PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	The Association between Earthquake Experience and Depression 37 Years after the Tangshan Earthquake: A Cross-sectional Study
AUTHORS	Gao, Xing; Leng, Yue; Guo, Yuchen; Yang, Jichun; Cui, Qinghua; Geng, Bin; Hu, Hongpu; zhou, Yong

VERSION 1 - REVIEW

REVIEWER	Eizaburo Tanaka Hyogo Institute for Traumatic Stress, Japan
REVIEW RETURNED	12-Oct-2018

GENERAL COMMENTS	Review of Manuscript #bmjopen-2018-026110 This study aims to investigate the association between the experience of the Tangshan earthquake and the risk of depression 37 years after the disaster. The authors found that participants who experienced the earthquake had more depression than those who didn't. In particular, those who lost relatives after the earthquake were more likely to have depression as compared with those who didn't experience the earthquake. Although authors made a lot of effort to reveal long-term consequence of the major natural disaster, there are several serious concerns with the manuscript that need to be addressed. Comments to the authors 1. Since quite a long time has passed from the exposure event (the Tangshan earthquake) to the outcome which is current mental health state measured by CES-D, other important confounders such as adverse childhood experiences, other bereavements, and current psychological stressors should be included in the analysis. 2. Some previous studies (Alexander C, 2009, 20 years after bushfire & Green BL, 1994, 17 years after the Buffalo Creek dam collapse) reported there were no significant differences between exposed population and non-exposed population in mental health. Normally mental health problems after mass disaster peaked several months to two years then alleviated over time. The authors should discuss why their survey population suffered from depression in the long run. 3. Inclusion criteria should be stated explicitly. Was it only birth before the earthquake? 4. Is the single question "Were you in the Tangshan earthquake area in 1976?" appropriate for asking the earthquake experience? If so, add a relevant reference. 5. Was the Chinese version of CES-D validated? Was the cutoff score (16) for a Chinese population?

	6. I don't understand the description of "Patients and public involvement p8." 7. How did the authors deal with missing data? 8. I don't think this is a prospective study rather it is a cross-sectional study.

REVIEWER	Talya Greene Senior Lecturer, University of Haifa, Israel
REVIEW RETURNED	27-Oct-2018

GENERAL COMMENTS	This study investigating long-term depression in earthquake survivors. This is an important issue to investigate, and I believe that this study has the potential to be a useful contribution to the literature on this topic. I would recommend a number of issues are addressed before publication as follows: Introduction 1. The opening paragraph is quite generic. I would recommend merging the first and second paragraph so as to make it more relevant to the research question of the paper. 2. Paragraph 2: 'these studies mainly examined the effects of earthquakes on depression in the short-term'. It would be helpful to clarify the timeframe of 'short-term' here. 3. It should be make clear why the potential covariates are considered as such, beyond that these were available to the researchers. 4. Please include specific aims or hypotheses for gender and age. Methods 5. It is unclear to me whether the 5024 participants were only those born before the earthquake, or whether there were some other inclusion/exclusion criteria. This should be clarified in the manuscript. 6. The paragraph titled Patients and public involvement should be edited for language issues. There are also a few other typos and language errors in the manuscript (e.g., 'use of glucose-lowing drugs'). 7. The paragraph of 'assessment of the earthquake experience' seems to contain an error as follows: 'Participants who confirmed the earthquake were placed into one of 3 groups: no earthquake experience…' Results 8. Why were under 18s split into under 6 and then 6-18? I would recommend justifying this in the manuscript. Further, the results seem to suggest that a comparison of under 18s vs over 18s would have been relevant, and may well have led to different conclusions. I mention this not to encourage p hacking, but because I am suspect that age is relevant after all, just not in the way that the authors expected. It is ok to run these analyses afterwards, as long as it is made clear that they were run in light of the initial findings as an exploratory rather than confirmatory procedure. Discussion 9. The first sentence of the discussion is too sweeping in its conclusions 'this is the first study to prove that earthquake survivors have a higher risk….' I would suggest avoiding the word 'prove', but rather using some more moderate language. 10. The first sentence is presented as a stand alone paragraph, but this is too short for a paragraph. I would suggest summarizing

	the results of the study more extensively in this first paragraph of the discussion. 11. On page 12, the authors refer to studies of earthquake survivors in Japan, Haiti and China. These should all be accompanied by citations. 12. On page 13, the authors write that the study helps identify people who are prone to depression. I don't think this is an accurate assessment of what the study does. Tables and figures: 13. I would also like to see the range for age in Table 1, and a breakdown of the number (and percentage) of participants from each of the categories that are assessed in the analysis shown in figure 2. 14. Figure 1 should include some indication for significant differences between the categories

REVIEWER	siri Thoresen Norwegian Center for Violence and Traumatic Stress Studies, Norway
REVIEW RETURNED	29-Oct-2018

GENERAL COMMENTS	This paper examines depression in earthquake exposed and non-exposed 37 years after the disaster. Very long-term studies are lacking, so this paper is welcome. However, I have some concerns. As far as I could understand, this was a cross-sectional study. Nevertheless, throughout the manuscript, words like 'baseline', 'development', 'follow-up' etc are used, which confused me. I think the authors should refer to the very long term studies that have been performed on other disasters. The authors seem to restrict their reference to previous literature (Introduction and Discussion) only to studies on earthquakes. The Introduction does not build up to the aim 'varies by age'. Why did the authors want to study age, what does previous literature tell us about age, and why is it important to know? Abstract Objective: 'Over 37 years' or 'after 37 years'? Outcomes and variables: This sentence does not read so well in my view. It was not clear to me which variables were outcome variables and which were independent variables in the logistic regressions. Results: ' …To develop depression after 37 years' : What is meant here: delayed development, or to have depression after 37 years? Lost relatives after the earthquake: The way this is formulated, it sounds that the loss of relatives were not earthquake-related, but occurred any time in the 37 years after. ? 'The association was more pronounced for women' – or the association was only significant for women? Conclusion: The implication about early intervention does not necessarily follow from what is previously said in the abstract. Strengths and limitations: This is not the first study to look at long-term outcome of disasters. 'Participants are stratified by gender and age at the earthquake': What does this mean? Is it a 'follow-up'? Introduction:

