

Research Article

Acute Stress Reactions and Posttraumatic Stress Symptoms of the General Population Six Months after the Great East Japan Earthquake

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Keywords

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- acute stress reaction
- The Great East Japan Earthquake
- Indirect exposure to traumatic events
- Survey descriptive study

Abstract

The present study examined acute stress reactions (ASR) and posttraumatic stress symptoms (PTS) six months after the Great East Japan Earthquake among 746 residents in the South Kanto area, which was minimally damaged by the earthquake. The results showed that 72.7% experienced at least one ASR, and 13.0% were identified as a high-risk group for probable PTSD at six months after the earthquake. The determinants of ASR and PTS after six months included both direct and indirect exposure. A mediating effect of ASR on the PTS after 6 months from the earthquake was observed. These results shed light on the importance of taking indirect exposure into consideration as well as direct exposure with respect to early intervention for minimally damaged people immediately following an earthquake. Implications for preventions are discussed based on the findings from this study.

ABBREVIATIONS

PTSD: Posttraumatic Stress Disorder; PTS: Posttraumatic Stress Symptoms; ASR: Acute Stress Reactions

INTRODUCTION

Since the concept of posttraumatic stress disorder (PTSD) was introduced into DSM-III, a wide range of studies have been conducted concerning the prevalence and determinants of PTSD in various groups with experience of traumatic events and posttraumatic stress symptoms (PTS) [1-3]. The literature shows that a range of distressing responses including physical and psychological symptoms immediately or shortly after exposure to a traumatic event are an indicator for subsequent development of PTSD [2]. In other words, acute stress reactions (ASR) that occur in the initial month after exposure to a traumatic event [4] need to be considered within the context of prevention to the PTSD. However, it remains to be proven whether the ASR in the immediate aftermath of an earthquake can be associated with PTSD in adults who were exposed to the earthquake indirectly via media.

Studies of victims of earthquake disasters have looked at symptoms of distress, such as PTSD, anxiety, and depression [5-8] and cognitive disruption [9]. Studies in Japan after the Great

Hanshin-Awaji Earthquake of 1995 examined PTSD in victims of the earthquake disaster [10-11], and also PTS in rescue workers, such as firefighters, nurses, and nursing care facility personnel [12-15]. All of these studies have been conducted with people who were near the epicenter of the earthquake, rather than examining the effects on people who were more distant or experienced the earthquake destruction vicariously through the media. However, an indirect effect was found in a study carried out with Chinese undergraduate students who did not experience the Sichuan earthquake of 2008 but were exposed indirectly via TV or the Internet. A greater amount of time spent watching TV during the two months following the earthquake was correlated with higher stress levels [16].

The most prevalent studies of indirect exposure leading to PTS among adults involve survey research following the 9/11 terrorist attacks in the U.S. [17]. In a nationally representative sample of 560 U.S. adults three to five days after 9/11, 90% reported one or more symptoms of stress, and 44% reported one or more substantial symptoms of stress [18]. Silver et al. (2002) conducted a web-based survey of adults throughout the U.S. to longitudinally examine the process of adjustment following the 9/11 terrorist attacks [19]. A total of 2,729 adults completed a questionnaire 9 to 23 days following 9/11; 1,069 adults residing

outside of New York, drawn from the previous sample, completed a second survey approximately two months after 9/11; and 787 adults participated in a third survey approximately six months after 9/11. The prevalence of acute stress symptoms was 12.4% in the first group; 17.0% of the U.S. population outside of New York reported PTS after two months, and 5.8% did at six months. Schlenger et al. (2002) conducted a web-based survey with a nationally representative sample 2,273 adults one to two months following the 9/11 terrorist attacks [20]. The results showed that the prevalence of probable PTSD was the highest in New York City (11.2%), compared to 2.7% in Washington, D.C., 3.6% in other major metropolitan areas, and 4.0% in the rest of the country.

