with PTSD (2 groups) | 47.8–52.8 | Connor & Davidson, 2003 |

PTSD, post-traumatic stress disorder.
that they were eligible to win one out of 75 gift cards valued at $10USD each. Those who took the electronic survey were routed to a different queue where their name, e-mail address and phone number were not linked to their survey responses. One button was used to redirect them to the gift card draw entry area, and another button routed them to the notification of focus groups dates, times and locations according to their age range. Participants who completed the hard copy were given cards and envelopes to enter their contact information for the gift card drawing and optional focus group. Every focus group volunteer was eligible to participate in a focus group and told that they would receive a gift card valued at $20 USD at the conclusion of the session.

Data collection

Survey
The CD-RISC tool was administered in two ways; a facilitator at the Joplin hospital emailed a recruitment flyer and a Qualtrics (Qualtrics, Provo, Utah, USA) electronic version of the survey to all hospital employees; hard copies of the survey were also available in the hospital lobby to employees and community-dwelling older adults who attended a regular meeting at the community location. For the older adults, the survey was available in large print to facilitate readability. The PI was available to read the questions to participants who had difficulty viewing the survey. Although survey responses were anonymous, a mechanism was in place for participants to enter a drawing for a department store gift card and volunteer for an optional focus group session.

Focus groups
Upon completion of the electronic or hard-copy version of the survey, participants were informed of focus group dates, times and locations. All individuals who were willing and available to participate in the focus group for his/her age group were invited to do so. Three focus groups were formed: emerging/young adult (ages 18–39 years; n = 3), middle adult (ages 40–64 years; n = 11), and late/older adult (ages 65 years and older; n = 5). Participants were asked a series of questions that were based on the purpose of the study (Table 2). The questions were vetted with Joplin-area healthcare professionals, including a psychiatric mental health provider, three nurses, and a community citizen. Minor edits were made based on their feedback. The focus group sessions were tape-recorded. The PI asked the questions without the assistance of additional facilitators. The PI had prior focus group experience with Hurricane Katrina survivors (Langan & Palmer, 2012). A $20USD gift card was provided to each focus group participant following the session.

Data analysis
Quantitative data analysis was conducted using IBM SPSS Statistics version 22 (IBM Corp., 2013). Participant characteristics were described using frequencies and percentages for categorical variables and means ± standard deviations for continuous variables. Statistical significance was defined as alpha <0.05. Differences between age groups were analyzed using chi-square tests for categorical variables, and student’s t-test or one-way analysis of variance (ANOVA) for continuous variables.

The audio recordings of the focus group sessions were transcribed verbatim, read and re-read by three doctorally prepared researchers and a doctoral student, coded, and analyzed for meaning. Content analysis was used to break down the qualitative data into smaller units of expression, for coding, and grouping the coded material as based on shared concepts (Polit & Beck, 2014). The levels of reintegration found by Richardson et al. (1990) were used as a framework for classifying the focus group data; for example, participant expressions of the ability to do more or to handle more than they were able to do prior to the tornado were coded as resilient reintegration. “Return to baseline” or back to homeostasis expressions included stories of just getting past or beyond the disruption. Those persons who expressed a lower level of homeostasis were categorized as “recovery with loss.” Narratives representing “dysfunctional behavior” included descriptions of maladaptive strategies or behaviors that were used to cope with the stresses of the tornado and its aftermath (Richardson et al., 1990; Richardson, 2002).

RESULTS
Two hundred individuals submitted surveys (138 elec-
tronically and 62 in paper form); however, 18 surveys lacked sufficient data to be included in the final sample. Specifically, 11 subjects did not provide their ages, and seven failed to complete at least 75% of the CD-RISC. Thus, the final sample for the survey portion of the study was 182 subjects. Although 46 of the participants did not complete all of the demographic questions, they are included in the final sample of 182 participants (Table 3).

As previously indicated, all participants self-identified as Joplin tornado survivors. However, as noted in Table 3, 14 individuals identified themselves as “not in/near Joplin” at the time of the tornado. Although these individuals were not physically in Joplin when the tornado “hit”, their homes, families, places of employment, etc. were located in Joplin and they were directly affected by this disaster.

**Research question 1**

The mean scores for the three age groups on the CD-RISC survey approximated the mean U.S. general population (mean = 80.4) and primary care patients (mean = 71.8) scores as reported by Connor and Davidson (2003) (Table 1). Further, there were no significant differences between age groups in terms of mean scores of resilience (Table 3) with the CD-RISC©. Overall, 20 of the 182 participants had a total mean score of 62 or below, which is consistent with the mean scores reported by Connor and Davidson (2003) for individuals with generalized anxiety and PTSD; four of those individuals had scores of less than 50.