	Although disasters probably are detrimental to mental health, disasters may not necessarily impact much on the general prevalence of mental health disorders. If the authors start out with the prevalence of depression, they need to justify this link. Are women a group of 'vulnerable individuals'? Maybe there are no long-term studies of earthquake survivors, but there are long-term studies of other disasters that the authors should refer to, e.g. following the Estonia ferry disaster, the Alexander Kielland oil platform collapse, the Piper Alpha oil platform disaster, Australian bushfires, the Buffalo Creek. Could the authors add a bit more information about the earthquake, e.g. how many people died or were injured? Methods: Can the authors supply some information about the response rate/representativity of the original study sample (the 9078), and how they were selected/recruited? The sentence about the 5024 study participants is not clear: Are these the total sample born before the earthquake? Please also add some more information about the aim of the larger study and refer to a paper describing the methods in more detail. It's not clear to me what is meant with 'baseline' information in this context? Were there several waves of this study? Assessment of earthquake experience: What is meant by a 'standardized'questionnaire in this context? How was data actually collected: Did the participants self-report on a questionnaire during a face-to-face visit? Re the 3 groups: What about individuals who were not present in the region at the time of the earthquake but who lost someone? Depression assessment: The word questionnaire is used here, but it sounds like a structured interview. Please clarify. Covariates: What does drinking status 'yes' mean? Is smoking daily smoking or ever smoking? All measures: Are all measures current? That is: smoking is current smoking? Depression is current depression? And so on? Please specify which periods are covered by the measures. Statistics: What is meant by 'baseline' in this context? Also the use of 'the development (depression) is not clear. I take it the authors are talking about current depression? It would be helpful if the authors explained why they adjusted for all these confounders. Could these variables be thought to play a role on a potential causal chain, and should they all be adjusted for? And why were hypertension, diabetes and dyslipidemia chosen as confounders as opposed to other health conditions? Could the authors explain more in detail how the subgroup analyses were done? Did they do 5 + 2 separate regressions to arrive at Table 3? Results: Could the authors explain what is meant by 'baseline' in this context? Table 1. I was surprised to see that men seemed to be under-represented in the bereaved group. Any explanation for this? Table 2: Why are there 3 groups in Table 1 and 4 groups in Table 2? It took me some time to figure out that the 'experience' group included both groups (with and without bereavement). Why should there be such a collapsed group, and if there is a need for a collapsed group – why not also in Table 1? The row giving n (%) only gives the %. Consider placing the % somewhere else, I think this row makes the table less easy to read.

	I wonder if the models are over-adjusted. Figure 1: This figure can be omitted, as %s are given in Table 1. Bottom of page 10: “There were significant associations between the earthquake and depression in females…” This part of the sentence is just a repetition of the previous sentence. Figure 2: The rationale for studying age is not given in the Introduction. The reader needs to understand why the authors looked into age, why they did it in this particular way, and the results need to be explained. I also wondered why age was entered as a continuous variable in Table 2 but separated into age groups here? (This may be OK, but it could be explained.) Discussion This is not the only study of long-term (decades) mental health after a disaster, and I think the authors could link their findings up with this literature. What is the ‘ensuring’ period? I’m not sure that the authors are correct about the short-lived responses to acute stressors. Very long-term negative health outcomes have been identified for other disasters as well. Why is the Italian study not mentioned in the Introduction? (or did I miss it?) Pls rephrase ‘merely lived in an earthquake zone’ (might not be perceived as ‘merely’ for those who did). The sentence (p 12) ‘Although these studies…’: I did not completely understand the meaning of this sentence. I think the authors should discuss their findings on age groups and relate those findings to existing literature. I also think the authors should discuss their control for potential confounders. They have adjusted for a lot of factors that may have had a place on a potential causal chain. Limitations: Was the study conducted over a long period? Was it a follow-up? I wonder if I have misunderstood the description in Methods – I thought this was a cross-sectional study conducted in 2013-2014? If the study was cross-sectional, this should be mentioned as a limitation. The authors state that ‘…it was unlikely that people who experienced an earthquake were more likely to be depressed prior to the earthquake’. Are the authors sure about this? What do the authors know about the sociodemographic makeup of the district at the time before the earthquake? Are there potential sociodemographic differences between those staying in the district and those moving into the district? There must have been quite substantial mobility, as only about 13% (?) of those living in the district now lived there at the time of the earthquake. Also, during the 37 years that had passed, many disaster victims may have died, and early death may have been related to depression and illnesses. How would this impact the results? Limitations should include reflections on non-response, which I miss from Methods. I also think the authors could discuss generalizability. The sentence (p 13): ‘…because they may obtain benefit from early intervention policies and strategies’. This was not completely clear to me, could the authors be more specific. Do we have evidence that early intervention can prevent depression? Conclusions: “an earthquake increases the risk of depression and has long-lasting effects on depression”: Pls explain what the difference is between the two (risk and effect). (cont)… “particularly women” : Only women?

VERSION 1 – AUTHOR RESPONSE

Reviewers' Comments to Author:
Reviewer: 1

Reviewer Name: Eizaburo Tanaka
Institution and Country: Hyogo Institute for Traumatic Stress, Japan
Please state any competing interests or state 'None declared': None declared

This study aims to investigate the association between the experience of the Tangshan earthquake and the risk of depression 37 years after the disaster. The authors found that participants who experienced the earthquake had more depression than those who didn't. In particular, those who lost relatives after the earthquake were more likely to have depression as compared with those who didn't experience the earthquake. Although authors made a lot of effort to reveal long-term consequence of the major natural disaster, there are several serious concerns with the manuscript that need to be addressed.
Comments to the authors
1. Since quite a long time has passed from the exposure event (the Tangshan earthquake) to the outcome which is current mental health state measured by CES-D, other important confounders such as adverse childhood experiences, other bereavements, and current psychological stressors should be included in the analysis.