Contact with media that report catastrophes and devastating events can be associated with PTS in individuals who have not directly experienced damage from a traumatic event. For example, some children who witnessed the explosion of the Challenger space shuttle on television experienced stress reactions [21]; this was called a “distant traumatic effect.” Similar effects of indirect exposure through television on children have been reported [22-23]. Moreover, PTS levels were associated with the amount of time spent watching TV coverage, as well as sex, age, and direct exposure to the attacks. Furthermore, not only the total amount of viewing time but also the content of the coverage was associated with the general symptoms of distress. Ahern et al. (2002) reported that respondents who had repeatedly seen television images of people falling or jumping from the towers of the World Trade Center showed a significantly higher prevalence of PTSD and depression compared with those who had not [24]. Using randomized surveys of adults in New York City, Galea et al. (2003) reported a trend of prevalence of probable PTSD at 1 month, 4 months, and 6 months after 9/11 [5]. In individuals who were not directly affected, the prevalence of probable PTSD decreased from approximately 5% (at 1 month) to near 0% (at 6 months). According to Silver et al. (2005), the prevalence of high levels of ASR was 12.8% among people who watched the attacks on live TV during the two weeks following 9/11, and 4.7% showed high levels of PTS one year after 9/11 [25]. For individuals with no live exposure to 9/11, the prevalence of high levels of ASR was 10.4% in the weeks following 9/11, and 3.4% reported PTS one year later.

The Great East Japan Earthquake of March 11, 2011 caused devastating damage, including 15,854 people dead, 26,992 injured, and 3,167 missing, and 129,104 buildings completely destroyed and 254,086 severely damaged [26]. The severity of the earthquake was rated M9.0, which is the highest level recorded in Japan. Aftershocks persisted not only in the three prefectures in Tohoku (Miyagi, Iwate, and Fukushima), which was the epicenter, but also in the Kanto area. There also was significant shock and fear among people in a much broader area who were exposed to frequent media reporting about the tsunamis, damage to nuclear reactors, and contamination from radioactive substances.

An effect on mental health of media coverage of the Great East Japan Earthquake has been shown in Japan and also in residents in other countries. Hashimoto (2012) found in a sample of college students residing in a region of Japan which was not directly affected by the earthquake that the students who spent

more hours viewing television coverage about the earthquake showed significantly higher stress reactions a month after the earthquake [27]. According to an Internet survey that included people in France, Canada, and the U.S., a longer time viewing Internet coverage during the first week following the earthquake significantly predicted disrupted sleep in the first ten days and PTS after two months [28].

Residents in the South Kanto area of Japan (Saitama, Tokyo, and Kanagawa prefectures) are presumed to have high anxiety about massive earthquakes and radiation. While they were experiencing aftershocks, they were in situations of complex stress from a mixture of direct exposure to minimal damage and indirect exposure to media reports about the devastating earthquakes, heavily damaged areas, and nuclear accidents. They experienced earthquakes with registered intensities of 5+ and 4 on the Japanese scale in the capital, Tokyo, including strong aftershocks. They were exposed to daily media “disaster marathons” [29] of scenes of the earthquake destruction and tsunamis. The media repeatedly discussed possible enormous damages that might be caused by a massive earthquake hitting the Tokyo metropolitan area and accompanying tsunamis [30]. Although they were not directly affected by the accident at the Fukushima Nuclear Power Plant (approximately 227 km away), it is likely that they experienced anxiety about the spread of radioactive substances and the distribution of contaminated foodstuffs. Thus, it is likely that many individuals in this area experienced PTS for an extended time because of the combination of direct and indirect exposure. The effect of negative life events and subsequent traumas since exposure to the traumatic event has been reported to contribute to delay PTSD [24, 17].

The present study was conducted to identify ASR, PTS and their determinants in adult residents of the South Kanto area. First, ASR following the Great East Japan Earthquake as well as PTS after six months is described. Then the determinants of these were examined, including individual characteristics such as sex, connection with the disaster area, direct exposure and indirect exposure via media coverage, to analyze their effects on ASR and PTS after six months.

MATERIALS AND METHODS

Participants

A survey was conducted with residents of Saitama, Tokyo, and Kanagawa prefectures between 20 and 59 years old who were registered for an Internet panel, using the web-based panel survey approach of Cross Marketing, Inc. Based on the results of population surveys of these prefectures, a sample was drawn stratified by sex and age according to the proportion of the population. Out of a panel of 140,000, 10,000 were randomly chosen and the invitation message was sent to them. Participants volunteered to complete the questionnaire after agreement to the terms of this study including the explanation that the data would be analyzed anonymously and they were free to quit the survey at any time. The survey was administered online between September 13 and 15, 2011, approximately six months after the earthquake. A total of 783 respondents completed 75 questions in the survey. The average amount of time for participants to complete the questionnaire was 20 minutes approximately.

