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# Relation of High Social Capital to Preferable Emotional Response to News Media Broadcasting of Natural Disasters: A Nationwide Cross-Sectional Study in Japan

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Media coverage of disasters potentially damages mental health. Moreover, its effects may differ as recipients may have different emotional responses toward media. The present study examined whether social capital, known to be protective against mental problems, influences a recipient's emotional response toward news media broadcasting of natural disasters via newspapers, television and internet in Japan. Three social capital components, social participation, social support and cognitive social capital, were considered in the present study as each component reportedly had different effect on mental health. This nationwide cross-sectional survey was undertaken in 2015 among 1,200 Japanese citizens aged 15 to 79 years who were selected using the multi-stage sampling procedure. Data were collected via the drop-off pick-up method using a printed structured questionnaire. Negative and positive emotions were classified based on recipients' responses against news media. Among 1,190 participants who reported emotions toward news media, 30.9% (368) had experienced any natural disasters, 37.4% (445) belonged to at least one formal or informal organization (social participation), 40.2% (478) had high social support, and 68.8% (819) had high cognitive social capital. High social support was associated with both reduced negative emotional response (OR 0.66, 95% Confidence Interval (CI) 0.47-0.93) and increased positive emotional response (OR 1.48, 95% CI 1.04-2.12) in multivariate analyses, while high cognitive social capital was only associated with increased positive emotional response (OR 1.62, 95% CI 1.11-2.37). These results suggest protective effects of social support and cognitive social capital against news media coverage of natural disasters.

**Keywords:** emotional response; media; mental health; post-disaster; social capital
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## Introduction

Mainstream media reportedly play a significant role after disasters in disseminating detailed information about disaster situations and encouraging affected and non-affected populations to perform positive corrective actions such as volunteering (Rattien 1990; Cheng et al. 2015b). In contrast, it has also been suggested that consumption of media disaster coverage can lead to physiological distress including post-traumatic stress disorder (PTSD), and anxiety and mood disorder (Lima 2004; Sugimoto et al. 2013; Suzuki et al. 2015; Pfefferbaum et al. 2014, 2018).

The negative impact of media on mental health had been observed not only in the disaster-affected area but also in non-affected areas due to the dissemination of violent and shocking images (Cho et al. 2003; Holman et al. 2014; Pfefferbaum et al. 2014; Cheng et al. 2015a). Further, a survey conducted in areas affected by the 1995 Great Hanshin-Awaji Earthquake in Japan reported that information delivered through media did not satisfy the demands of disaster victims and instead might have increased their frustration (Yamanaka 2018). Media usually opt to broadcast physical disaster damage and poor conditions in the affected areas, but community and wellbeing information were critical and required more among disaster victims. In this respect, it is important for us to request that media establish better guidelines for disaster broadcasting. In the meantime, we need to establish an appropriate framework to protect both disaster-affected and non-affected populations from undesirable coverage of disaster-related information.

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Social capital is the resource that an individual can access through their social network (Kawachi and Berkman 2014). Social capital can be categorized into structural and cognitive components (De Silva et al. 2007); while the structural component can be measured by an extent of social participation and social support that an individual receives through a participating network, the cognitive component (cognitive social capital) addresses an individual's perception towards the community, expressed by concepts of fairness, reciprocity, and trust.

Social participation, social support, and cognitive social capital are believed to be major factors that improve various health outcomes through different mechanisms (Moore and Kawachi 2017). Moreover, they reportedly exert protective effects against mental problems among people experiencing disasters (Wind et al. 2011; Noel et al. 2018; Ozaki et al. 2018). However, some studies suggested different mechanisms between social support and cognitive social capital and showed their heterogeneous effects on mental health (Wind et al. 2011; Hikichi et al. 2017; Noel et al. 2018). In our former paper (Ozaki et al. 2018), we mentioned that high social support was associated with lower mental health only for those without disaster experience, while cognitive social capital was protective against mental health problems. The authors therefore considered that to examine the role of social support and cognitive social capital in a detail way may help better understanding of social capital on disaster related issues. On the other hand, multiple studies performed in general settings suggest that both the structural (social participation and social support) and cognitive components of social capital enhance the messages media attempt to convey and encourage positive behaviors among the recipients (Beaudoin et al. 2006; Tokuda et al. 2009; Robinson et al. 2017; Namkoong et al. 2018). To the best of our knowledge, no investigations have examined how social capital and its components can modify the effect of news media broadcasting of disasters.