Response: Thank you for pointing this out. According to relevant literature, confounding factors related to earthquakes and depression were considered in the present study. Earthquakes have no inevitable relationship with adverse childhood experiences, other bereavements, and current psychological stressors; therefore, we did not consider these to be confounding factors. Of course, a potential relationship may exist between an earthquake that occurred 37 years ago and other adverse events. Unfortunately, these data were not collected in the investigation, which has been added as one of the limitations. (Page 16 Lines 335-339)

2. Some previous studies (Alexander C, 2009, 20 years after bushfire & Green BL, 1994, 17 years after the Buffalo Creek dam collapse) reported there were no significant differences between exposed population and non-exposed population in mental health. Normally mental health problems after mass disaster peaked several months to two years then alleviated over time. The authors should discuss why their survey population suffered from depression in the long run.

Response: We greatly appreciate your suggestion.

The inconsistent results may be explained by 3 reasons. First, subclinical psychotic experiences (SPE) and depression reflect different aspects of psychological problems. SPE is defined as symptoms or experiences of or experiences resembling hallucinations, delusions or both[1], whereas depressive disorder is characterized by sadness or irritability[2]. Differences in symptoms may explain why our findings differ from the results of the 20-year follow-up study of Australian bush fires. Second, psychological problems may depend on the severity of a trauma. For example, Galletly C et al reported that the risk of psychological disorder is associated with multiple traumas rather than a single major trauma[3]. Third, the trauma experiences of the participants in these studies are different. In the study on Buffalo Creek survivors, few survivors suffer from bereavement[4], which is different from the

survivors in our study. Different characteristics of trauma experiences between the two studies may account for the discrepancy. (Page 13-14 Lines 275-287)

References:

[1] van Os, J., Linscott, R.J., Myin-Germeys, I., Delespaul, P., Krabbendam, L., 2009.A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness–persistence–impairment model of psychotic disorder. Psychol. Med. 39 (2), 179–195.

[2] Belmaker., R.HAgam., Galila., Major Depressive Disorder. N Engl J Med 2008;358:55-68.

[3] Galletly C, Van Hooff M, McFarlane A. Psychotic symptoms in young adults exposed to childhood trauma--a 20 year follow-up study. Schizophrenia research 2011;127(1-3):76-82.

[4] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

3. Inclusion criteria should be stated explicitly. Was it only birth before the earthquake?

Response: Thank you for your question regarding the inclusion criteria in our study. Since we want to understand the long-term effects of earthquake exposure on depression, no more specific inclusion criterias were implemented for the population.

The participants were selected from the Jidong Cohort, an ongoing community-based prospective study on Chinese adults. To increase the comparability, we only included participants born before the Tangshan earthquake. (Page 8 Lines 136-141)

4. Is the single question “Were you in the Tangshan earthquake area in 1976?” appropriate for asking the earthquake experience? If so, add a relevant reference.

Response: We added the following reference: “Li N, Wang Y, Yu L, et al. Long-term effects of earthquake experience of young persons on cardiovascular disease risk factors. Archives of Medical Science, 2017, 1:75-81.” (Page 8 Lines 151)

5. Was the Chinese version of CES-D validated? Was the cutoff score (16) for a Chinese population?

Response: The Chinese version of CES-D has been validated in several studies [1-4]. (Page 9 Lines 157-169)

The cut-off value of ≥16 has been widely used to define clinically meaningful depressive symptoms [2-4]. (Page 9 Lines 166-168)

References:

[1] Chien C P , Cheng T A . Depression in Taiwan: epidemiological survey utilizing CES-D[J]. 1985, 87(5):335-8.;

[2] Zhang Y , Ting R Z W , Lam M H B , et al. Measuring depression with CES-D in Chinese patients with type 2 diabetes: the validity and its comparison to PHQ-9[J]. Bmc Psychiatry, 2015, 15(1):198.;

[3] Zhang J , Sun W , Kong Y , et al. Reliability and validity of the Center for Epidemiological Studies Depression Scale in 2 special adult samples from rural China[J]. Comprehensive Psychiatry, 2012, 53(8):1243-1251.

[4] Wang F , Liu J , Liu L , et al. The status and correlates of depression and anxiety among breast-cancer survivors in Eastern China: a population-based, cross-sectional case–control study[J]. BMC Public Health, 2014, 14.

6. I don't understand the description of "Patients and public involvement p8."

Response: Patients and public involvement is required by editors in the method section.We apologize for the unclear description. We revised this text to: "Patients and the public were not involved in development of the research question or outcome measures, study design, or recruitment to and conduct of this study. Results will be disseminated to study participants through annual information events.

" (Page 11 Lines 221-224)

7. How did the authors deal with missing data?

Response: Thank you for your question on missing data. We excluded 4054 subjects from the 9078 participants according to the following standards: (1) born after July 28th, 1976 (n=4053), (2) incomplete information on relevant earthquake experience (n=1), and (3) missing values in the surveys for the CES-D measurement scale (n=0). Therefore, 1 participant with missing value of incomplete information on relevant earthquake experience were excluded.

Missing data for confounding variables (60 for income information) were imputed with their mean values among all participants. Finally, a total of 5024 individuals were included in the current analysis. (Page 8 Lines 136-142)

8. I don't think this is a prospective study rather it is a cross-sectional study.
Response: Thank you for your comment. We have revised the description to describe a cross-sectional study (Title: The Association between Earthquake Experience and Depression 37 Years after the Tangshan Earthquake: A Cross-sectional Study).

Reviewer: 2

Reviewer Name: Talya Greene
Institution and Country: Senior Lecturer, University of Haifa, Israel
Please state any competing interests or state 'None declared': None declared

This study investigating long-term depression in earthquake survivors. This is an important issue to investigate, and I believe that this study has the potential to be a useful contribution to the literature on this topic. I would recommend a number of issues are addressed before publication as follows:
Introduction
1. The opening paragraph is quite generic. I would recommend merging the first and second paragraph so as to make it more relevant to the research question of the paper.