The data from 37 respondents who entered their responses in a very short time and repeated identical answers were excluded from the analysis. The remaining 746 were considered to have provided valid responses. This study was approved by the Institutional Review Board on research with human subject for Graduate School of Comprehensive Human Sciences at University of Tsukuba.

Instruments

The questionnaire consisted of 75 questions, from which the following were used in the current research study.

Demographics: Respondents identified their sex, age, education, and marital status. Regarding the involvement with the disaster area, respondents were asked to select all the options that apply about their involvement with the disaster area using a multiple response format. Options were as follows: "My parents' home is located in the disaster area," "I have family and friends in the disaster area," "I have lived in the disaster area before," "I have other types of involvement with the disaster area," and "I have no involvement with the disaster area." The choice of "I have no involvement with the disaster area" was classified as not involved, while any other choice was classified as involved.

Extent of damage: Respondents were asked to select all the options that apply about the damage that affected them on the day of the earthquake and in the following two to three days using a multiple response format. Options were as follows: "I was unable to return home," "I was walked home because transportation such as trains was not available," (these were classified as "difficulty returning home"), "I was imminently fearful about physical safety," "I or my family was injured," (these were classified as "worry about safety of self or family") "my house was destroyed," "electrical appliances or furniture was turned over," "I was inconvenienced by power outages and water outages" (these were classified as "inconveniences in life").

Media exposure: Respondents were asked to select all the options that apply about their sources of information in the first two to three days after the earthquake, using a multiple response format. Options are as follows: "television," "newspaper," "radio," "Internet," and "acquaintances."

Acute stress reactions scale: Fifteen of the 19 items of the PTSD Prevention Checklist [31] were used to assess acute stress reactions immediately after the earthquake. The PTSD Prevention checklist [31] was developed to predict PTSD among Japanese firefighters, which consists of 19 items to measure 17 physical and psychological responses following rescue work such as "I could not believe what I saw was real," "I had excessive heartbeats," "I was too confused or upset to make rational judgments," including "others (which allows respondents to select if their symptoms were not included in the options)" and "no symptoms that I experienced as above (which allows respondents to select if they had no symptoms)." The concurrent validity and reliability of this checklist was proven in the literature of a range of trauma experienced groups such as Japanese journalists [32], Japanese volunteer firefighters [33], Japanese government workers in the disaster area [34] as well as Japanese fire fighters. In this survey, in addition to 2 items with "others" and "no symptoms that I experienced as above", 13 items on physical and psychological

responses were used since they were highly correlated with IES-R-J scale scores regardless of group characteristics [32-34].

Respondents were asked to select all the items that apply their physical and psychological responses immediately after the earthquake. ASR total score was calculated by adding 13 item scores each rated on a 1-point scale (0: no, 1: yes). "Others" were excluded from calculating total score since it was below 5%. With the range of ASR total score from 0 to 13, a higher ASR total score on the scale indicates more various types of psychological and physical responses immediately after the earthquake. Respondents with choice of "no symptoms that I experienced as above" were considered as "without any symptoms", whose ASR total score had 0.

Japanese version of the Impact of Events Scale - Revised (IES-R-J). Respondents completed the Japanese version of the Impact of Events Scale - Revised (IES-R-J) [35-37]. IES-R-J is a brief and easy scale to administer with good reliability and validity in assessing traumatic stress responses due to a variety of traumatic events [36]. This scale measures the degree of posttraumatic stress symptoms (e.g., intrusion, hyper-arousal, and avoidance). It consists of 22 items, each rated on a 5-point scale ("0: not at all applicable" to "4: very much applicable"). A higher total score on the scale indicates more intense stress reaction after the traumatic experience and more types of stress symptoms. In the present study, based on Asukai et al. (2002), respondents whose IES-R-J total score were 25 or higher were classified as a probable PTSD group considered as having a higher risk for PTSD [36].

