



Narratives of resilience in medical students following the 3/11 triple disaster: Using thematic analysis to examine paths to recovery

Halley Kaye-Kauderer^{c,*}, Ana Rodriguez^c, Jake Levine^c, Yuzo Takeguchi^d, Moeko Machida^e, Jordyn Feingold^c, Hideharu Sekine^f, Craig Katz^{b,c}, Robert Yanagisawa^a

^a Department of Internal Medicine, Icahn School of Medicine at Mount Sinai, New York, NY, USA

^b Department of Psychiatry, Icahn School of Medicine at Mount Sinai, New York, NY, USA

^c Department of Medical Education, Icahn School of Medicine at Mount Sinai, New York, NY, USA

^d Department of Medical Education, Fukushima Medical University, Fukushima, Tohoku, Japan

^e Department of Medical Education, Shirakawa Kosei General Hospital, Fukushima, Tohoku, Japan

^f International Exchange Affairs, Fukushima Medical University, Fukushima, Tohoku, Japan

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ABSTRACT

In March of 2011, a 9.0 magnitude earthquake, tsunami, and nuclear explosion damaged northeastern Japan. While nine years have passed, the memory of this disaster continues to linger. This qualitative study had three main goals. First it aimed to explore the reactions and interpretations of adolescents living in areas affected by the disaster. Second, it sought to examine the behaviors and beliefs that enabled these students to not only recover but thrive. Third, it strived to build a more global and dynamic framework of resilience. A convenience sample of 18 students participated in semi-structured face-to-face interviews. Their narratives were qualitatively analyzed using thematic content analysis. Overall, four themes, each with four codes or sub-themes, emerged as sources of resilience including social support (social networks, role models, and community service), hopeful future orientation (cognitive reappraisal, optimism, and motivation to be physician), active emotions (rational compassion, luck, and suppression) and sense of purpose or duty (sharing of personal story, motivation to educate others, and Fukushima image). These findings reveal the experiences of highly resilient youth facing trauma and the connection between childhood adversity and career choices. They also begin to uncover the unique ways that culture, society, and tradition impact processes of recovery.

1. Introduction

In March of 2011, northern Japan suffered one of the deadliest disasters in recent history, the 3/11 Triple Disaster including the Great East Japan Earthquake, tsunami, and subsequent nuclear explosion. Its impact on Northern Japan was immense, leading to almost 20,000 deaths, 7,000 injuries, and 2,500 missing people (Headquarters, 2013; Nakahara and Ichikawa, 2013).

While such tragedies can leave behind deep physical and psychological wounds, many individuals are able to recover. Much of this positive deviance can be explained by resilience, the ability to bounce back from adversity, serious threat, or trauma (Feder et al., 2019).

In recent years, a surge of literature has supported the neurobiological, psychological, and environmental underpinnings that allow humans to recover and thrive in the face of adversity (Horn and Feder, 2018; Ozbay et al., 2007; Southwick and Charney, 2012).

Research has shown that resilience is far more than a simple psychological trait or biological process. Rather it is complex, dynamic, and unique to an individual and their surrounding environment (Bonanno, 2005; Gottschalk et al., 2020; Southwick et al., 2014). Furthermore, studies have shown that certain levels of stress can actually help build resilience, akin to how a muscle develops strength through controlled physical training (Amstadter et al., 2014). Thus, when stress is managed appropriately it can be beneficial for humans to achieve their full potential.

Most theories posit that there are several distinct features that contribute to an individual's overall resilience including optimism, cognitive flexibility, social support, spirituality, and physical agility. Several researchers have used interviews to explore the commonalities that allow resilient individuals to bounce back (Buikstra et al., 2010; Iacoviello and Charney, 2014; Singh et al., 2011; Southwick and Charney, 2018). Indeed, the use of interviews has been shown to have

* Corresponding author at: 1 Astor Place, Apt 70, New York, NY 10003, USA
E-mail address: Halley.kaye-kauderer@icahn.mssm.edu (H. Kaye-Kauderer).

numerous benefits as it allows for complex ideas to be examined in detail, picking up on subtleties that may be missed when using solely quantitative methods (Anderson, 2010).