Response: Thank you for your suggestion. We have modified the opening paragraph as follows: “Depression is predicted to be a major reason for disability around the world by 2030 according to the World Health Organization[1]. In addition, the chronic and debilitating nature of depression complicates the prognosis of chronic diseases, aggravates diseases and even leads to suicide[2-4]. Evidence shows that depression is related to demographic characteristics, living habits, education, income, and health status[5-7]. Some studies suggest that participants exposed to disasters at early life stage are of higher risk of depression, independent to age, gender, income, education and other confounders in the short term (1-4 years)[8-10]. Meanwhile, studies report that some survivors have psychological problems in the immediate aftermath of disaster trauma, most of these reactions abate over time, and only a minority of survivors develop a long-standing disorder[11 12]. Therefore, long-term evidence is essential to evaluate the effects of disaster on depression.” (Page 6 Lines 81-92)

References:

[1] Who W, Mathers C, Fat DM, et al. The global burden of disease: 2004 update. Irish Medical Journal 2008;106(1):4.

[2] Krishnan V, Nestler EJ. The molecular neurobiology of depression. Nature 2008;455(7215):894-902.

[3] Guo J, He H, Fu M, et al. Suicidality associated with PTSD, depression, and disaster recovery status among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Psychiatry research 2017;253:383-90.

[4] Yang L, Zhao Y, Wang Y, et al. The Effects of Psychological Stress on Depression. Current neuropharmacology 2015;13(4):494-504.

[5] Madden JS. Alcohol and depression. British journal of hospital medicine 1993;50(5):261-4.

[6] Gu L, Xie J, Long J, et al. Epidemiology of major depressive disorder in mainland china: a systematic review. PloS one 2013;8(6):e65356.

[7] Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). Jama 2003;289(23):3095-105.

[8] van Griensven F, Chakkraband ML, Thienkrua W, et al. Mental health problems among adults in tsunami-affected areas in southern Thailand. Jama 2006;296(5):537-48.

[9] Fergusson DM, Horwood LJ, Boden JM, et al. Impact of a major disaster on the mental health of a well-studied cohort. JAMA psychiatry 2014;71(9):1025-31.

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

[11] Bryant RA, Creamer M, O'Donnell M, et al. Acute and Chronic Posttraumatic Stress Symptoms in the Emergence of Posttraumatic Stress Disorder: A Network Analysis. JAMA psychiatry 2017;74(2):135-42.

[12] Arnberg FK, Eriksson NG, Hultman CM, et al. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. Journal of traumatic stress 2011;24(2):183-90.

2. Paragraph 2: ‘these studies mainly examined the effects of earthquakes on depression in the short-term’. It would be helpful to clarify the timeframe of ‘short-term’ here.

Response: Thank you for your advice. Short-term referred to 1-4 years, according to the reference[10]. We revised to be:“Some studies suggest that participants exposed to disasters at early life stage are of higher risk of depression, independent to age, gender, income, education and other confounders in the short term (1-4 years)[8-10].” (Page 6 Lines 86-88)

References:

[8] van Griensven F, Chakkraband ML, Thienkrua W, et al. Mental health problems among adults in tsunami-affected areas in southern Thailand. Jama 2006;296(5):537-48.

[9] Fergusson DM, Horwood LJ, Boden JM, et al. Impact of a major disaster on the mental health of a well-studied cohort. JAMA psychiatry 2014;71(9):1025-31.

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

3. It should be make clear why the potential covariates are considered as such, beyond that these were available to the researchers.

Response: We greatly appreciate your suggestion. The selected covariates included factors known to be predictive of depression [1-5]. These potential covariates include age at the time of the earthquake, gender, education, income, smoking status, drinking status, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidemia. (Page 6 Lines 85-88)

References:

[1] Madden JS. Alcohol and depression. British journal of hospital medicine 1993;50(5):261-4.

[2] Gu L, Xie J, Long J, et al. Epidemiology of major depressive disorder in mainland china: a systematic review. PloS one 2013;8(6):e65356.

[3] Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). Jama 2003;289(23):3095-105.

[4] van Griensven F, Chakkraband ML, Thienkrua W, et al. Mental health problems among adults in tsunami-affected areas in southern Thailand. Jama 2006;296(5):537-48.

[5] Fergusson DM, Horwood LJ, Boden JM, et al. Impact of a major disaster on the mental health of a well-studied cohort. JAMA psychiatry 2014; 71(9):1025-31.

4. Please include specific aims or hypotheses for gender and age.

Response: Thank you for your suggestion. We have added specific aims or hypotheses for gender and age as follows: “Considering that age and gender may confound the association between earthquake experience and depression[13 17-19], we performed an analysis stratified by age and gender.” (Page 6 Lines 97-99; Page 7 Lines 116-118)
References:

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994.

[18] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

[19] Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

Methods

5. It is unclear to me whether the 5024 participants were only those born before the earthquake, or whether there were some other inclusion/exclusion criteria. This should be clarified in the manuscript.

Response: Thank you for your question regarding the inclusion criteria in our study. Since we want to understand the long-term effects of earthquake exposure on depression, no more specific inclusion criterias were implemented for the population.

The participants are selected from the Jidong Cohort, an ongoing community-based prospective study on Chinese adults. To increase the comparability, we only included participants born before the Tangshan earthquake. (Page 8 Lines 136-142)

6. The paragraph titled Patients and public involvement should be edited for language issues. There are also a few other typos and language errors in the manuscript (e.g., 'use of glucose-lowing drugs').

Response: We greatly appreciate that the reviewer pointed out the typos and language errors. The revised manuscript was corrected by American Journal Experts (Certificate Verification Key: EAF5-5E43-7C3F-FDB3-702P).

7. The paragraph of 'assessment of the earthquake experience' seems to contain an error as follows: 'Participants who confirmed the earthquake were placed into one of 3 groups: no earthquake experience….'