We have hypothesized that social capital would have some influence on emotion toward news media and the influence might vary across different components of social capital (social participation, social support and cognitive social capital) given their associations with mental health. Further, this would be a relevant research question to help us better understand social capital characteristics in disaster settings that were possibly different from those in general settings (Robles and Ichinose 2015; Melo Zurita et al. 2018). Moreover, we wanted to inform countermeasures against negative emotional impacts caused by news media broadcasting of disasters.

Japan has repeatedly suffered major natural disasters including earthquakes, volcano eruptions, and typhoons with subsequent flooding and landslides, especially in recent decades. Indeed, many residents in Japan have experienced disasters during the past decade and been exposed to news media broadcasting coverage disasters. The present study attempted to examine whether high social participation, social support, and cognitive social capital could independently alleviate negative effects of news media broadcasting of natural disasters via newspapers, television and internet, and increase recipients' positive emotion toward news media coverage of disasters in Japan. The present study will achieve a better understanding of the relationship between each component of social capital and emotion toward news media, thus leading to better disaster preparedness and more appropriate communication strategies during disasters.

## Methods

*Study design, setting, and participants*

Details of the study methodologies are described elsewhere (Ozaki et al. 2018). This nationwide cross-sectional survey was undertaken in Japan in 2015, 4 years after the severe Great East Japan Earthquake and subsequent tsunami. The subjects of this study were Japanese citizens aged 15 to 79 years residing in Japan at the inception of the survey. We chose study participants using the following multi-stage sampling procedure. Firstly, we selected 200 areas as sampling units after stratified random sampling from the whole country. Then, we classified each unit into 9 geographical blocks and 4 urban scales based on official census data. In each of the selected areas, we chose six participants. We systematically extracted six households from each of the selected areas using a residential map database as a sampling frame, and then recruited one participant from each household. We continued the recruitment of the participants using quota sampling until the total number reached 1,200 people.

*Data collection*

The data were collected using the drop-off pick-up method. Details of the data collection method are described elsewhere (Ozaki et al. 2018). Using the printed structured questionnaire, we collected data on sociodemographic factors, disaster experience, social capital (social participation, social support, and cognitive social capital), trust toward news media, emotion toward news media broadcasting of natural disasters, and psychological status.

Sociodemographic factors included sex, age, education attainment, and annual income. "Disaster experience" was measured by asking whether participants experienced any natural disasters in the previous 10 years regardless of their type and severity. "Social participation" was measured by asking survey participants the number of informal and formal organizations they belonged to. Responses to this variable were either "zero" or "one or more." Social support was measured by asking if a participant knew anyone (1) who would give him/her physical or financial support, (2) who would understand his/her feelings, (3) who would casually meet and talk, (4) who would respect him/her, and (5) who would give him/her advice and information.

Social support was categorized as "low" if a participant did not have anyone who would support him/her in every area described above, and "high" if a participant had someone who would support him/her in all five areas. Cognitive social capital was measured by asking about perception of fairness, trust, and reciprocity toward the community a participant belonged to (De Silva et al. 2007). It was categorized as "low" for those who had a positive perception in none of fairness, trust, and reciprocity, and "high" for those who had positive perception in at least one of three components. Trust toward

newspapers, television, and the Internet was measured by asking each participant whether they trusted each form of news media.

