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Forty Days after the Great East Japan Earthquake: Field Research Investigating Community Engagement and Traumatic Stress Screening in a Post-Disaster Community Mental Health Training

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Abstract

The current paper describes the results of posttraumatic stress educational outreach and screening offered to 141 citizens of Japan who attended a public-service mental health training regarding post-disaster coping 40 days after a 6.8 Richter Scale earthquake, local and regional deaths, and an ongoing nuclear radiation threat. Attendees were given access to anonymous questionnaires that were integrated into the training as a tool to help enhance mental health literacy and bridge communication gaps. Questionnaires were turned in by a third of those in attendance. Among respondents, multiple exposures to potentially-traumatic events were common. More than a quarter of respondents met criteria for probable PTSD. Physical health and loss of sense of community were related to PTSD symptoms. Associations and diagnosis rates represented in these data are not generalizable to the population as a whole or intended for epidemiological purposes; rather, they are evidence of a potentially useful approach to post-disaster clinical screening, education, and engagement. Results are presented in the context of previous findings in Japan and ecologically-supportive post-disaster field research is discussed.

On Friday, March 11, 2011, an undersea earthquake with a magnitude of 9.0 on the Richter scale occurred 130 kilometers east of Sendai, Japan. The earthquake was the largest to have ever occurred in Japan and was the fourth largest in the world since recording began in 1900 (US Geological Survey, 2011). Officially known as the Great East Japan Earthquake, the disturbance was felt throughout the four main islands of Japan, and caused a tsunami consisting of waves up to 120 feet high, traveling as far as 6 miles inland. The tsunami caused flooding at a nuclear power plant in Fukushima prefecture, disabling electric water pumps used to cool nuclear reactors, causing full meltdowns of 3 reactors, localized hydrogen gas explosions, the release of radioactive materials, and widespread public fear (Report of Japanese Government to the International Atomic Energy Agency, 2011). The disaster was associated with over 19,000 deaths or missing people and over 5,000 reported injuries (Japanese National Police Agency, 2011); additionally, various sources have estimated that between 70,000 and 400,000 individuals lost or were evacuated from their homes (Japanese Ministry of Foreign Affairs, 2011; UN Office for the Coordination of Humanitarian Affairs, 2011).

The mental health effects of disasters are difficult to study and address, especially in international contexts. Publications relating to PTSD often rely on small homogeneous samples or focus on one particular event at a time (Fraser, 2007). Heterogeneity in disaster proximity, severity, time of measurement since event, post-event data collection methodology, and cultural context make direct comparisons of prevalence and impact of PTSD across studies difficult to interpret. Nevertheless, there is good reason to report on international data regarding post-disaster PTSD symptoms, and to continue to describe diverse samples, as such studies may provide insight into the universal expression of post-trauma distress and the risk factors for negative outcomes that transcend cultural influence. Additionally, ongoing questions regarding how to effectively identify and provide mental health information and services to victims in disaster areas necessitate investigations of methods for engaging individuals who could benefit from and are open to mental health education/intervention. Describing diverse outreach strategies; including, timing, context, content, and characteristics of the engaged audience will assist the field in identifying appropriate methods that avoid aggressive or potentially iatrogenic post-disaster programming.

International investigations of PTSD related to earthquakes indicate similar symptom patterns and risk factors to other traumatic events. Risk factors include female gender (Caldera, Palma, Penayo, et al., 2001; Carr, Lewin, Webster, et al., 1995;), low social support (La Greca, Silverman, Vernberg, et al. 1996; Vernberg, La Greca, Silverman, et al., 1996; Wang, Gao, Shinfuku, et al., 2000); physical injury related to the trauma (Lima, Chavez, Samaniego, et al., 1989; Kuwabara, Shioiri, Toyabe, Kawamura, Koizumi, Ito-Sawamura, et al., 2008), and intensity and duration of trauma exposure (Goenjian, Najarian, Pynoos, et al. 1994; Wang, Gao, Shinfuku, 2000). Loss of home has also been associated with increased risk for PTSD and decreased post-disaster resiliency in earthquake-related traumatic events (Chen, Yeh, Yang, 2001; Goto, Wilson, Kahana, Slain, 2006; Joh, 1997; Kuwabara, Shioiri, Toyabe, Kawamura, Koizumi, Ito-Sawamura, et al., 2008; Sharan, Chaudhary, Kavathekar, Saxena, 1996) and natural disasters (Ironson, Wynings, Schneiderman, Baum, Rodriguez, Greenwood, Benight, et al., 1997; Thompson & Abel, 2009). Taken together with research