Response: Thank you. We have modified the sentence as follows: "According to the answers to these questions, subjects were classified into 3 groups: no earthquake experience, earthquake experience without bereavement, and earthquake experience with bereavement." (Page 8 Lines 151-154)

Results

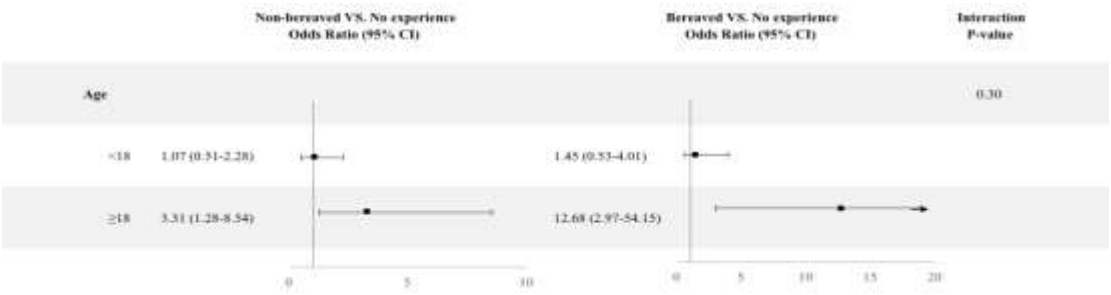
8. Why were under 18s split into under 6 and then 6-18? I would recommend justifying this in the manuscript. Further, the results seem to suggest that a comparison of under 18s vs over 18s would have been relevant, and may well have led to different conclusions. I mention this not to encourage p hacking, but because I am suspect that age is relevant after all, just not in the way that the authors expected. It is ok to run these analyses afterwards, as long as it is made clear that they were run in light of the initial findings as an exploratory rather than confirmatory procedure.

Response: Thank you for your question regarding the age grouping in our study.

Evidence shows that trauma experience in childhood and adolescence may have a determining effect on brain structural development, sympathetic nervous system responsivity, and the hypothalamic

pituitary adrenal axis, especially in younger children (pre-school) and school-age children (late childhood and early adolescence), resulting in a large stress response and some psychological problems [1]. Therefore, we classified age into 0-6, 6-18 and older than 18 years to investigate the long-term impact of disaster on mental health at different age stages. (Page 15 Lines 313-319)

However, we think that your suggestion is very meaningful. The statistical analysis was performed by classifying age into <=18 and >18 years. The results showed that P-value for the interaction was not statistically significant. Therefore, we maintained the results based on the original category.



Reference

[1] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

9. The first sentence of the discussion is too sweeping in its conclusions ‘this is the first study to prove that earthquake survivors have a higher risk….’ I would suggest avoiding the word ‘prove’, but rather using some more moderate language.

Response: Thank you for your comment. I have modified the sentence as follows: “we observed that earthquake survivors have a higher risk of depression than those who did not experience an earthquake even 37 years later.” (Page 13 Lines 262-264)

10. The first sentence is presented as a stand alone paragraph, but this is too short for a paragraph. I would suggest summarizing the results of the study more extensively in this first paragraph of the discussion.

Response: Thank you. We have modified the manuscript as follows:

“In the community-based study, we observed that earthquake survivors have a higher risk of depression than those who did not experience an earthquake even 37 years later. In addition, long-term effects of an earthquake on depression were found among survivors with bereavement, women and individuals over 18 years old. This is the first study to investigate the association between earthquake experience and depression as long as 37 years after an earthquake.” (Page 13 Lines 262-267)

11. On page 12, the authors refer to studies of earthquake survivors in Japan, Haiti and China. These should all be accompanied by citations.

Response: Thank you for your suggestion. We have added the reference in the modified manuscript. (Page 16 Lines 353-354)

12. On page 13, the authors write that the study helps identify people who are prone to depression. I

don’t think this is an accurate assessment of what the study does.
Response: This sentence is confusing, therefore we deleted it and changed to be the following sentence “Clinicians and policymakers in public health should direct more attention toward high-risk survivors of disasters, which may reduce the incidence of mental health problems, including depression, in disaster zones[47], even if the disaster has passed for a long time.” (Page 17 Lines 357-360)

Reference:

[47] Salcioglu E, Basoglu M. Psychological effects of earthquakes in children: prospects for brief behavioral treatment. World journal of pediatrics : WJP 2008;4(3):165-72.

Tables and figures:
13. I would also like to see the range for age in Table 1, and a breakdown of the number (and percentage) of participants from each of the categories that are assessed in the analysis shown in figure 2.

Response: The current age range of all participants was 37 to 82 years. We have added this information in the main text as follows: “In total, 5024 participants were included in this study, with 50.2% male participants and current ages ranging from 37 to 82 years.” (Page 11-12 Lines 229-230).

The percentages of participants in different age groups were also added in Table 1.

14. Figure 1 should include some indication for significant differences between the categories.
Response: Thank you for your comment. We have added the indication for significant differences in Figure 1. However, as the suggestion of Reviewer 3(“Figure 1: This figure can be omitted, as %s are given in Table 1.”), we deleted this figure.

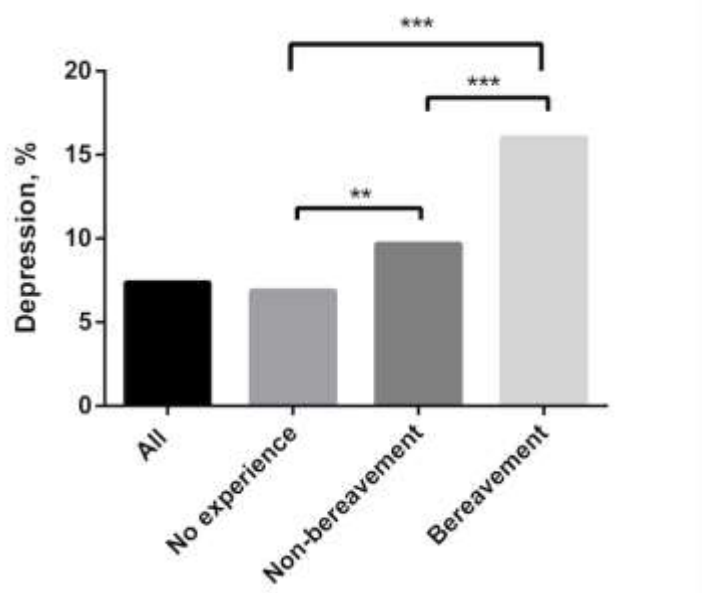


Figure 1 Prevalence of depression among different earthquake experience categories. ** P <0.01 and *** P <0.001.