All but four participants were white, so differences could not be calculated by race. Men (n = 14) overall had a higher mean resilience score (mean = 77.64, SD = 9.16) than women (n = 122, mean = 76.24, SD = 12.58); however, there was not a significant difference by gender (t = 0.40; p = 0.69) or by education level (F = 1.06; p = 0.37). There was a trend for those with higher education levels to have higher resilience scores. In general, those who had a high school education as their highest level of education (n = 43) had a lower score (mean = 74.70, SD = 12.96) than those with a graduate or professional degree (n = 22; mean = 79.32, SD = 9.68).

**Research question 2**

Consistent with the quantitative data, differences by age group were also not noted during the analysis of the focus group transcripts for the participants’ expressions of stress-coping ability and return to baseline, higher or lower level homeostasis/stress. However, when considered as a whole, the focus group narratives demonstrated all four levels of resilience, as identified by the metatheory by Richardson et al. (1990): “resilient reintegration”; return to normal state, “baseline homeostasis”; experience reduced levels of coping/loss, “recovery with loss”; or experience a “dysfunctional state” and are demonstrated below.

### Table 3 Joplin tornado survivors’ participant characteristics and Connor–Davidson Resilience Scale (CD-RISC©) mean scores by age group (N = 182)

| Characteristic | Young (n = 33) | Middle (n = 101) | Older (n = 48) | p-value |
|---------------|---------------|-----------------|---------------|---------|
| Race          |               |                 |               |         |
| White         | n (%)         | n (%)           | n (%)         | 0.42    |
| Other         |               |                 |               |         |
| Gender        |               |                 |               | 0.31    |
| Male          | 1 (3.1)       | 12 (12.6)       | 1 (11.1)      |         |
| Female        | 31 (96.9)     | 83 (84.7)       | 8 (88.9)      |         |
| Highest level education |         |                 |               | 0.52    |
| High school   | 11 (34.4)     | 27 (28.4)       | 5 (55.6)      |         |
| College degree| 17 (53.1)     | 51 (53.7)       | 3 (33.3)      |         |
| Graduate/Professional degree | 4 (12.5) | 17 (17.9)      | 1 (11.1)      |         |
| Annual household income |         |                 |               | 0.003   |
| $20,000 or less | 2 (6.3) | 1 (1.1)        | 0 (0)         |         |
| $20,001–$30,000 | 4 (12.5) | 13 (13.7)     | 0 (0)         |         |
| $30,001–$40,000 | 7 (21.9) | 6 (6.3)        | 4 (44.4)      |         |
| $40,001–$50,000 | 6 (18.8) | 14 (14.7)     | 3 (33.3)      |         |
| Over $50,000  | 13 (40.6)     | 61 (64.2)       | 2 (22.2)      |         |
| Current living arrangements† |         |                 |               | NS      |
| Live alone    | 3 (9.1)       | 14 (13.9)       | 3 (6.8)       |         |
| Live with spouse | 19 (57.6) | 53 (52.5)      | 5 (11.4)      |         |
| Live with family members | 13 (39.4) | 32 (31.7)     | 1 (2.3)       |         |
| Caregiver for person in home | 1 (3.0) | 5 (4.9)       | 0 (0)         |         |
| Where were you when the tornado touched down?‡ |         |                 |               | 0.08    |
| In Joplin, Missouri | 16 (50.0) | 52 (54.7)     | 9 (100)       |         |
| Near Joplin, Missouri | 11 (34.4) | 34 (35.8)    | 0 (0)         |         |
| Other (not in/near Joplin) | 5 (15.6) | 9 (9.5)       | 0 (0)         |         |
| CD-RISC© mean | 75.4        | 75.4           | 79.6          | 0.15    |
| CD-RISC© range | 33–100     | 40–99          | 47–100        |         |

†Complete demographics were not available for all of the participants. The above data reflect the number of responses.
‡Participants were instructed to “check all that apply”. Categories are not mutually exclusive.

N = Total sample size; n = group size; NS = non-significant.

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Immediate coping

Richardson (2002) distinguished between the immediate coping response of individuals to disruption and the new level of resiliency that occurs later with the passage of time. Examples of immediate coping in contrast to long-term resiliency levels were expressed during the focus groups. For example, focus group participants described coping strategies in the immediate aftermath of the tornado. One individual described how her brain “shut off” horrific images of injuries and loss immediately following the tornado:

“I remember walking back to my house and I know I saw people gravely injured but I couldn’t tell you, I couldn’t tell you what they looked like. I couldn’t tell you who they were. I know they were my neighbors. You know my husband remembers seeing a neighbor with a 2 by 4 through his neck, and I, I know I was right there with him [husband] but I, my brain shut it off.”