Relatively few of these studies, however, have engaged with highly resilient adolescents. Additionally, few studies have fully explored the cross-cultural underpinnings and practices of resilience following tragedy. For example, most resilience research uses Western definitions of healthy functioning with little attention to how resilience may be influenced by cultural context and societal factors (Boyden and Mann, 2005; Carver and Scheier, 2001; Theron and Liebenberg, 2015; Ungar et al., 2007). These shortcomings have been addressed in a mixed method study called the International Resilience Project, which surveyed over 1500 youths (mean age of 16) in 14 communities on 5 continents to investigate how culture impacts resilience in adolescents (Ungar, 2008). Among other findings, this project concluded that there are both global and culturally or contextually specific aspects of resilience (Ungar, 2004). Other studies have reinforced that community ideology and values as well as socio-political systems and religious beliefs contribute to unique understandings and practices of resilience (Lerner, 2006; Panter-Brick and Eggerman, 2012; Super and Harkness, 2002; Theron and Liebenberg, 2015), and thus, attention to cultural factors in the adolescent population is warranted.

This qualitative study aims to expand the literature on transcultural resilience by shedding light on the understandings and practices of resilient behaviors in support of both a theoretical framework, and perhaps more importantly, the development of practical interventions. It has three specific aims: (1) to explore the reactions and interpretations of the 3/11 triple disaster among medical students who were adolescents (age 12 – 18) at the time of the disaster; (2) to understand the salient features that contributed to their overall resilience; (3) to expose features of resilience that may be specific to Japanese culture.

2. Methods

2.1. Participants

Inclusion criteria were students at Fukushima Medical University (FMU), with no preference for age, sex, hometown, or experience with the disaster. Fukushima Medical University is located in Fukushima City and was the closest hospital that remained open during the 3/11 Triple Disaster. Interviews were open to students in all classes and convenience sampling was used. Eighteen interviews were conducted in total, 3 from third year students (17%), 4 from fourth year students (22%) and 11 from fifth year students (61%). Seven participants were female (39%) and 11 were male (61%). Of the interviews conducted, 13 (72%) were from prefectures directly impacted by the disaster including Fukushima, Miyagi, and Iwate prefectures and the remaining 5 participants (28%) were from prefectures farther away where the effects of the disaster were less severe.

2.2. Procedures

Eighteen face-to-face semi-structured interviews were performed at Fukushima Medical University. A translator was present in all interviews. Examples of questions are listed in Table 1:

In order to recruit participants, information about the interviews was included in an annual survey distributed during student's academic courses. Each interview was audio recorded and then later transcribed. Anonymity and confidentiality were maintained by removing all identifying information from the interviews during the transcription process.

2.3. Data analysis

The interviews were analyzed using thematic content analysis, which strives to be systematic and objective, allowing direct quotes

Table 1
Sample questions from interview guide.

Sample Questions
Please tell me about your experience with the Great East Japan Earthquake: Where were you at the time of the earthquake and tsunami? How were you affected? What do you remember from that day?
In what ways did you, your friends and family, and your community suffer? What emotions did you feel at the time of the disaster? What emotions do you feel today when thinking of its memory?
How were you able to overcome such difficulties and tragedy? What were the most important things that helped you to recover?
How do you feel about the disaster today, eight years later?
What was your motivation for becoming a physician?
Have you heard of the term resilience? What does it mean to you?

from the interviews to drive the process of finding patterns and themes (Erlingsson and Brysiewicz, 2017).