Reviewer: 3

Reviewer Name: Siri Thoresen
Institution and Country: Norwegian Center for Violence and Traumatic Stress Studies, Norway
Please state any competing interests or state 'None declared': None declared

This paper examines depression in earthquake exposed and non-exposed 37 years after the disaster. Very long-term studies are lacking, so this paper is welcome. However, I have some concerns.
1. As far as I could understand, this was a cross-sectional study. Nevertheless, throughout the manuscript, words like 'baseline', 'development', 'follow-up' etc are used, which confused me.

Response: Thanks for your comment. We have revised it to be a cross-sectional study (Title: The Association between Earthquake Experience and Depression 37 Years after the Tangshan Earthquake: A Cross-sectional Study).

2. I think the authors should refer to the very long term studies that have been performed on other disasters. The authors seem to restrict their reference to previous literature (Introduction and Discussion) only to studies on earthquakes.

Response: We greatly appreciate your suggestion. We have already added literatures about the long-term effects of other disasters on mental health in the revised manuscript. Please see:

Introduction

Findings regarding the long-term impact of disasters on mental health have been mixed. Several studies have reported no differences [13 14], but others have revealed more psychological problems in exposed individuals compared with non-exposed individuals for more than a decade after disasters[10 15 16]. Moreover, evidences show that such effects are increased if survivors suffer from bereavement[10 12] . Overall levels of psychological symptoms may be associated with different age stages[17 18], and women show more psychological symptoms than men[13 19]. However, in these studies, the samples were relative small and not representative of the affected population. One study with a sample of 529 people followed the childhood survivors of natural disasters for 20 years, while depression was not investigated[14].

(Page 6 Lines 93-102)

Discussion

Consistent with our findings, a longitudinal study on the Alexander Kiedand oil platform collapse shows that survivors have a higher risk of depression than non-exposed individuals 27 years after the disaster[15]. Similar results are observed in another longitudinal study with 10 years of follow-up, which indicates that survivors of the Piper Alpha oil platform disaster show continued problems of mental health compared with non-exposed individuals[16]. In contrast, some previous studies report no significant differences between exposed population and non-exposed population in mental health[13 14]. The inconsistent results may be explained by 3 reasons. First, subclinical psychotic experiences (SPE) and depression reflect different aspects of psychological problems. SPE is defined as symptoms or experiences of or experiences resembling hallucinations, delusions or both[34], whereas depressive disorder is characterized by sadness or irritability[35]. Differences in symptoms may explain why our findings differ from the results of the 20-year follow-up study of Australian bush fires. Second, psychological problems may depend on the severity of a trauma. For example, Galletly C et al

reported that the risk of psychological disorder is associated with multiple traumas rather than a single major trauma[14]. Third, the trauma experiences of the participants in these studies are different. In the study on Buffalo Creek survivors, few survivors suffer from bereavement[13], which is different from the survivors in our study. Different characteristics of trauma experiences between the two studies may account for the discrepancy.

(Page 13-14 Lines 268-287)

References:

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

[12] Arnberg FK, Eriksson NG, Hultman CM, et al. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. Journal of traumatic stress 2011;24(2):183-90.

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[14] Galletly C, Van Hooff M, McFarlane A. Psychotic symptoms in young adults exposed to childhood trauma--a 20 year follow-up study. Schizophrenia research 2011;127(1-3):76-82.

[15] Boe HJ, Holgersen KH, Holen A. Mental health outcomes and predictors of chronic disorders after the North Sea oil rig disaster: 27-year longitudinal follow-up study. The Journal of nervous and mental disease 2011;199(1):49-54.

[16] Hull AM, Alexander DA, Klein S. Survivors of the Piper Alpha oil platform disaster: long-term follow-up study. The British journal of psychiatry : the journal of mental science 2002;181:433-8.

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994

[19] Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

[34] van Os J, Linscott RJ, Myin-Germeys I, et al. A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. Psychological medicine 2009;39(2):179-95.

[35] Belmaker RH, Agam G. Major depressive disorder. The New England journal of medicine 2008;358(1):55-68.

3. The Introduction does not build up to the aim ‘varies by age’. Why did the authors want to study age, what does previous literature tell us about age, and why is it important to know?

Response: Thank you for your question regarding the age grouping in our study. We have added this content in the revised manuscript. “overall levels of psychological symptoms may be associated with different age stages[17 18].” “Considering that age and gender may confound the association between earthquake experience and depression, we also performed an analysis stratified by age and gender. (Page 6 Lines 97-98; Page 7 Lines 116-118)

Reference:

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994.

[18] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

Abstract
4. Objective: 'Over 37 years' or 'after 37 years'?

Response: Thank you, we have modified the sentence as follows: "To investigate the association between the Tangshan earthquake and the risk of depression after 37 years." (Page 3 Lines 44-45)

5. Outcomes and variables: This sentence does not read so well in my view. It was not clear to me which variables were outcome variables and which were independent variables in the logistic regressions.

Response: We apologize for the unclear description. We revised the text to:

"The outcome was depression measured using the Center for Epidemiological Study and Depression Scale (CES-D). The independent variable was earthquake experience, with 3 groups: no earthquake experience, earthquake experience without bereavement, and earthquake experience with bereavement. Multivariable logistic analysis was used to evaluate the association between earthquake experience and depression after adjusting for gender, age at the time of the earthquake, smoking status, drinking status, education, income, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidemia." (Page 3 Lines 51-58)

6. Results: ' …To develop depression after 37 years' : What is meant here: delayed development, or to have depression after 37 years?

Response: We have modified the sentence as follows: "Participants who experienced the earthquake (with or without bereavement) had higher prevalence of depression than those without earthquake experience, 37 years after the earthquake" (Page 3 Lines 60-63)

7. Lost relatives after the earthquake: The way this is formulated, it sounds that the loss of relatives were not earthquake-related, but occurred any time in the 37 years after. ?

Response: We are sorry for this typo. We revised to be "Survivors who lost relatives during the earthquake". (Page 3 Lines 63)

8. ‘The association was more pronounced for women’ – or the association was only significant for women?