regarding elevated risk related to psychosocial resource loss (e.g., Freedy, Saladin, Kilpatrick, Resnick, 1994; Freedy, Shaw, Jarrell, Masters, 1992; Hall et al., 2008; Smith, & Freedy, 2000) special attention should be given to assessing physical and psychosocial resource loss along with psychological aspects of functioning among survivors of natural disasters.

Setting

The current paper describes the results of posttraumatic stress education and screening invitations offered to 141 citizens of Mito, Japan who attended a public service information training regarding family and community post-disaster coping on April 19, 2011, 40 days after the earthquake. Mito is situated in Ibaraki prefecture, directly southeast of Fukushima prefecture, 195 kilometers from the earthquake's epicenter. Seismic measurements indicate the strength of the earthquake in Mito was 6.8 on the Richter scale (USGS, 2011). Measurements of earthquake shaking and damage in Mito were similar to Sendai, the city closest to the epicenter; the Modified Mercalli Intensity (MMI) rating scale, which ranges from light impact (V) to very violent (X), scored both cities in the range of VII to VIII depending on exact location (USGA, 2011), and the Japan Meteorological Agency Seismic Intensity Scale, which ranges from 0 to 7, scored both cities in the range of 6 (Japan Meteorological Agency, 2011; USGS, 2011). Even so, the vast majority of deaths and missing persons occurred in areas north of Mito that were directly affected by the tsunami. In Mito, 20 deaths were linked to the disaster and many homes were left structurally unsound. Electrical power, water, telecommunications, and public transportation systems were immediately incapacitated by the earthquake, and local rivers could be seen flowing backward due to the tsunami. Although Mito lies 60 kilometers outside of the 80 kilometer evacuation zone around the Fukushima nuclear plant recommended by international experts, citizens experienced fear and helplessness regarding the potential of radiation exposure. Citizens also expressed that fears were intensified by mistrust of official information released by the government, widespread media coverage, inaccurate internet speculation regarding levels of danger, and limited access to Geiger counters and other methods of monitoring personal radiation exposure.

After the earthquake, the Tokiwa International Victimology Institute (TIVI) of Tokiwa University in Mito sponsored two psychoeducational trainings for citizens, community leaders, and university students. These educational initiatives are described in greater detail elsewhere (Yoder, et al., in press). The trainings focused on concrete tenants and suggestions for action to increase community and family connection, supportive parenting, and victim assistance. Additionally, psychoeducation was incorporated regarding common reactions to trauma, timelines of natural recovery, and future warning signs and symptoms of PTSD to be watchful of in self and others. The trainings incorporated a large amount of participant interaction and collaborative two-way didactics. Some components of the trainings were similar to those in Psychological First Aid (PFA; Brymer, 2006); however, given that empirical data supporting the use of PFA are still forthcoming (Ruzek, Brymer, Jacobs, Layne, Vernberg, & Watson, 2007), we opted to create curricula with a custom degree of specificity regarding the particular training setting, timing, resources, and context, and in collaboration with representatives of the host institution. Data for the current study were

collected during a 2.5 hour training for 141 community members and leaders (e.g., school teachers, police officers, monks, managers of evacuation centers, etc.) conducted 40 days after the earthquake. Community members responded to invitations and public advertisements regarding the open-forum training, conducted at 7 PM, on April 19, 2011. Notably, despite heavy wind and rain, the community auditorium was at capacity, indicating an interest in mental health issues among the citizens of Mito.