We considered both negative and positive emotions toward news media broadcasting coverage of natural disasters for a deeper understanding of their relationship to social capital. Different components of social capital have diverse effects on different types of emotions, and the health implications differ (De Silva et al. 2005; Noel et al. 2018). The emotions were measured by asking each participant whether they considered the following questions were true: (1) media broadcasting enhanced awareness of disaster preparedness; (2) positive behavior among disaster victims were impressive; (3) media broadcasting was important to remind the presence of disaster victims and damage; (4) programs specifically arranged for disaster victims, instead of those for general public, would be important; (5) it was painful to watch programs broadcasting devastating situations in disaster areas; (6) media programs concentrate too much on disaster damage; (7) it was desirable to resume normal programs sooner; and (8) media programs concentrate too much on highlighting the damage in specific areas.

Based on results of the experimental factor analysis (Table 1), we judged that a participant had a negative emotion toward news media broadcasting of natural disasters when a participant considered either (4), (5), (6), (7), and (8) were true or (1) was not true. Conversely, we judged that a participant had a positive emotion toward news media broadcasting of natural disasters when a participant considered either (2) or (3) were true. Therefore, some participants could have both negative and positive emotions.

*Data analysis*

We examined the distribution of each variable among the study participants. Using univariate and multivariate logistic regression models for negative and positive emotions toward news media broadcasting on natural disasters, we calculated odds ratios (ORs) and 95% confidence intervals (95% CIs) for the following outcomes and sociodemographic factors: disaster experience, social participation, social support, cognitive social capital, and trust toward news media. The stepwise method with inclusion and exclusion criteria of 0.2 respectively was used for variable selection. Our main focus was the association between negative and positive emotion toward news media broadcasting on natural disasters and three different components of social capital (social participation, social support and cognitive social capital), respectively. In addition, we examined the association between emotion toward news media and mild mood or anxiety disorder that was measured using a cut-off point of 5 in the Japanese version of the K6 (Prochaska et al. 2012). For all of the analyses above, sensitivity analyses of complete data and multiple imputation were done to examine effects of missing data. Multiple imputation was done under the missing at random assumption by using chained equations to obtain the estimates of interest. In general, whether it is missing at random (MAR) or missing not at random (MNAR) cannot be proved from the data and it is a so-called "unverifiable" assumption. The missing mechanism is specified by unobserved information because information to evaluate is not obtained in the first place. Nonetheless, the similar estimates between complete data and multiple imputation provide the robustness of the conclusion based on the main analysis. Outcome variables were included when missing data were inserted. Factor analyses were done using SAS v 9.4 software (SAS Institute Inc., Chicago, IL). All other analyses were done using STATA/IC v14.0 software (StataCorp LLC, College Station, TX).

*Ethics approval*

The present study was conducted as part of the omnibus survey performed by the Nippon Research Center, a research agency that is a member of the Japan Marketing Research Association. The survey was planned and conducted following the General Principle of Marketing Research (Japan Marketing Research Association 2017 [in Japanese only]) which took place based on the ICC (International Chamber of Commerce)/ESOMAR (European Society for Opinion and Marketing Research) Code (International Chamber of Commerce and European Society for Opinion and Marketing Research 2016). The Nippon Research Center also complies with "ISO 20252 Market Public Opinion, Social Survey – Terms and Service Requirements" that establishes ethical and professional behavioral guidelines in compliance to the Personal Information Protection Law and the marketing research policy. For the above-mentioned reasons, acquisition of ethical approval from authors' individual affiliations did not apply to the present study.

Table 1. Rotated explanatory factor loadings for 8 items, promax (N = 1,190).

| Component | N (%) | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|---|
| Media programs concentrate on damage of specific areas too much | 172 (14.5) | 0.719 | 0.153 | −0.072 |
| Media programs concentrate on disaster damage too much | 150 (12.6) | 0.593 | −0.227 | −0.013 |
| Media broadcasting enhanced awareness of disaster preparedness | 758 (63.7) | −0.604 | 0.126 | −0.026 |
| Positive behavior among disaster victims was impressive | 473 (39.8) | -0.018 | 0.713 | −0.047 |
| Media broadcasting was important in reminding us of the presence of disaster victims and damage | 647 (54.4) | −0.113 | 0.682 | −0.032 |
| It was painful to watch programs broadcasting devastating situations in disaster areas | 60 (5.0) | −0.114 | −0.006 | 0.716 |
| It was desirable to resume normal programs sooner | 135 (11.3) | −0.014 | −0.263 | 0.613 |
| Programs specifically arranged for disaster victims, instead of the general public, would be important | 178 (15.0) | 0.184 | 0.408 | 0.529 |