Data analyses

All statistical analyses were performed with the statistical package Statistical Package for the Social Sciences (SPSS) 17.0 Japanese version for Windows. Statistical analyses were carried out according to the following procedures. Descriptive analyses were performed for demographic variables, trauma-related indicators, IES-R-J total score, and ASR total score, using Chi-squared test and t-test to evaluate differences between the probable PTSD group (IES-R-J total score ≥ 25) and non-probable PTSD group. Moreover, path analysis was conducted with AMOS after SPSS. In the first step, to examine the determinants of acute distress and posttraumatic stress reactions six months later, a path analysis was conducted by repeating multiple regression analysis (stepwise method) with SPSS. In the second step, goodness-of-fit test on the model derived from the first step was conducted with structural equation modeling in AMOS. A value of $p < .05$ was considered statistically significant for t-test and regression analyses.

RESULTS

Sample demographics and descriptive statistics

The demographic characteristics of respondents are presented in Table 1. Respondents consisted of 371 men and 375 women, with a mean age of 39.86 years (159 in their 20s; 209 in 30s; 204 in 40s; and 174 in 50s). In terms of location of residence, 150 (20.1%) resided in Saitama prefecture, 387 (51.9%) in Tokyo, and 209 (28.0%) in Kanagawa. Descriptive statistics for the study variables is presented in Table 2. Women reported more

inconveniences in life ($\chi^2(1)=4.34$, $p<.05$), more information about the earthquake from their acquaintances ($\chi^2(1)=23.12$, $p<.001$), while men experienced difficulty in returning home ($\chi^2(1)=25.58$, $p<.001$), obtained more information from radio ($\chi^2(1)=6.36$, $p<.05$) and Internet ($\chi^2(1)=3.94$, $p<.05$).

ASR immediately after the earthquake: Table 3 displays the rate of 14 ASR items, which excluding "None of the above symptoms" from 15 items, that measured the physical and psychological distress respondents experienced immediately after the earthquake. ASR total score was calculated after scoring an affirming response as 1 and a denying response as 0 for 13 of the 15 symptom items, excluding the 2 items - "Others" and "None of the above symptoms." Higher ASR total scores indicate more various kinds of ASR respondents experienced. ASR total score ranged from 0 to 13, with a mean of 1.31 ($SD=1.63$, $\alpha=.66$). No ASR was reported by 27.3% of the respondents, which means 59.5% of respondents experienced some kind of ASR. Women, compared with men, scored significantly higher on the ASR ($M_{women}=1.6$ ($SD=1.7$), $M_{men}=1.0$ ($SD=1.4$), $t(722.7)=5.4$, $p<.001$).

PTS six months after the earthquake

To identify PTS, participants were asked to recall their experiences of the earthquake and to respond to the 22 items of the IES-R-J about their symptoms in the week prior to their participation in the survey, which would be about six months after the earthquake. Simple aggregate scores were calculated. Higher IES-R-J scores indicate more intense PTS. In this study, the IES-R-J scores of the respondents ranged between 0 and 88, with a mean of 10.63 ($SD = 12.8$, $\alpha = .95$). Women scored significantly higher than men on the IES-R-J ($M_{women}=12.0$ ($SD=13.3$), $M_{men}=9.2$ ($SD=12.0$), $t(744)=2.962$, $p<.01$). Scores of 97 respondents (13.0%) exceeded 25, which is the cutoff point for higher risk for PTSD according to Asukai et al. (2002). No PTS were reported by 13.5% of the respondents, while 86.5% reported some PTS. 97 respondents were classified as a probable PTSD group.

Table 1: Demographics of the respondents.

Variables	n	(%)
Male	371	49.7
Female	375	50.3
Age Range		
20 – 29	159	21.3
30 – 39	209	28.0
40 – 49	204	27.4
50 – 59	174	23.3
Marital Status		
Married	339	45.4
Not married	407	54.6
Education		
College graduate	362	48.5
Not college graduate	384	51.5

Table 2: Descriptive statistic for the study variables.