Education and Data Collection

In order to prime attendees regarding the target information to be disseminated, attendees were invited to complete anonymous questionnaires regarding their functioning since the earthquake. Attendees were informed the questionnaires did not have to be turned in but that many of the questions raised issues they should be aware of regarding post-disaster functioning. Attendees were also told that the training would include time for questions related to the questionnaires or any other mental health topics. Accordingly, the self-report questionnaires were integrated into the training as a tool to help enhance mental health literacy, encourage interactive participation, and to promote long-term retention of the covered topics. Contact information regarding resources for mental health services was provided. At the end of training, attendees were invited to turn in the measures so that the results could be used to understand who was participating in the training, how the community reacted to the earthquake, and to understand what factors may be related to post-disaster mental health for the participating attendees. Attendees were encouraged to ask questions or make comments directly in the training and were given paper and pencils along with the questionnaires to write down questions to be answered anonymously. As noted, attendees were given access to the questionnaires regardless of their intention to turn them in. The anonymous screening and data collection were completed in reaction to the community's initiated request and completed in accordance with local oversight and by the authority of the Tokiwa International Victimology Institute, in tandem with Tokiwa University, affiliated with the senior author. Although the institution did not have access to a formal U.S.-style institutional review board (IRB), special attention was given to mirroring processes, and providing university leadership with consultation directed towards, activities which would be considered exempt under U.S. standards. Special consideration was given to the potential for iatrogenic effects associated with participation. As the anonymous questionnaires were an important part of the community support and education curricula, it was deemed that including the questionnaires, and open discussion of them, represented a decreased rather than increased risk for adverse mental health reactions. Encouragement of community support, open (non-coercive) discussion, and the *accomplishment* of accurate and involved psychoeducation are in line with best-practices in community mental health post-disaster response settings.

Measures

To accommodate the use of the questionnaire packet as a pragmatic tool for education and to minimize participant burden, assessment measures and construct items were intentionally parsimonious. The questionnaires were limited to 40 items, all of which could be addressed with a check mark or circle.

Sample characteristics were obtained for participant gender, income, age, educational attainment, and marital status.

Posttraumatic stress disorder symptoms (PTSD) and trauma exposure were measured with the posttraumatic stress diagnostic scale Japanese version (PDS-J; Nagae, 2007). This self-report instrument inquires about exposure to 12 potentially-traumatic events. Respondents indicate which event was most disturbing in the past month. PTSD symptoms are measured with 17 items corresponding to each DSM-IV PTSD symptom rated from 0 to 3 in severity. In English speaking samples, the PDS demonstrates adequate internal consistency, test-retest reliability, content validity, and good sensitivity and specificity (Foa, Cashman, Jaycox, Perry, 1995). The PDS-Japanese Version (PDS-J) was created by translating the PDS, including language-related and cultural-related modifications by native speakers. The instrument was then back translated for accuracy and cross referenced with the original items in English. The PDS-J has been published and is available for use in Japanese samples (Nagae, 2007). Current probable PTSD was defined as the presence of at least one reexperiencing symptom (e.g., intrusive memories or distressing dreams), three avoidance symptoms (e.g., efforts to avoid thoughts or activities associated with the trauma), two symptoms of hyperarousal (e.g., difficulty falling asleep or concentrating) and self-reported functional impairment.

Subjective physical health was assessed by two items. Participants provided an overall rating of their health during the past 7 days from 1 (very good) to 4 (poor) and an overall rating of their health-related functional impairment during the past 7 days from, from 1 (not at all), to 4 (a very great amount).

Loss of social connectedness since the earthquake was measured by asking participants to what degree they had lost their sense of being connected with friends/family, from 1 (not at all) to 4 (a very great amount).

Social support since the earthquake was measured by two items. One measured whether the participants felt they could turn to family, and the other whether they felt they could turn to friends when needed. Both were rated from 1 (not at all), to 4 (a very great amount).

Media exposure was assessed by asking participants to report on the average number of hours they watched television reports about the earthquake/tsunami per day during the past seven days.

Fear of earthquake during the past seven days was assessed by asking participants how much they have been fearful of another earthquake, from 1 (not at all), to 4 (a very great amount).

Results

Engagement

Participant engagement in the training forum was robust as indicated by at-capacity attendance and the necessity of a 30-minute extension to the 2-hour training to accommodate participant questions. Seventeen attendees out of 141 (12%) asked a question directly during the forum and 42 (30%) wrote down questions to be answered anonymously by the

presenters, while 21 (15%) wrote their emails addresses with their questions to receive answers electronically. Of those in attendance, 41 (30%) turned in completed questionnaires and 100 (70%) kept their questionnaires. The training was broadcast live on local television and then replayed for a wider regional audience the following day.