A confirmative factor analysis produced a Comparative Fit Index (CFI) of 0.97 with RMSEA = 0.02, AGFI = 0.99 when hypothesized three factors (Factor 1, Factor 2, and Factor 3).
A combination of Factor 1 and Factor 3 was regarded as "negative emotion toward news media", while Factor 2 was regarded as "positive emotion toward news media". A confirmative factor analysis produced CFI = 0.92, RMSEA = 0.03, AGFI = 0.98 when two factors (Factor 2 and a combination of Factor 1 and Factor 3) were hypothesized.
RMSEA, the root mean square error of approximation; CFI, the comparative fit index; AGFI, the adjusted goodness of fit index.

## Results

In total, 1,200 participants answered the questionnaire. Data on emotion toward news media broadcasting were available for 1,190 (99.3%) participants, who were included in the following analyses. Participants' characteristics are summarized in Table 2. In total, 50.3% (598) of the participants were female, and the mean age of the overall respondents was 48.2 years (standard deviation (SD) 17.8 years). Only 25.8% (307) of the participants graduated from universities or graduate schools, and 31.8% (378) had an annual income of less than 5 million yen, approximately the same range of the national average salary in Japan (4 million yen in 2013) (National Tax Agency of Japan).

With respect to disaster experience, 30.9% (368) experienced at least one natural disaster in the 10 years prior to the survey. With respect to variables related to social participation, 37.4% (445) belonged to at least one formal or informal organization, 40.2% (478) had high social support, and 68.8% (819) had high cognitive social capital.

Table 3 summarizes the findings for logistic regression analyses of negative and positive emotion toward news media broadcasting of natural disasters. The respondents with high social support were less likely to have negative emotion compared with their counterparts in both the univariate (OR 0.70, 95% CI 0.52-0.94) and multivariate (OR 0.66, 95% CI 0.47-0.93) logistic regression models. In contrast, such protective effects were not obvious either in those with high social participation or in those with high cognitive social capital.

In the same context, those with high social participation (OR 1.55, 95% CI 1.19-2.00), high social support (OR 1.63, 95% CI 1.20-2.22), and high cognitive social capital (OR 1.83, 95% CI 1.42-2.37) were more likely to have positive emotion compared with their counterparts in univariate analysis.

After adjusting for other covariates, participants with high social support (OR 1.48, 95% CI 1.04-2.12) and with high cognitive social capital (OR 1.62, 95% CI 1.11-2.37) were still more likely to have positive emotion compared with their counterparts. Although the association was not statistically significant, those with high social participation were also likely to have the positive emotion compared with their counterparts (OR 1.20, 95% CI 0.83-1.74). There was no multiplicative interaction between each of the three social capital components and prior experience of disaster.

Other remarkable findings with respect to the results of the multivariate (complete case) analyses were as follows (Table 3). Respondents aged 45 to 64 years (OR 1.97, 95% CI 1.40-2.77), and aged more than 65 years (OR 1.76, 95% CI 1.20-2.57) were more likely to have positive emotion compared with respondents under 35 years of age after adjusting for covariates including trust on newspapers, television and internet. The proportion of respondents who trusted internet media increased in the younger age group (chi p value = 0.001) while the younger age group had the

Table 2. Characteristics of the study participants.