The analysis, based primarily on the methods originally proposed by Boyatzis, included the following steps (Boyatzis, 1998): 1) One primary investigator (HK) read through all the interviews to familiarize herself with the general content (n = 18); 2) The same investigator (HK) then analyzed each interview with open coding to look for salient patterns and themes; 3) A second investigator (AR), blind to the study hypothesis, independently used open coding on a sample of interviews (n = 4); 4) The two investigators convened to discuss the similarities and differences between their individual codes; 5) Response patterns and themes were organized into a codebook consisting of structured themes and codes supported by specific quotes from the interviews; 6) The codebook was individually applied to all interviews by both investigators.

The codebook consisted of four main themes and twelve specific codes or sub-themes that were developed from meaning units or verbatim quotes through an inductive approach. The meaning units were converted into condensed meaning units, simple summaries of each meaning unit, which allowed the units to be more easily organized and structured. An example of specific meaning units, condensed meaning units, codes, and themes derived from the interviews is shown in Table 2.

3. Results

Thematic content analysis of the FMU students' narratives resulted in four broad themes, that were further organized into twelve codes or sub-themes as depicted in Table 3.

3.1. Connection and social support

The theme of social support including social networks, role models, and community service was mentioned in every interview (18 of 18) as a significant source of resilience after the disaster.

3.1.1. Social networks

Students emphasized the importance of family, friends, school communities, sports teams, and neighborhoods as a foundation for their recovery. One student said, "To me, the people were the biggest thing. The only thing to do was reach out to friends, family, relatives; I just wanted to talk to friends who were in totally different places to make sure they were okay and exchange stories about how life was going. I just wanted those connections. I found strength and calmness in hearing from friends and hearing that they were okay gave me peace." Another student reflected, "Through the experience of 3/11, I realized how important the family bond is – that it must be preserved and treasured."

3.1.2. Role models

Many students also spoke about the importance of finding support and inspiration from strong role models. For some, these role models

Table 2

Example of selected meaning units, condensed meaning units, codes and themes.

Meaning Unit	Condensed Meaning Unit	Code / Sub-theme	Theme
"I also belonged to a music club at school so we had a charity concert to collect money. It was a major turning point for me. Before this, I believed that I couldn't do anything to help others. But through the charity concert, I found a way to help others."	Volunteering with charity concert made her feel she could help others	Community Service	Connection and Social Support
"Through the experience of 3/11, I realized how important my family bond is and that it must be preserved and treasured."	Realized importance of family bond	Social Networks	
"I wanted to educate high school and junior high school students to understand what happened."	Wanted to educate students on what happened	Motivation to educate others	Sense of Purpose or Duty
"I wanted to send the message that Fukushima is safe. So mothers can live with their children free of fear of radiation. So thanks to the earthquake, ironically, I am studying here. I wanted to serve Fukushima more in my future."	Wanted to send message that Fukushima is safe, wanted to serve Fukushima more in future	Fukushima Image	

Table 3

Major themes and codes/sub-themes that emerged from FMU student interviews.

Theme	Code / Sub-theme
Connection and Social Support	Social Networks Role Models
Hopeful Future Orientation	Community Service Cognitive Reappraisal Optimism
Active Emotions	Motivation to be Physician Rational Compassion Luck
Sense of Purpose or Duty	Suppression Sharing of Personal Story Motivation to Educate Others Fukushima Image

were an identifiable source of unwavering support. One participant spoke about her mother saying, "She was the most influential person who helped me. I could depend on her." For others, role models possessed attitudes and actions that inspired them. Another participant remarked, "Seeing how other people were helping those in need made me so interested and made me want to be on the helping side."

3.1.3. Community service

Students expressed the importance of participation in community service as a source of resilience. One participant reflected, "Many people wanted to return to their hometowns, but we had to get rid of destroyed things. So, I went to help do this. Engaging in volunteer work makes me feel like I can help others." Others emphasized that community service allowed them to feel not only like a victim, but a helper too. As one student remarked, "It will be very difficult for my hometown to be restored. But now I would like to help someone to give back for all of the help that I received."