Demographics

Of those individuals who turned in questionnaires, 35 (83%) were female. The mean age was 33.75 ($SD = 9.16$). Half of the sample (50%) was single and almost half were married (48%), with a small percentage reporting divorce (2%). Seventy-three percent completed either college or graduate school. Sixty-five percent reported having an “average” household income, 7.5% reported “above average,” and 27.5% reported “below average.”

Trauma Exposure & Symptoms

Exposure to potentially-traumatic events was high in this sample. Most people reported having experienced one potentially-traumatic event prior to the most recent earthquake (52%), 24% reported two exposures, and 24% reported three or more exposures. Although not all respondents indicated having been exposed to a natural disaster, all were exposed to the earthquake on March 11, and subsequent significant aftershocks, which were continuing during the training and data collection. Fifty-two percent reported their most traumatic, or index event, was the March 11 earthquake (See table 1 for list of events). Participants watched an average of two hours of television programming related to the earthquake per day ($SD = 3.5$). Fears regarding a second major earthquake were relatively low, with only 12% of the sample indicating a good deal, or a great amount of concern about this occurring.

The mean level of overall PTSD symptom severity on the PDS-J was 10.07 ($SD = 7.62$) and internal consistency of the measure was excellent ($\alpha = .92$). Twenty-seven percent of the sample reported symptoms consistent with PTSD, i.e., indicating reexperiencing, avoidance, hyperarousal, and functional impairment related to a variety of traumatic life events. As table one denotes, 15% met criteria for probable PTSD related to the March 11, 2011 earthquake on the PDS-J.

Subjective physical health was generally low in the sample, with 55% reporting poor or fair health and 33% reporting health-related functional impairment. Over half of the participants indicated that they could turn to family for support a great or very great amount (58%). The reverse was true for turning to friends for support, with 56% indicating a small amount or not at all. Half of the participants reported no loss to their sense of community, 37.5% reported a small amount, and 12.5% reported a great or very great amount of loss.

Bivariate outcomes

We evaluated the zero-order correlations between demographic variables, psychosocial risk and protective factors and PTSD symptoms (see Table 2). PTSD symptoms were correlated significantly with physical health in past 7 days ($r = .58$), health-related impairment ($r = .35$), and a sense of loss of community ($r = .39$). In order to better understand the relative importance of these significant correlates, we entered them simultaneously in a multivariate OLS regression. When examining them together, self-reported subjective health and loss of

sense of community ($\beta = 6.42$, $p < .001$ and $\beta = 3.38$, $p = .02$, respectively, model $R^2 = .43$) remained significant in the model and accounted for a large portion of the variance in PTS symptoms.

Discussion

The current paper describes the results of citizen engagement and posttraumatic stress screening invitations offered to 141 citizens of Mito, Japan who attended a public-service information training regarding post-disaster coping 40 days after the Great East Japan Earthquake. The training was well-attended indicating that community advertisements were an effective outreach strategy. Interactive participation in the forum and self-disclosure exceeded expectations and the integration of self-report measures as a community training tool appeared feasible and helpful. Over a third of the sample asked specific questions related to mental health issue during the training and 15% provided email addresses to have their specific questions answered after the training. Of those in attendance, 41 (30%) turned in questionnaires. Of those who turned in questionnaires, 27% met criteria for probable PTSD with 15% reporting that the recent earthquake was the index event. Considering the entire sample, the intervention yielded positive screening rates of 8% for probable PTSD in general, and 4% for probable PTSD related to the recent earthquake. Physical health problems in the past 7 days and loss of sense of community were related to PTSD symptoms, after accounting for meaningful covariates.