Another participant stated: “It was a state of traumatizing panic.” Some participants described taking an inventory of basic needs as a first step in coping:

“I…think you go through an inventory, you know what’s here, what’s not here, what’s important, and what’s not important…you answer the most important questions first. You know: Where am I gonna sleep tonight? What am I going to eat tomorrow? Is my house livable? Is my car drivable…After the tornado, you start to take an inventory. Start somewhere, it doesn’t really matter where, as long as you start.”

A nurse explained how she went into automatic mode and put her feelings aside:

“I knew that I was safe, my daughters were safe, everyone in my family was safe. Then I knew I had to deal with what I saw later. I am sure that is part of nursing mode to know you just have to deal with, face things head on and process what you saw later.”

Another healthcare worker explained:

“Coping with stress is not an issue for me at the time. It comes later for me…. Right after the tornado… I headed straight towards the hospital. I had to hike in through the neighborhoods that had been hit…Well the memories are there. It’s a blur, the stress was there but you didn’t stop to evaluate your stress….”

Coping 3 years post tornado

The study participants had a range of experiences through the tornado and afterwards. As one participant explained: “I see it like ripples in the pond when you drop that stone. Everyone [in the tornado area] is affected, and no one doubts that or questions that in any way. But there is a difference in experience depending on what ripple you were in.”

The primary purpose of the focus groups was to ask about reintegration, coping and levels of resilience, three years after the tornado. Consistent with Richardson’s theory, participants from each age group verbalized developing stronger coping mechanisms and increased resiliency.

Higher level homeostasis/stronger coping

Young adult. A younger adult stated, “[Now] I always put things in perspective.”

Middle adult. One middle-aged adult noted, “I think all of the things that we’ve done since the tornado have helped me to deal with stress better and to know that I am able to keep going in a variety of circumstances.” Another participant in this group reported that through her experience with the tornado she experienced insight into handling future stressful events. She stated, “There were a lot of difficult situations after the tornado that we had to deal with, rebuilding all of that, and I think it has made me stronger, able to handle difficult situations even at work, at home, it’s better.” Another said, “I think I handle stress better. That’s probably the worst thing I’ve been through so that was very stressful… I just need to learn very quickly, what’s the most important, what’s the least important to worry about.” Yet another stated, “I feel like it has probably helped me to know that I can deal with even more than what I thought I could.”

Older adult. Older adult participants also noted increased resilience; for example, one participant stated, “During the past year it seems like I’m in better health than some of my children… I have coped and helped support them… Anyone that needs assistance, just give me a call.”

Return to normal state/homeostasis

Young adult. Some participants described a return to a normal state of homeostasis. One young adult stated, “I also wouldn’t say that I am necessarily more positive, but I think I am more realistic.”

Middle adult. A middle aged adult gave this perspective, “You don’t have any choice but to do what you have to do whenever something like that happens so you try to deal with it the best you can.”

Older adult. Similarly, an older adult participant described, “…I guess that it is the survivorship in us; we know we just have to keep going forward, we can’t change anything that has happened, and we have to accept things…”
Lower level homeostasis/reduced coping

The narratives of some study participants were consistent with ongoing reduced levels of coping or Richardson’s “recovery with loss”.

Young adult. One young adult participant stated, “...I used to be very Pollyanna, look on the bright side of everything, and I think in these last couple of years...I don’t tend to look at things as positively as I used to.”

Middle adult. A middle-aged adult participant shared, “I always thought that I was, like lived for stress and I think after the tornado, I have not handled stress as well as I used to.”

Older adult. An older adult participant related her ability to cope following her tornado experience, “It was stressful, well, I cried I can’t do this anymore, (crying)...I kept thinking it’s [house] 130 years old, it can’t fall down, it just can’t, and it did. So, I don’t do well with stress.”

Dysfunctional state/pathology

Unfortunately, a few individuals described a “dysfunctional state.”

Young adult. One participant reflected, “…the only thing that was left in my house was the deck. It was intact, everything else was completely destroyed and we were sitting there, we were just crying and crying and crying...So I just kind of disengaged myself from relationships, people who you know I used to talk to on a daily basis...I would kind of blow them off.”

Middle adult. Only one middle-aged adult participant’s comments suggested a prolonged dysfunctional state, “…I can handle stress at work so much better than I can home stress...I think some of that stems probably from so many people losing...and I didn’t know it would be that difficult. I don’t know, I don’t know if I handle that as well.”