Variables	n	(%)	Sex (%)		PTSD group (%)	
			Male	Fe-male	probable PTSD	non-probable PTSD
Sex						
Male	371	49.7			12.1	87.9
Female	375	50.3			13.9	86.1
Involvement with the Disaster Area						
Involved	246	33.0	32.3	33.6	42.3	31.6
Not involved	500	67.0	67.7	66.4	57.7	68.4
Extent of Damage						
Difficulty returning home	296	39.6	48.8	30.7	42.3	39.3
Worried about safety	203	27.2	25.6	28.8	28.9	27.0
Inconveniences in life	126	16.9	14.0	19.7	27.8	15.3
Media exposure						
Television	707	94.8	93.5	96.0	93.8	94.9
Newspaper	272	36.5	33.4	39.5	48.5	34.7
Radio	153	20.5	24.3	16.8	27.8	19.4
Internet	389	52.1	55.8	48.5	52.6	52.1
Acquaintances	170	22.7	15.4	30.1	29.9	21.7

Table 3: Rate of ASR following the Great East Japan Earthquake ($N=746$).

Items of ASR following the event	(%)
I could not believe that what I saw was real	33.1
I worried much about the safety of myself or family	28.0
I wasn't sure what to do	23.2
I had rapid heartbeats	10.6
I was too confused or upset to make rational judgments	7.5
I had trouble judging what was important and what was not when evacuating	7.0
I lost sense of time temporarily	6.7
I was very frustrated or irritated by little things	4.6
I felt weight on my stomach	2.9
I sweated all over	2.9
I felt nauseated	2.4
I had a headache temporarily	1.9
I completely forgot where I had stored emergency relief goods	0.9
Others	4.8

Abbreviations: ASR: Acute Stress Reactions

Association of study variables with PTS after 6 months from the earthquake

To examine the characteristics of probable PTSD group, t-test and Chi-squared test was conducted. Probable PTSD group showed higher ASR total score than non-probable PTSD group ($M_{probable}=2.47$ ($SD=2.2$), $M_{non-probable}=1.14$ ($SD=1.5$), $t(108.85)=5.77$, $p<.001$). Moreover, probable PTSD group significantly more experienced "inconveniences in life ($\chi^2(1)=9.52$, $p<.01$)," more involved with the disaster area ($\chi^2(1)=4.36$, $p<.05$), got more information about the earthquake from newspaper than non-probable PTSD group ($\chi^2(1)=6.92$, $p<.01$).

Determinants of ASR and PTS

To examine the determinants of ASR and PTS six months later, a path analysis was conducted by repeating multiple regression analysis (stepwise method) with SPSS. In the second step, goodness-of-fit test on the model derived from the first step was conducted with structural equation modeling in AMOS (Figure 2). The goodness-of-fit indices were CMIN = 166.667 (df=42, $p < .001$), GFI=.965, AGFI=.935, RMSEA=.063.

The results of path analysis indicated that women, compared with men, and those who had involvement with the disaster area, compared with those who did not, scored higher for ASR. Additionally, those who experienced difficulty returning home, those who worried about the safety of themselves or their families, and those who experienced inconvenience in their lives because of the earthquake showed higher ASR. In regard to sources of information about the earthquake, those who obtained information from acquaintances and those who obtained information from the radio and the Internet scored higher for ASR. Furthermore, when the impact on PTS was analyzed, those who scored higher for ASR and those who experienced inconveniences in their lives due to the earthquake also scored higher for PTS after six months. Finally, in regard to contact with different media, those who obtained information from newspapers scored higher for PTS.

DISCUSSION

More than 70% of the respondents had some ASR immediately after the earthquake, while 13.0% of the respondents were classified as a probable PTSD group after 6 months from the earthquake. Most of participants got information on the earthquake from TV, Internet. Women got more information from acquaintances, while men got more information from radio and internet. Both direct exposure and indirect exposure were included in the determinants of ASR and PTS after 6 months from the earthquake.

Prevalence of ASR

While 27.3% of the respondents did not experience ASR, approximately 70% experienced at least one of ASR immediately after the earthquake such as "I could not believe that what I saw was real," "I worried much about the safety of myself or family," "I wasn't sure what to do." This was lower than the 90% mean prevalence of at least one symptom in adults in the U.S. [18], but higher than the 12.4% prevalence of ASR within 23 days (national sample [19]) and the 45% of experiencing disrupted sleep immediately after the Great East Japan Earthquake [28]. Particularly, seeing the conditions of the disaster areas as reported by the media was especially shocking, as seen in the item "I could not believe that what I saw was real (33.1%)."