3.2. Hopeful future orientation

The theme of hopeful future orientation was prevalent throughout all the interviews (18 of 18) and highlighted the students' use of cognitive reappraisal, optimism, and desire to be a physician in their process of recovery.

3.2.1. Cognitive reappraisal

Cognitive reappraisal, or re-interpreting emotionally difficult events, was echoed throughout many interviews as one of the main sources of resilience. One student said, "Every time I get depressed or feel in vain, I try to analyze the situation. And try to think about the main reasons for those bad feelings. Then I try to restore the situation." Another student remarked, "I understood that I could not change the things that happened in the past. But we can change our

interpretations." These statements demonstrate students' abilities to reframe negative sentiments in a more positive light.

3.2.2. Optimism

Ideas of optimism and positivity also resonated throughout the interviews. One student remarked, "Learning about disasters was good because if something happens again in the future, I feel like I can help. I can't change the past, but maybe I can change the future." Other narratives showed students trying to think optimistically about the future of Fukushima. "Perhaps, the incident changed Fukushima a lot in a positive way. Fukushima was kind of revitalized." Some students commented on the importance of positivity for Japanese people saying, "I think that doing positive thinking is very good for Japanese people."

3.2.3. Motivation to be a physician

Many students believed that the disaster contributed to their desire to pursue a career in medicine. One student remarked, "Before the earthquake, I wanted to be a doctor. But I had more desire because of the incident. It was a driving force for me." Reflecting back on times before they were medical students, one student proclaimed, "It was such a tragedy. I was 14 years-old at the time and I wanted to help the people who were suffering, but I had no instrument or knowledge to do this. But now, I am a medical student and I will be a doctor in the future. If another earthquake happened, I could help the people with my knowledge and my hands."

3.3. Active emotions

For many people, feelings of compassion and luck or suppressing these feelings altogether were sources of resilience in the path to recovery. This theme appeared in nearly all interviews (17 of 18) and served as motivation for action.

3.3.1. Rational compassion

Rational compassion, or a rationalized and deliberate concern for the suffering of others, drove many students to contribute more in the aftermath of 3/11. One student declared, "The fact is that I didn't lose my hometown, but other people near the nuclear power plant did. I can understand the feelings of those people. I understand mentally those people will never restore their feelings. But I really want to help. Maybe, it's life-long work for me."

3.3.2. Luck

Similar to sentiments of rational compassion, many students expressed feelings of luck. One student said, "The first thing I think of is how lucky I am to have survived and that people around me are all okay." Another student reiterated this idea saying, "I felt like I was lucky because I didn't suffer any severe damage from the earthquake so maybe I didn't need to take it as seriously."

3.3.3. Suppression

Several students spoke about how their ability to suppress their own emotions allowed them to bounce back more quickly and focus on other personal or societal matters. One student explained, “I try to do my best every day. And to focus on myself. I don’t really talk to anyone about this. I just keep it inside.” In commenting about Japanese culture, one student remarked, “I have never had a friend who has talked to me about their tragedies or trauma. This is because of Japanese culture. Maybe, we think that hiding our emotions is a kind of fact. Or we just feel embarrassed to express our thoughts in our minds, especially trauma.”

3.4. Sense of purpose or duty

Nearly all students (17 of 18) spoke about the importance of feeling that they had a duty or sense of purpose to share their story, educate others, and support Fukushima.

3.4.1. Sharing of personal story

While few students sought to keep their emotions and struggles hidden, many spoke openly about a duty to share their stories. One student explained, “I think sharing emotions was the most important thing for me. I was one of the people that directly suffered from the earthquake and radiation. Sharing my emotions and my story again and again and again helped me.” Another student echoed these thoughts saying, “I needed to focus on what I could do to help the people of Fukushima. I thought I could share the information I received from my parents or other places, so I could maybe be a vehicle to bring things together.”