Older adult. One older adult participant described how she coped by purchasing items she did not need, “So after the tornado when I was basically homeless for a year, I grew independent, but it wasn’t necessarily good independence and I bought a house...And my friends, even my grandson were telling me, Grandma, you don’t need this and I said, Yes I do. And they said, No, this washer works fine in this house. And I said, it’s pink on the bottom, I don’t want it. So I didn’t deal well with all that. And the stove, it was gas so I said, I want an electric stove, and I spent a lot of excess money that I really didn’t need to spend...”

Another older adult participant described ongoing nightmares, “I had a woman who was in the back room with me...during the tornado and we really clung to each other and I still, I have nightmares...”

Again, significant differences in the quantitative analysis and important differences in the qualitative analysis of the participants’ resiliency levels by age group were not found. However, participants’ narratives across all three age groups included examples of the four levels of resiliency as illustrated by the framework developed by Richardson et al. (1990). In other words, there were individual differences but not age-group differences in levels of resiliency in both the quantitative and qualitative data.

DISCUSSION

The sample size for the survey was limited, but much better than that for the focus groups. Recruitment for the focus groups was more of a problem than anticipated. It is not known why the researcher was unable to recruit larger numbers of younger and older adult focus group participants. Perhaps the young adults were preoccupied with child care, work, or other duties. The older adults may have preferred to rest or participate in familiar activities at the community center. Some may have declined participation if their friends chose to decline. The low response rate to the focus groups may have been due to the 50-min time commitment and lack of sufficient monetary incentive. Additionally, reluctance to participate may have been due to concerns about trust and wariness of the principal investigator’s motives (Murphy, Schwerin & Eyerman, 2008).

We were surprised to find no difference in resiliency scores according to age; we expected to find higher scores in the older adult group, based on information obtained during the literature review (Cherry et al., 2012; Cohen, Baziliansky, & Beny, 2014; MacLeod, Musich, Hawkins, Alsgaard, & Wicker, 2016). It was rewarding to find that the majority (~89%) of the participants did not express long-lasting psychosocial ill effects from the Joplin tornado. Of course, it is possible that the participants over-estimated their level of resiliency in an attempt to appear ‘positive’ about their experiences. Also, it is possible that the participants had repressed some of the psychological ill effects of the traumatic tornado experience. It is noteworthy that 20 of the 182 participants had low resilience scores, consistent with the mean scores of individuals with depression and PTSD, as reported by Connor and Davidson (2003). This finding supports the need for long-term psychosocial support for some, post-disaster, and that the CD-RISC© tool may be
helpful in identifying individuals in need of such support.

**Strengths**

The mixed-methods approach was a strength of the study; as indicated above, the qualitative data supported the findings of the quantitative data in that neither dataset showed significant difference in levels of resilience among adult disaster survivors by age group. In addition, the qualitative data captured distinct levels of resilience of individual participants that would not have been captured with the quantitative data alone.

**Limitations**

There were several limitations in this pilot study. First, the sample size was relatively small and even representation of the various age groups was not achieved. Second, it is unknown if those who reported lower levels of resilience/coping and/or dysfunction had pre-existing dysfunction. Third, the self-selected sample could have resulted in positive skewing of the findings. Finally, we were unable to assess the effect of recall biases, given that the study data was collected 3 years after the event.

**Recommendations for future research**

Clearly, more studies are needed regarding resiliency of disaster survivors (CDC, 2011a). It is recommended that the study reported here be replicated with a larger sample that is not limited to self-selected participants. Further, even representation of the three age groups is recommended to adequately address the research questions. Ideally, pre-disaster measures of resilience are desirable to compare with post-disaster resilience measures. Perhaps this could be accomplished by identifying a sub-set of a high-risk population for tornadoes and performing pre-testing; scores could be kept for comparison following a future traumatic event, should one occur.

**CONCLUSION**

While we celebrate the high percentage of the Joplin tornado survivors who have successfully integrated disastrous experiences into their lives, we must acknowledge their often-painful journey and support those who remain in need. According to our findings, a small percentage (~10%) of survivors of the Joplin tornado continues to experience low or dysfunctional levels of resilience 3 years after the event. It is important to identify individuals who have difficulty adapting to catastrophic events and provide needed services to help them heal and achieve a more peaceful and healthy existence.

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**AUTHORS’ CONTRIBUTIONS**

Each listed author has made substantive intellectual contributions to this study. JCL and KC made substantial contributions to the conception and design of this study. JCL was actively engaged in the recruitment of study participants and the acquisition of data. JCL, JP, and AS were actively engaged in the literature review process. JCL, JP, KC and AS made substantial contributions to the analysis and interpretation of data, drafting the manuscript, and have given final approval of this version of the manuscript for consideration and publication.

**DISCLOSURES**

None of the authors have any involvement, financial or otherwise, that might potentially bias their work.

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