| | Total (N = 1,190) |
|---|---|
| **Sex** | |
| Male | 592 (49.8) |
| Female | 598 (50.3) |
| **Age (years), Mean (SD)** | 48.2 (17.8) |
| Less than 35 | 294 (24.7) |
| 35-44 | 237 (19.9) |
| 45-64 | 375 (31.5) |
| 65 or more | 284 (23.9) |
| **Educational attainment** | |
| Primary/Secondary/High/Vocational Training School | 873 (73.4) |
| University and above | 307 (25.8) |
| Missing | 10 (0.8) |
| **Annual income (JPY)** | |
| Less than 3.0 million | 207 (17.4) |
| 3.0-4.9 million | 378 (31.8) |
| 5.0-6.9 million | 179 (15.0) |
| 7.0 million or more | 138 (11.6) |
| Missing | 288 (24.2) |
| **Disaster experience** | |
| No | 815 (68.5) |
| Yes | 368 (30.9) |
| Missing | 7 (0.6) |
| **Social participation** | |
| No | 740 (62.2) |
| One or more | 445 (37.4) |
| Missing | 5 (0.4) |
| **Social support** | |
| Low | 298 (25.0) |
| High | 478 (40.2) |
| Missing | 414 (34.8) |
| **Cognitive social capital** | |
| Low | 365 (30.7) |
| High | 819 (68.8) |
| Missing | 6 (0.5) |
| **Trust toward newspapers** | |
| No | 229 (19.2) |
| Yes | 871 (73.2) |
| Missing | 90 (7.6) |
| **Trust toward television** | |
| No | 355 (29.8) |
| Yes | 745 (62.6) |
| Missing | 90 (7.6) |
| **Trust toward Internet** | |
| No | 631 (53.0) |
| Yes | 349 (29.3) |
| Missing | 210 (17.7) |
| **Negative emotion toward news media** | |
| No | 505 (42.4) |
| Yes | 685 (57.6) |
| **Positive emotion toward news media** | |
| No | 390 (32.8) |
| Yes | 800 (67.2) |

SD, standard deviation; JPY, Japanese yen.
Numbers are number (%) unless otherwise indicated.

Table 3. Crude and adjusted odds ratios (OR) of negative and positive emotion toward news media (Logistic regression models).

| Variables | Negative emotion (95% CI) | | | Positive emotion (95% CI) | | |
|---|---|---|---|---|---|---|
| | Crude OR[1] (N = 1,190) | Adjusted OR with complete data[1,2,3] (N = 642) | Adjusted OR with imputed data (N = 1,190) | Crude OR[1] (N = 1,190) | Adjusted OR with complete data[1,2,4] (N = 642) | Adjusted OR with imputed data (N = 1,190) |
| **Age (years)** | | | | | | |
| Less than 35 | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| 35-44 | 0.97 (0.68-1.36) | 0.88 (0.55-1.41) | 0.89 (0.63-1.28) | 1.28 (0.90–1.82) | 1.51 (0.93–2.45) | 1.28 (0.89–1.84) |
| 45-64 | 0.96 (0.70-1.31) | 0.85 (0.56-1.29) | 0.91 (0.66-1.26) | 2.01 (1.45-2.78)*** | 1.93 (1.24-3.01)** | 1.97 (1.40-2.77)*** |
| 65 or more | 1.04 (0.75-1.45) | 1.02 (0.60-1.76) | 0.96 (0.67-1.38) | 1.86 (1.31-2.63)*** | 1.62 (0.92-2.86) | 1.76 (1.20-2.57)** |
| **Disaster experience** | | | | | | |
| No | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Yes | 1.29 (1.01-1.67)* | 1.36 (0.96-1.94) | 1.27 (0.98-1.65) | 1.01 (0.78-1.32) | 1.06 (0.73-1.54) | 1.08 (0.82-1.43) |
| **Social participation** | | | | | | |
| Zero | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| One or more | 1.10 (0.87-1.40) | 1.02 (0.73-1.44) | 1.09 (0.85-1.41) | 1.55 (1.19-2.00)** | 1.20 (0.83-1.74) | 1.34 (1.01-1.76)* |
| **Social support** | | | | | | |
| Low | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| High | 0.70 (0.52-0.94)* | 0.66 (0.47-0.93)* | 0.72 (0.52-0.98)* | 1.63 (1.20-2.22)** | 1.48 (1.04-2.12)* | 1.51 (1.05-2.16)* |
| **Cognitive social capital** | | | | | | |
| Low | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| High | 1.00 (0.78-1.28) | 1.04 (0.71-1.50) | 1.13 (0.87-1.47) | 1.83 (1.42-2.37)*** | 1.62 (1.11-2.37)* | 1.53 (1.17-2.01)** |
| **Trust toward newspapers** | | | | | | |
| No | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Yes | 0.44 (0.32-0.60)*** | 0.60 (0.37-0.97)* | 0.58 (0.38-0.87)** | 1.90 (1.41-2.57)*** | 1.67 (1.03-2.71)* | 1.86 (1.27-2.73)** |
| **Trust toward television** | | | | | | |
| No | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Yes | 0.55 (0.42-0.71)*** | 0.84 (0.54-1.29) | 0.75 (0.52-1.07) | 1.34 (1.03-1.76)* | 1.14 (0.72-1.83) | 0.97 (0.66-1.41) |
| **Trust toward Internet** | | | | | | |
| No | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Yes | 0.73 (0.56-0.95)* | 0.86 (0.60-1.23) | 0.87 (0.64-1.17) | 0.98 (0.74-1.29) | 1.01 (0.68-1.50) | 0.94 (0.68-1.30) |