Response: Thank you for pointing this out. We conducted an analysis stratified by gender and found a statistically significant association between earthquake experience and depression in women but not in men. The manuscript has been revised as follows: “A statistically significant association between earthquakes and depression was found in women, but not in men.” (Page 3 Lines 65-66)

9. Conclusion: The implication about early intervention does not necessarily follow from what is previously said in the abstract.

Response: Thank you for your suggestion. We deleted the sentence in the modified manuscript. (Page 4 Lines 68-69)

10. Strengths and limitations: This is not the first study to look at long-term outcome of disasters.

Response: We have modified the sentence as follows: “The study investigated the long-term risk of depression as long as 37 years after a major earthquake.” (Page 5 Lines 73-74)

11. ‘Participants are stratified by gender and age at the earthquake’: What does this mean? Is it a ‘follow-up’?

Response: I am sorry for the fuzzy description. We revised this to: “Participants were stratified by gender and age at the time of the earthquake”. (Page 5 Lines 75)

12. Although disasters probably are detrimental to mental health, disasters may not necessarily impact much on the general prevalence of mental health disorders. If the authors start out with the prevalence of depression, they need to justify this link.

Response: Thank you for pointing this out. We have modified the manuscript in response to your suggestion.

“Depression is predicted to be a major reason for disability around the world by 2030 according to the World Health Organization[1]. In addition, the chronic and debilitating nature of depression complicates the prognosis of chronic diseases, aggravates diseases and even leads to suicide[2-4]. Evidence shows that depression is related to demographic characteristics, living habits, education, income, and health status[5-7]. Participants exposed to disasters at early life stage are of higher risk of depression, independent to age, gender, income, education and other confounders in the short term (1-4 years)[8-10]. Meanwhile, studies report that some survivors have psychological problems in the immediate aftermath of disaster trauma, most of these reactions abate over time, and only a minority of survivors develop a long-standing disorder[11 12]. Therefore, long-term evidence is essential to evaluate the effects of disaster on depression.” (Page 6 Lines 81-92)

References:

[1] Who W, Mathers C, Fat DM, et al. The global burden of disease: 2004 update. Irish Medical Journal 2008;106(1):4.

[2] Krishnan V, Nestler EJ. The molecular neurobiology of depression. Nature 2008;455(7215):894-902.

[3] Guo J, He H, Fu M, et al. Suicidality associated with PTSD, depression, and disaster recovery status among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Psychiatry research 2017;253:383-90.

[4] Yang L, Zhao Y, Wang Y, et al. The Effects of Psychological Stress on Depression. Current neuropharmacology 2015;13(4):494-504.

[5] Madden JS. Alcohol and depression. British journal of hospital medicine 1993;50(5):261-4.

[6] Gu L, Xie J, Long J, et al. Epidemiology of major depressive disorder in mainland china: a systematic review. PloS one 2013;8(6):e65356.

[7] Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). Jama 2003;289(23):3095-105.

[8] van Griensven F, Chakkraband ML, Thienkrua W, et al. Mental health problems among adults in tsunami-affected areas in southern Thailand. Jama 2006;296(5):537-48.

[9] Fergusson DM, Horwood LJ, Boden JM, et al. Impact of a major disaster on the mental health of a well-studied cohort. JAMA psychiatry 2014;71(9):1025-31.

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

[11] Bryant RA, Creamer M, O'Donnell M, et al. Acute and Chronic Posttraumatic Stress Symptoms in the Emergence of Posttraumatic Stress Disorder: A Network Analysis. JAMA psychiatry 2017;74(2):135-42.

[12] Arnberg FK, Eriksson NG, Hultman CM, et al. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. Journal of traumatic stress 2011;24(2):183-90.

13. Are women a group of ‘vulnerable individuals’?

Response: Thank you for pointing this out. Women show more psychological symptoms than men[13 19]. Considering that gender may confound the association between earthquake experience and depression, we performed an analysis stratified by gender. (Page 6 Line 99; Page 7 Lines 116-118)
References :

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[19] Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

14. Maybe there are no long-term studies of earthquake survivors, but there are long-term studies of other disasters that the authors should refer to, e.g. following the Estonia ferry disaster, the Alexander Kielland oil platform collapse, the Piper Alpha oil platform disaster, Australian bushfires, the Buffalo Creek.

Response: Thank you. Your suggestion broadens our research horizon. We greatly appreciate your suggestion and have added these references in the Introduction.

“Findings regarding the long-term impact of disasters on mental health have been mixed. Several studies have reported no differences [13 14], but others have revealed more psychological problems in exposed individuals compared with non-exposed individuals for more than a decade after disasters[10 15 16]. Moreover, evidences show that such effects are increased if survivors suffer from bereavement[10 12]. Overall levels of psychological symptoms may be associated with different age stages[17 18], and women show more psychological symptoms than men[13 19]. However, in these studies, the samples were relative small and not representative of the affected population. One study with a sample of 529 people followed the childhood survivors of natural disasters for 20 years, while depression was not investigated[14].” (Page 6-7 Lines 93-102)

References:

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

[12] Arnberg FK, Eriksson NG, Hultman CM, et al. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. Journal of traumatic stress 2011;24(2):183-90.

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[14] Galletly C, Van Hooff M, McFarlane A. Psychotic symptoms in young adults exposed to childhood trauma--a 20 year follow-up study. Schizophrenia research 2011;127(1-3):76-82.

[15] Boe HJ, Holgersen KH, Holen A. Mental health outcomes and predictors of chronic disorders after the North Sea oil rig disaster: 27-year longitudinal follow-up study. The Journal of nervous and mental disease 2011;199(1):49-54.

[16] Hull AM, Alexander DA, Klein S. Survivors of the Piper Alpha oil platform disaster: long-term follow-up study. The British journal of psychiatry : the journal of mental science 2002;181:433-8.

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994

[19] Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

15. Could the authors add a bit more information about the earthquake, e.g. how many people died or were injured?
Response: We have added information on casualties in the earthquake as follows: “The earthquake caused 242,769 deaths and left 164,851 people severely injured[20].” (Page 7 Lines 105-106)

[20] Sheng ZY. Medical support in the Tangshan earthquake: a review of the management of mass casualties and certain major injuries. The Journal of trauma 1987;27(10):1130-5.