The current finding of a relationship between physical problems and PTSD is in line with previous investigations regarding posttraumatic reactions in Japan. There is evidence that Japanese disaster victims express distress somatically (Araki, 1995; Hayashi & Nishio, 1996; Ozake & Fukunishi, 1995; Williams, Baker, & Williams 1999). Reporting physical problems might enable victims to ask for help from medical sources without associated fear of stigma; alternatively, Japanese trauma survivors might actually manifest their distress psychosomatically. Regardless of the reasons for increased endorsement of physical complaints, Goto (2001) found less than 3% of Japanese disaster victims sought help from mental health professionals during the 10-month period following a volcanic eruption, whereas more than 75% of victims sought help from medical doctors. In line with these results, Araki (1995) found that most Japanese post-disaster victims appreciated a medical team listening to their experiences in addition to providing medical services. The important role of physicians in addressing post-disaster mental health needs, in part due to their increased immediate access to survivors and willingness of survivors to seek out their services, is also increasingly recognized in the U.S. (Freedy & Simpson, 2007). Viewed in this context, the current results indicating broad participation in a post-disaster mental health-only focused forum may represent changing mores regarding mental health information-seeking norms.

Importantly, loss of social connectedness was significantly related to PTSD symptoms. Previous post-disaster research in Western samples indicates that loss of social support is one of the most robust predictors of PTSD symptom severity following trauma (e.g., Acierno et al., 2007; Kaniasty and Norris, 1994; La Greca, et al., 1996). This relationship was also found in the current study and may be more robust in Japan where individuals typically self-

disclose emotions only to close friends and family (Hayashi & Nishio, 1996; Hirai & Clum, 2000; Tanaka & Takagi, 1997), and where public (i.e., out of support network) disclosure is not as common or available as it is in Western settings.

Attitudes regarding disclosure of post-disaster mental health functioning and associated treatment seeking may be changing in Japan. The Japanese concept of *Shouganai* (translated as, “It cannot be helped”) often accompanies post-disaster discussions and can reinforce taboos regarding the importance of non-disclosure of negative emotions (Williams et al., 1999). However, recognition by Japanese media and health professionals of PTSD and other post-disaster mental health difficulties has increased since a large scale 1995 earthquake in Kobe, Japan (McCurry, 2004). Since the Kobe earthquake, many peer-reviewed scientific publications have explored PTSD-related constructs in Japanese samples via patient self-disclosure (see: Asukai, et al., 2008; Fukuda, et al., 1999; Kato, et al., 1996; Kuwabara, et al., 2008; and Nishi, et al., 2009; for a thoughtful review of PTSD-related research specific to Japan see: Goto & Wilson, 2003, and Norris, 2011). The Japanese Society for Traumatic Stress Studies (JSTSS) was established in 2002 and currently has over 1,000 members. Japanese newspapers run headline articles on a routine basis highlighting post-disaster public mental health issues. Accordingly, changing attitudes and media perceptions, and ongoing advocacy and public health education efforts by Japanese traumatic stress researchers and clinicians may be responsible for the successful rate of participation in the community education event described here. Importantly, willingness to self-disclose and discuss post-disaster mental health issues will likely be related to acceptance and utilization of evidence based treatments for PTSD in the future.

The current intervention represented a feasible and viable method of post-disaster mental health engagement, outreach, and clinical PTSD screening. There is an abundance of scientifically rigorous epidemiological studies regarding post-disaster PTSD diagnosis rates; and similarly, there are many helpful accounts describing expert-informed or face-valid post-disaster mental health interventions and direct outreach curricula. The current study builds on these resources by empirically investigating the results of direct community outreach in regards to post-disaster participant engagement and PTSD screening outcomes. Notably, the unique elements of this intervention include the incorporation of members of the cultural group being trained as actual trainers and planning partners, which has been hypothesized to be an important component in post-disaster mental health group interventions (Everly, Phillips, Kane, Feldman, 2006). Also unique was the dual-purposed inclusion of mental health questionnaires as both a training tool and screening mechanism, as well as the availability of email as a viable adjunct to in-person training.

One other unique aspect of the current method that merits further investigation is the immediate usefulness of the data gathered. It appeared that we were able to use the results of the community screening and questionnaires to address citizen concerns and improve the quality of subsequent community outreach and trainings. The victims of the disaster were reasonably interested in how other victims of the disaster in their communities responded. In this sense the data provided a natural bridge between our team of trainers, Japanese mental health professionals, and affected citizens. Indeed the training described here was part of a long-term strategy of post-disaster relationship building, outreach, clinical training, and the

eventual provision of evidence based services for PTSD. We have little doubt that the empirical findings presented here were in and of themselves a useful tool of engagement.