CI, confidence interval.
[1]Missing data were excluded.
[2]Adjusted for sex, age, educational attainment, disaster experience, social participation, social support, cognitive social capital, trust toward newspapers, trust toward television and trust toward internet.
[3]Log likelihood = –424.009.
[4]Log likelihood = –382.269.
*p value < 0.05, **p value < 0.01, ***p value < 0.001.

lower trust toward television (chi p value = 0.027). Disaster experience was associated with neither positive emotion (OR 1.06, 95% CI 0.73-1.54) nor negative emotion (OR 1.36, 95% CI 0.96-1.94) toward the news media broadcasting. Further, among variables for trust toward news media, trust toward newspapers was significantly associated with emotion toward news media broadcasting. Moreover, those participants with trust toward newspapers were more likely to have positive emotion (OR 1.67, 95% CI 1.03-2.71) and were less likely to have negative emotion (OR 0.60, 95% CI 0.37-0.97). Overall, the findings obtained using the multiple imputed data were basically similar to those observed with the complete case analyses.

In addition to the main results, Table 4 compares the effects on emotion toward news media between respondents with disaster experience and disaster victims. Disaster victims were not significantly related to either negative or positive emotion toward news media in univariate and multivariate analyses. Furthermore, Table 5 summarizes the findings regarding the association between emotion toward

Table 4. Crude and adjusted odds ratios (OR) of negative and positive emotion toward news media in relation to respondents with disaster experience and disaster victims (Logistic regression models).

| Variables | Nuber (%) (N = 1,190) | Negative emotion (95% CI) | | Positive emotion (95% CI) | |
|---|---|---|---|---|---|
| | | Crude OR[1] (N = 1,183) | Adjusted OR with complete data[1,2] (N = 642) | Crude OR[1] (N = 1,183) | Adjusted OR with complete data[1,2] (N = 642) |
| **Disaster experience** | | | | | |
| No | 822 (69.0) | Ref. | Ref. | Ref. | Ref. |
| Yes | 370 (31.0) | 1.29 (1.01-1.67)* | 1.36 (0.96-1.94) | 1.01 (0.78-1.32) | 1.06 (0.73-1.54) |
| **Disaster victim** | | | | | |
| No | 1,125 (94.4) | Ref. | Ref. | Ref. | Ref. |
| Yes | 67 (5.6) | 1.30 (0.78-2.18) | 1.49 (0.67-3.32) | 0.85 (0.50-1.42) | 1.22 (0.51-2.90) |

CI, confidence interval.
[1]Missing data were excluded.
[2]Adjusted for sex, age, educational attainment, social participation, social support, cognitive social capital, trust toward newspaper, trust toward television and trust toward internet.
*p value < 0.05.