3.4.2. Motivation to educate others

Many students focused on their duty to educate others. It was this motivation that both helped them to recover and also empowered them to feel like they could contribute, even as adolescents. One student said, “I don’t think it is a good idea to forget. I think the biggest feeling for me is that fear of forgetting. I wanted to educate high school and junior high school students to understand what had happened.” Another student echoed similar thoughts, saying, “We have to promote and teach people about what we know. I have to let a lot of people know what happened in Fukushima and the right information about radiation. I felt a commitment to take what I learned and spread it to other people.”

3.4.3. Fukushima image

A final sub-theme that emerged throughout many interviews was a desire to repair and elevate Fukushima. By doing so, participants hoped to eliminate stigma and biases against the people and their homeland. One student declared, “I learned from the doctors of this university that the radiation level in Fukushima City was not so harmful. But I was disappointed about the reputation of Fukushima because many people thought that Fukushima was a ghost town and town of death. I want to send the message that Fukushima is a safe place to live.” Another student meditated on how this related to Japanese culture saying, “As Japanese people, we have to know about this disaster, even though people in Japan tend to not want to communicate about what happened in Fukushima. This is Japanese people’s character. We don’t need to change, but we need to tell people what is going on.”

4. Discussion

The 3/11 Triple Disaster had a profound and lasting impact on Japan’s northeastern prefecture. The goal of this study was to characterize resilience among a population of adolescents at Fukushima Medical University. These students represent a particularly resilient group of individuals as they were able to keep up with the grueling demands of premedical and medical education and gain enrollment into a top medical university despite adversity in their teenage years.

The first theme that emerged, connection and social support, has repeatedly been identified as the backbone of resilience (Ozbay et al., 2007). Research suggests this is particularly true for children and adolescents who seek safety, security, and affirmation from their social support systems and role models (Pietrzak et al., 2011; Woodgate, 2006). While research has shown that role models are valuable for all individuals facing adversity, this may be especially true during adolescence when identity formation is emerging (Yancey et al., 2002). Many students also expressed the importance of community service. This is not surprising given that past research has shown that altruism is positively associated with resilience and well-being (Poulin et al., 2013). These narratives suggest that community engagement may have subconsciously pushed participants toward medicine, a profession rooted in giving to others.

The next major theme that emerged from the narratives was that of hopeful future orientation, which included narratives of optimism, cognitive reappraisal, and motivations to become a physician. Past studies have indicated the importance of optimism, and conversely the disadvantages of pessimism, in children’s outlooks during adverse events (Cunningham et al., 2002). This may be partially explained by research showing that optimism and positive emotions broaden one’s awareness and attention, and by doing so, contribute positively to creativity, physical health, relationships, and resilience (Catalino and Fredrickson, 2011).

In a similar vein, students spoke about a sense of purpose or duty that emerged in the aftermath of 3/11 to share their stories, educate others, and publicly support Fukushima. In fact, several studies with trauma survivors have found that many feel a “survivor mission” to transform their own struggles into motivation for social action (King, 2016). Among the most interesting findings was the students’ commitment to spreading correct information on radiation and safety in Fukushima, thereby decreasing its global stigma.

The final theme that emerged throughout these narratives was active emotions, or emotions that pushed students towards action and recovery. Many of the students recalled feelings of rational compassion for those who had been more severely impacted by 3/11 and consequently felt lucky for their own circumstances. Recent studies have shown that the intentional cultivation of compassion can lead to positive coping strategies, reduced stress, and increased well-being (Fredrickson et al., 2008; Goetz et al., 2010; Klimecki et al., 2013). Thus, even when enduring difficult times, individuals who possess compassion can manifest resilience.