The present study has several strengths. It represents an ecologically helpful, if limited, way to collect data, by merging data collection with the provision of a community service. To our knowledge, it is the first study conducted following the events of March 11, 2011 and therefore offers unique information about a historic and devastating natural and technological disaster. We measured PTSD with a validated measure previously used in Japanese trauma survivors; its use and outcomes in the current context provide additional evidence that the instrument can be deployed easily in post-disaster settings with excellent internal consistency and that it may have additional value as a community service learning tool. The study also included measurement of culturally-relevant manifestations of psychological distress and culturally informed protective factors by targeting physical health and connection to community.

Limitations of this brief survey and outreach study are also evident. These data were gathered from a subset of those who participated in a community training; accordingly, the reported rate of probable PTSD in the sample is not generalizable. Additionally, assessed constructs of health, social connectedness, support, fear, and media exposure were measured with only one or a few items. Regardless, our results do indicate that risk factors and correlates of our sample matched those of other cultures following disaster, that citizens in urban Japanese areas are motivated for access to post-disaster mental health information, and that merging data collection with public service events may be a viable and non-exploitive method of post disaster field research and clinical screening by offering a service to the community.

In conclusion, the recent disasters in Japan have significantly affected the physical and mental health of many Japanese people. It is reasonable to assume that significant loss of life, compounded by the loss of livelihood in areas most impacted by the disaster, will continue to affect the disaster survivors and place them at increased risk for mental health difficulties in the years to come. The people of Japan, however, have experienced many natural disasters and traumas over time and their resilience is significant and notable. Current efforts are underway by the Japanese mental health community to connect with domestic and international resources to maximize opportunities for disaster recovery. For example, the Japan/U.S. Evidence-based Mental Health Recovery Initiative (JEMRI, 2011), an international collaboration and non-profit organization (NPO), is developing programs aimed to further boost the resilience of the Japanese population by providing access to information, evidence based mental health resources, multiday clinical trainings to licensed providers in evidence based treatments for PTSD, and telehealth-assisted ongoing clinical supervision. Such collaborations could prove beneficial to both countries, since both have under-researched post-disaster engagement strategies and underdeveloped mental health infrastructures not optimally capable of appropriately addressing the consequences of large-scale disasters.

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Table 1

Percentage of endorsement of worst traumatic life events in the sample

Traumatic Life events	% endorsement	Number and (percent) of PTSD cases by event
March 11, 2011 Earthquake	52.4	6 (55)
Previous natural disaster (e.g., earthquake)	9.5	0
Non-sexual assault by family member or someone you know	9.5	2 (18)
Serious accident, fire or explosion	7.1	1 (9)
Non-sexual assault by a stranger	4.8	0
Sexual assault by a family member or someone you know	4.8	0
Sexual assault by stranger	4.8	0
Childhood sexual abuse	4.8	1 (9)
Life threatening illness	4.8	1 (9)
Other traumatic event	2.4	0

Table 2

Intercorrelations among study variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender	.												
2. Income	-.08	.											
3. Age	-.20	.55**	.										
4. Education	-.17	.23	.34**	.									
5. Marital status	-.28	.32	.64**	.01	.								
6. Physical health	.13	-.03	-.17	-.27	.11	.							
7. Health-related impairment	-.11	.12	.20	.10	.07	-.54**	.						
8. Lost sense of community	-.22	.08	.23	-.13	-.03	-.08	.23	.					
9. Family support	-.11	.19	.06	.02	.20	-.03	-.14	-.01	.				
10. Friends support	.08	-.06	-.14	-.11	.24	.40*	-.24	-.26	.34*	.			
11. Hours of TV watching	-.27	.13	.04	.10	.31	.28	-.07	-.10	.08	.30	.		
12. Fear of another earthquake	.11	.30	.49**	.11	.38*	.10	-.15	.10	.21	.11	.04	.	
13. PTSD (PDS-I)	-.02	.07	.25	.01	-.18	-.58**	.35*	.39*	-.10	-.18	-.07	.03	.

Note. PDS-I = PTSD Diagnostic Scale- Japanese Version.