Table 5. Crude and adjusted odds ratios (OR) of having mild mood or anxiety disorder (Logistic regression models).

| Variables | Mild mood or anxiety disorder (95% CI) | | |
|---|---|---|---|
| | Crude OR[1] (N = 1,190) | Adjusted OR with complete data[1,2] (N = 919) | Adjusted OR with imputed data[2] (N = 1,190) |
| **Negative emotion toward news media** | | | |
| No | Ref. | Ref. | Ref. |
| Yes | 1.40 (1.08-1.84)* | 1.15 (0.78-1.68) | 1.35 (1.02-1.78)* |
| **Positive emotion toward news media** | | | |
| No | Ref. | Ref. | Ref. |
| Yes | 0.93 (0.71-1.23) | 1.20 (0.80-1.81) | 1.08 (0.81-1.45) |

CI, confidence interval.
[1]Missing data were excluded.
[2]Adjusted for sex, age, disaster experience, social participation, cognitive social capital, trust toward newspaper and trust toward internet that were selected in the stepwise selection procedure with power of 0.20.
*p value < 0.05.

news media and mental health to relate to another work that reported protective factors of mild mood disorder or anxiety disorder among the same population as the present study (Ozaki et al. 2018). The present study showed that participants with negative emotion toward news media were more likely to have mild mood disorder or anxiety disorder compared with those without negative emotion after adjusting for covariates with imputed data (OR 1.35, 95% CI 1.02-1.78), although the present study did not show significant evidence for the association in a multivariate analysis with complete data (OR 1.15, 95% CI 0.78-1.68).

## Discussion

The present study has shown that social support among Japanese people was associated with decreased negative emotional response and increased positive emotional response toward news media broadcasting about natural disasters regardless of prior experience of natural disasters. The consistent effect of social support on negative and positive emotions indicates robustness of the association that the present study detected.

A possible explanation for the protective effect of social support on emotion toward news media is that high social support may allow people to receive necessary infor-

mation and/or emotional support through their social network, which supports them in coping with negative messages delivered through media (Wind et al. 2011; Sugimoto et al. 2013).

Indeed, social support has been shown to protect people from social stress through physical, financial, emotional, and appraisal support (Kawachi and Berkman 2014). Another explanation is that high social support fosters community ties and cultural resilience in difficult situations such as an aftermath of a disaster, which makes individuals less prone to the negative impact of media coverage of disasters (Ledogar and Fleming 2008; Melo Zurita et al. 2018).

On the other hand, the effect of cognitive social capital on human emotion may be less robust compared with that of social support; namely, cognitive social capital exerted a preferable effect only on positive emotion toward news media. Inconsistent effects on mental health between social support and cognitive social capital have been reported in multiple previous studies (Wind et al. 2011; Hikichi et al. 2017; Noel et al. 2018). These inconsistent effects suggest different mechanisms in effects on emotion between social support and cognitive social capital.

The cognitive social capital has been reported to predominantly enhance positive feelings toward human societies by shaping an individual's mental attitude (De Silva et al. 2005; Cacioppo and Hawkley 2009; Cacioppo et al. 2009). In the present study, participants with high cognitive social capital had positive feeling when they encountered images of positive behavior among disaster victims. In the area of neuroscience, the mechanism has been described in such a way that high cognitive social capital leads to higher activation of the rewarding system in a brain and higher response to pleasant pictures (Cacioppo et al. 2009). The findings of these studies would explain a part of the associations between cognitive social capital and positive and negative emotions.

Nonetheless, some caution is required when interpreting these findings. Given that the present study had a cross-sectional design, the relationships might be explained as a reverse causation. However, consistent association between social support and negative and positive emotion toward media supports the causal effect relationship. Longitudinal studies are needed to confirm the temporal relationship between each of social capital components and emotion toward media.

Although several studies reported the negative impact of media on mental health after disasters (Wind et al. 2011; Pfefferbaum et al. 2014), it remains to be clarified what factors influence an individual's response to media. This is the first study that shows the protective effect of social support and cognitive social capital on emotion toward news media. Emotional response to media varies between individuals and those who are vulnerable to negative messages conveyed by the media are at greater risk of developing mental health problems (Pfefferbaum et al. 2018).