Determinants of ASR

When each determinant of ASR was examined, women scored higher on ASR. This result is consistent with the findings that generally women are more likely to experience PTS [1].

The finding that those who had involvement with the disaster area scored high on ASR could be attributed to the effects of concern and anxiety about family and acquaintances residing in the disaster area. This suggests that in examining indirect exposure via media coverage about disasters, in addition to considering the physical distance to the disaster area, the psychological distance [38-39] should also be considered. With regard to the extent of damage, those who experienced inconveniences in their lives due to the earthquake, those who worried about the safety of themselves or families, and those who experienced difficulty returning home showed higher ASR. Based on these results, specific stressors presumably triggered ASR, providing support for the effect of perceived life threat during trauma and direct exposure [2,17].

In regard to the sources of information about the Great East Japan Earthquake, those who obtained information from acquaintances and those who obtained information through the

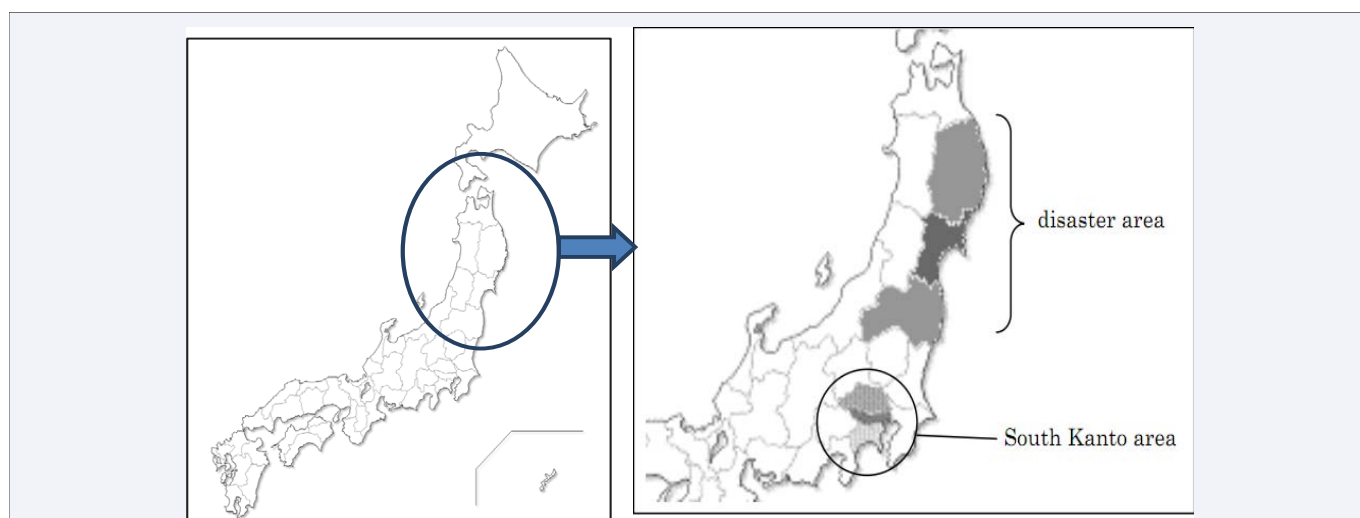


Figure 1 Left – Map of Japan, Right – Map of the disaster area and the South Kanto area.

Note. Disaster area - Iwate, Miyagi, and Fukushima prefectures (from north to south); South Kanto area (focus of the present study) - Saitama, Tokyo, and Kanagawa prefectures

radio and the Internet scored high on ASR. These results are not consistent with the previous findings that the longer the exposure to television coverage, the stronger the distress reaction [18], perceived stress [16], and stress responses [27]. However, because time in contact with the media was not measured in the present study, the results could not be compared directly with the findings from these other studies. Additionally, considering the fact that as many as 94.8% of the respondents reported using television as their source of information, it can be inferred that they obtained information primarily through television. Thus, the fact that they obtained information from the radio, the Internet, and their acquaintances in addition to what they obtained from television, in other words indirect exposure through a diverse variety of media, might have had effects on ASR. Specifically, it can be assumed that those who obtained information from the radio, the Internet, and their acquaintances had contact with a great deal of graphic information that had not been censored, in

addition to audiovisual information from television. Moreover, it is plausible that information from the Internet and acquaintances included inaccuracies. Where acquaintances were the most influential source of information, unsubstantiated information about the earthquake may have been exchanged.