Another goal of this study was to expose aspects of resilience that may be specific to Japanese culture. Recent research has begun to show that resilience is shaped by cultural and historical contexts (Lerner, 2006; Seccombe, 2002). For example, religion played a crucial role for individuals recovering from the 2005 Pakistan earthquake (Feder et al., 2013). And yet few students at FMU mentioned the role of religion at all (Kawabata and Tamura, 2007). In a collectivist society like Japan, relying heavily on community may come more naturally than cultivating religion or spirituality. A study conducted by psychologist Greg Miller after a tsunami struck southeast Asia found that, “Asian culture, with its emphasis on group welfare over individual self-reliance seems to have been a powerful, positive influence” (Miller, 2005). In a context where commitment to society plays a critical role in everyday life, disasters may have a greater disruptive effect on the community than on the individual. Thus, when considering the implementation of post-disaster mental health programs in places like Japan, there should be a greater emphasis on community-based resilience interventions that draw on mutual support, community service, and national empowerment.

Another interesting finding pertains to the unique role of luck in appraising and coping with tragedy. One study looked at the difference between how Americans and Japanese appraise success (Imada and Ellsworth, 2011). Ultimately, they found that Americans tended to be more individualistic and self-enhancing, reporting feelings of pride. In

contrast, Japanese people reported feeling lucky and attributing their successes to external or situational factors, rather than their own self-agency. In the place of luck, which denotes a kind of randomness, Americans point to more internal and controllable emotions (i.e. gratitude). This finding can help to explain why luck played a crucial role in many of the narratives presented here and yet has been largely left out of Western literature on resilience.

Many students also mentioned that they were helped by suppressing and silencing their emotions. A study that worked with the same population of students at FMU found a positive association between certain negative emotions like confusion, anger, and guilt and overall resilience (Kaye-Kauderer et al., 2019). Contrary to Western philosophy that emphasizes an open exchange of emotions, this suggests that the experience of negative emotions as well as actively suppressing these emotions may enhance resilience. These interviews begin to suggest a form of resilience that is perhaps less internal or emotional and more action oriented.

For the first time in modern history, the entire world faces a shared disaster: the COVID-19 pandemic. The present study may inform future research, as well as the development of resilience interventions in the wake of this new tragedy, not just in Japan, but around the globe. Similar to the threat of radiation associated with 3/11, the coronavirus cannot be seen, smelled, or felt. Additionally, substantial stigma and misinformation exists around individuals infected or considered to be at high risk. The findings here suggest critical areas that may be incorporated into intervention programs aimed at helping communities and individuals manifest resilient responses to COVID-19 (e.g. building connections, fostering optimism, developing a sense of purpose, sharing evidence-based information, etc.). Furthermore, the universal nature of the present tragedy may allow for the further development of a global understanding of resilience, parsing apart aspects that are culture-specific and those that are more universal. Finally, the role of adolescents in the disaster response should not be underestimated, and opportunities for young people to contribute to relief efforts and share their personal stories may enhance both individual and collective resilience.

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Compliance with ethical standards

This study received Institutional Review Board approval from both the Icahn School of Medicine at Mount Sinai in New York City and Fukushima Medical University in Fukushima, Japan in accordance with the Helsinki declaration.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

CRedit authorship contribution statement

Halley Kaye-Kauderer: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing, Project administration, Funding acquisition. **Ana Rodriguez:** Formal analysis, Writing - review & editing. **Jake Levine:** Conceptualization, Methodology, Investigation, Writing - review & editing, Project administration, Funding acquisition. **Yuzo Takeguchi:** Conceptualization, Investigation, Project administration. **Moeko Machida:** Conceptualization, Investigation, Project administration.

Jordyn Feingold: Formal analysis, Writing - review & editing. **Hideharu Sekine:** Conceptualization, Supervision, Project administration. **Craig Katz:** Conceptualization, Methodology, Writing - review & editing, Supervision. **Robert Yanagisawa:** Conceptualization, Methodology, Writing - review & editing, Supervision.

Declaration of Competing Interest

The authors declare no conflicts of interest associated with this research study.

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