Multiple studies have reported that mental health problems are increased in the aftermaths of disasters (Goldmann and Galea 2014; Harada et al. 2015; Ozaki et al. 2018) and could be exacerbated by media's negative impact following disasters (Holman et al. 2014; Pfefferbaum et al. 2018). The present study also suggests that negative emotion toward news media might be related to increased mild mood or anxiety disorder. In this respect, we believe that we have found that novel and important nature of social capital, which would help build a community resilient to dissemination of negative information following disasters.

Additionally, the present study investigated factors influencing emotion toward news media other than social capital components and found that disaster experience was not related to emotion toward media. This suggests that impact of news media could spread to people out of disaster affected area as reported in previous papers (Cho et al. 2003; Holman et al. 2014; Pfefferbaum et al. 2014; Cheng et al. 2015a). We also recategorized disaster experience into disaster victims who had severe damage and others, and thus found that disaster victims were not significantly related to either negative or positive emotion toward media. However, it would be difficult to conclude as such in the present study due to limited number of disaster victims.

The present study also found that trust toward newspapers was associated with increased positive emotion and decreased negative emotion toward media. Generally, in Japan, the most trusted media forms are newspapers and public television programs (NHK, Nippon Hoso Kyokai) followed by private television programs (Central Research Services 2015), and people tend to choose local papers rather than nationwide newspapers (Japan Audit Bureau of Circulations).

Several studies reported that local newspapers played an important role in disaster settings by providing a specific and essential lifeline and relevant information for local people in the aftermath of natural disasters (Rausch 2013; Matthews 2017). Although we could not confirm which types of newspapers the study participants read, the contribution of local newspapers might explain why a trusted newspaper has a protective effect against media coverage of disasters.

Older respondents were more likely to have positive emotion toward media after adjusting for covariates including trust on newspapers, television and internet. It was reported that determinants of well health change over life-course in relation to working environment, financial stability and lifestyle (Winzer et al. 2018), but the present study did not take into account these determinants. Another possible explanation of the age-difference would be residual confounding of trust toward news media given a great age-related difference in preference in regard to the media form. The present study did not capture which form of news media respondents actually consumed but asked which form of news media they trusted instead. Therefore, influence of news media consumption might not be fully

controlled in the present study.

The present study has three main limitations. First, we did not measure how much participants consumed disaster information through which forms of media. Therefore, it was difficult to quantify the level of exposure to disaster-related media. Secondly, we sought to quantify disaster experience in the preceding 10 years and social capital and emotion toward media at the time of interview. This made it difficult to examine the time relationship between social capital and emotion toward disaster media. Finally, many participants had missing data, namely in trust of media and social support. As a result, only half of the study participants' data were included in multivariate logistic regression models (52.5%, 642/1,200). Nevertheless, we assumed the missing data occurred at random and results of sensitivity analyses with multiple imputation method were reasonably close to the estimates of analyses with complete data.

In conclusion, high social support has a protective effect against negative emotion and enhances positive emotional responses toward media broadcasting of natural disasters regardless of direct experience of disasters. Moreover, high cognitive social capital has a preferable effect only on positive emotion toward media.

Regardless of the limitations, the present study suggests an important role of social support and cognitive social capital in response to media broadcasting about natural disasters. The results suggest that interventions to enhance social support will be useful to reduce negative emotional responses and may potentially prevent mental health problems in the aftermath of disasters. The results also suggest that media should develop their communication strategies based on the characteristics of their target audiences.

## Author Contributions

All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: All authors. Acquisition, analysis, or interpretation of data: Yamaoka. Drafting of the manuscript: Horiuchi and Ozaki. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: All authors. Administrative, technical, or material support: Yamaoka. Study supervision: Yamaoka.

## Conflict of Interest

The authors declare no conflict of interest. Among the authors, however, Akihiko Ozaki receives personal fees from MNES Inc., outside the submitted work.

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