Prevalence of PTS six months after the earthquake

Six months after the Great East Japan Earthquake, 13.0% of the respondents scored as high risk for PTSD. This rate is higher than the 5.1% potential PTSD rate among firefighters who were dispatched to the disaster area after the earthquake (assessed 3 - 4 months after the earthquake. [15]). It is lower than the 19.5% PTSD high-risk rate among personnel of nursing care facilities that were damaged by the Niigata Chuetsu Offshore Earthquake of 2007 (assessed one month after the earthquake [14]). There are several possible reasons why residents of the South Kanto area may have continued to experience PTS six months later. First,

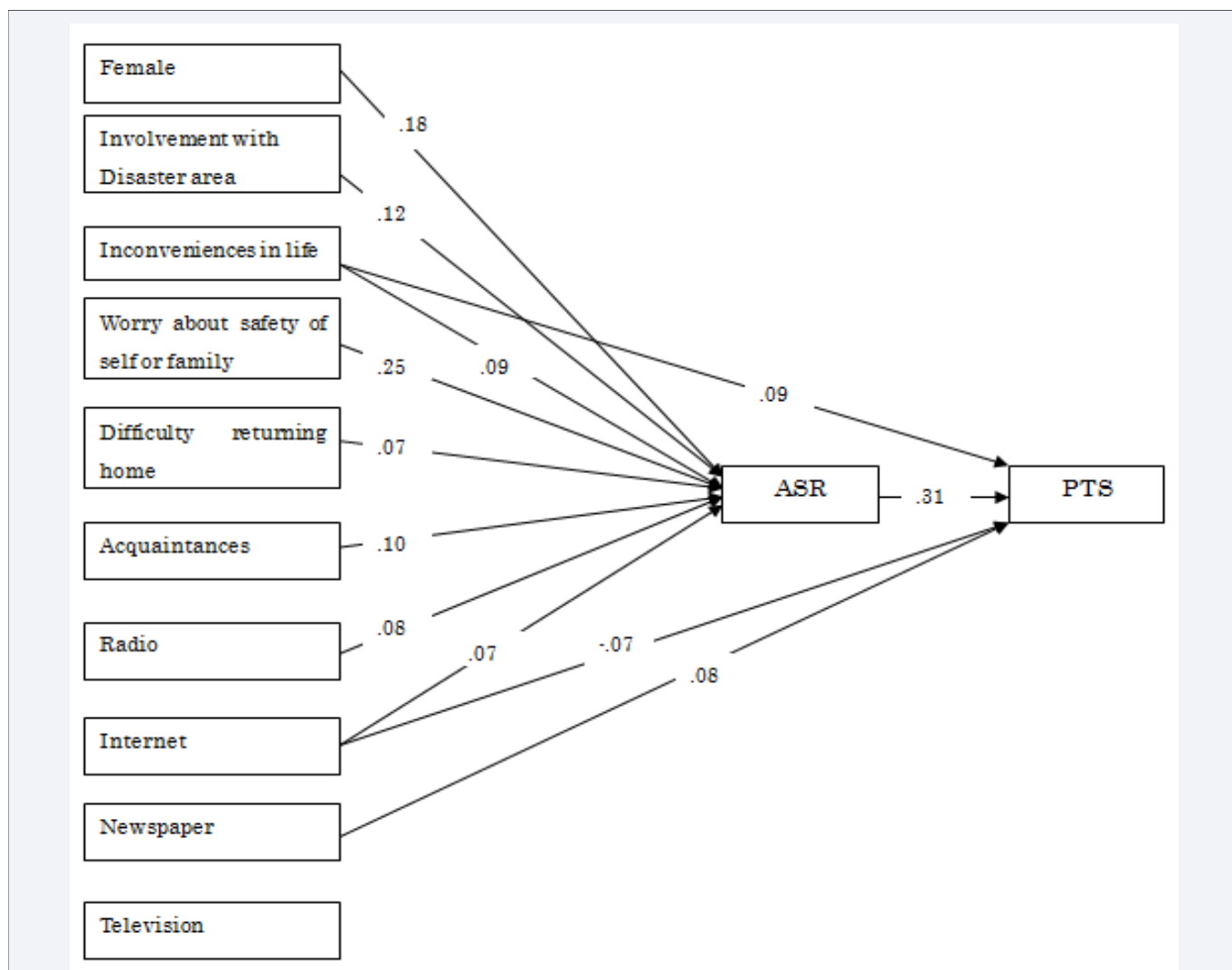


Figure 2 Risk factors for ASR and PTS after six months following the earthquake.
 Note : Female (Female=1, Male=0); Involvement with disaster area (Yes:1, No:0); Inconveniences in life (Yes:1, No:0); Worry about safety of self or family (Yes:1, No:0);Difficulty returning home (Yes:1, No:0);Acquaintances (Yes:1, No:0);Radio (Yes:1, No:0);Internet (Yes:1, No:0);Newspaper (Yes:1, No:0);Television (Yes:1, No:0); ASR=Acute Stress Reactions; PTS=Post traumatic Stress Symptoms; dashed line means negative effect on a dependent variable.

residents of the South Kanto area experienced an earthquake that registered intensity as high as 5 on the Japanese scale. This is high by conventional standards, although it was less than in the disaster area, and constitutes direct exposure to an earthquake. Second, in addition to indirect exposure to the conditions of the disaster area as reported by the media, they were exposed to media coverage of risks that were closer to them, including the nuclear accident and the theory of a massive earthquake hitting the Tokyo metropolitan area.

Determinants of PTS six months after the earthquake

The results of path analysis show that those with higher scores for ASR scored higher on PTS six months after the disaster. It has been known that ASR predicts PTS. For example, Bui et al. (2012) found that immediate peritraumatic distress had significant effects on PTS two months later [28]. Silver et al. (2005) found that the reported number of ASR was a significant predictor of PTS at the one-year anniversary of 9/11 [25]. Also, Tanno et al. (2011) found that the higher the score for ASR, the higher the scores for intrusion, hyper-arousal, and avoidance on the IES-R-J [14]. The results of the present study are consistent with these findings. Furthermore, those who experienced inconvenience due to the earthquake in the two to three days immediately after the earthquake scored higher on posttraumatic stress responses six months after the earthquake.

With regard to contact with the media, those who obtained information from newspapers immediately after the earthquake reported more PTS six months after the earthquake. This is different from the findings of other studies that the media that promoted ASR were the radio, internet, and acquaintances, suggesting that these more personal media had stronger effects immediately after the earthquake, but the effects did not last six months later. Finally, although the effect of newspapers was significant, the effect was smaller than the effect of ASR, suggesting that there is a mediating effect of ASR in the pathway between indirect exposure via media coverage related to the event and PTS.

CONCLUSION

In conclusion, there was a high prevalence both of ASR and PTS after six months among residents of the South Kanto area following to the Great East Japan Earthquake. The determinants of ASR included indirect exposure via the media coverage, in addition to direct exposure (e.g., difficulty in returning home and inconveniences in life). The determinants of PTS after six months also included direct and indirect exposure, but their influence was smaller than the ASR, and a mediating effect of ASR was evident. In other words, the stress reactions immediately following the earthquake did not diminish, and had a strong effect on PTS after six months. This suggests the importance of intervention immediately after an earthquake to prevent PTSD for residents even in areas minimally affected by the earthquake. Thus, it would be regarded as an intervention for people in minimally damaged area such as suggesting them refraining from repeated exposure to excessive media reports. Also, it would be helpful to inform them people can experience ASR even via the indirect exposure because it is natural reactions to a stressful event.

In spite of these findings from this study, there are several limitations. First, ASR and PTS were assessed via retrospective questionnaire in this cross-sectional study. Second, it was not assessed whether participants experienced any other traumatic events after the earthquake or took coping strategies for ASR. Hence, it is need to discuss the development of PTSD following the earthquake including stressful life events and coping strategies after the earthquake in a longitudinal study design as well as indirect exposure to media reports in detail.

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