16. Can the authors supply some information about the response rate/representativity of the original study sample (the 9078), and how they were selected/recruited? The sentence about the 5024 study participants is not clear: Are these the total sample born before the earthquake?

Response: Thank you. Since we want to understand the long-term effects of earthquake exposure on depression, no more specific inclusion criteria were implemented for the population. The participants were selected from the Jidong Cohort, an ongoing community-based prospective study on Chinese adults (9078). To increase the comparability, we only included participants born before the Tangshan earthquake (5025). Among them, 1 participant with missing value of incomplete information on relevant earthquake experience were excluded. Finally, a total of 5024 individuals were included in the current analysis. The response rate was 99.99% (5024/5025). (Page 8 Lines 136-142)

17. Please also add some more information about the aim of the larger study and refer to a paper describing the methods in more detail.

Response: Thank you, I have added the content as follows:

“In brief, the Jidong community is located in the Caofeidian district of Tangshan City, which is approximately 60 km from the epicenter of the Tangshan earthquake. A clustering sample method was used to select participants. From July 2013 to August 2014, a total of 9078 residents in Jidong community were recruited to participate in the cohort. This cohort has prospectively collected data regarding demographic and behavioral characteristics, insomnia, cognition, depression, and biochemical indicators at annual follow-ups since 2013[25-27]. These data were collected using a set of combined self-administered questionnaires (including the Center for Epidemiological Study and Depression Scale (CES-D)) with assistance of well-trained research nurses during face-to-face interviews. Biomedical variables were collected by physical examinations and laboratory assessments. The research field of this cohort has gradually expanded from the initial sub-health to depression, cardiovascular and cerebrovascular and other fields [25-28].” (Page 7-8 Lines 123-135)

References:

[25] Song Q, Liu X, Wang A, et al. Associations between non-traditional lipid measures and risk for type 2 diabetes mellitus in a Chinese community population: a cross-sectional study. Lipids in health and disease 2016;15:70.

[26] Hao Z, Zhang Y, Li Y, et al. The Association between Ideal Cardiovascular Health Metrics and Extracranial Carotid Artery Stenosis in a Northern Chinese Population: A Cross-Sectional Study. Scientific reports 2016;6:31720.

[27] Han X, Yang Y, Chen Y, et al. Association between insomnia and atrial fibrillation in a Chinese population: A cross-sectional study. Clinical cardiology 2017;40(9):765-69.

[28] Wang Y, Ge S, Yan Y, et al. China suboptimal health cohort study: rationale, design and baseline characteristics. Journal of translational medicine 2016;14(1):291.

18. It’s not clear to me what is meant with ‘baseline’ information in this context? Were there several waves of this study?

Response: We are sorry for fuzzy description. In order avoid confusion, we delete this sentence.

19. Assessment of earthquake experience: What is meant by a ‘standardized’ questionnaire in this context?

Response: Thank you. We revised this to a structured questionnaire. (Page 8 Lines 149)

20. How was data actually collected: Did the participants self-report on a questionnaire during a face-to-face visit?

Response: Thank you. Participants were asked to complete a set of combined self-administered questionnaires (including the CES-D) with assistance from well-trained research nurses during face-to-face interviews. (Page 8 Lines 130-132)

21. Re the 3 groups: What about individuals who were not present in the region at the time of the earthquake but who lost someone?

Response: We appreciate the reviewer’s insightful question. In fact, only 24 (0.5%) participants were not present in the region at the time of the earthquake but had lost someone. These deaths were not related to the earthquake; therefore, these were categorized into individuals who were not present in the region at the time of the earthquake.

22. Depression assessment: The word questionnaire is used here, but it sounds like a structured interview. Please clarify.

Response: Thank you for your question about the depression assessment. We clarified this as follows:

“The CES-D measures the frequency of common depressive symptoms over the past week, which are surveyed through the questionnaire. Each item in the depression assessment section of the questionnaire is scored from 0 (rarely or none of the time, less than one day) to 3 (all of the time, 5–7 days). The four positive statement items (item 4, I felt that I was just as good as other people; item 8, I felt hopeful about the future; item 12, I was happy; item 16, I enjoyed life) are reverse-coded to calculate the total score, which ranges from 0 to 60. The cut-off value of ≥16 has been widely used to define clinically meaningful depressive symptoms[31-33]. ” (Page 9 Lines 160-169)

References:

[31] Zhang Y, Ting RZ, Lam MH, et al. Measuring depression with CES-D in Chinese patients with type 2 diabetes: the validity and its comparison to PHQ-9. BMC psychiatry 2015;15:198.

[32] Zhang J, Sun W, Kong Y, et al. Reliability and validity of the Center for Epidemiological Studies Depression Scale in 2 special adult samples from rural China. Comprehensive psychiatry 2012;53(8):1243-51.

[33] Wang F, Liu J, Liu L, et al. The status and correlates of depression and anxiety among breast-cancer survivors in Eastern China: a population-based, cross-sectional case-control study. BMC public health 2014;14:326.

23. Covariates: What does drinking status ‘yes’ mean? Is smoking daily smoking or ever smoking?

Response: We have clarified the drinking status and smoking status in the Methods. Smoking status was classified as “yes” (current smoker or quit <12 months) and “no” (non-smoker or quit >12 months).” Drinking status was divided into “yes” (<1 standard servings/day, <2 standard servings/day, 2-4 standard servings/day, >=5 standard servings/day) and “no” (never drink). A standard serving was 15 g of ethanol. (Page 10 Lines 180-185)

24. All measures: Are all measures current? That is: smoking is current smoking? Depression is current depression? And so on? Please specify which periods are covered by the measures. Statistics: What is meant by ‘baseline’ in this context?

Response: All measures were current in this cross-sectional study except for earthquake experience. We have reorganized the manuscript and revised “baseline” to correct terms. (Page 9 Lines 155; Page 10 Lines 195)

25. Also the use of ‘the development (depression) is not clear. I take it the authors are talking about current depression?

Response: Thank you for pointing this out. To avoid confusion, we revised the sentence as follows: “We used logistic regression to examine the association between earthquake experience and current depression, with "no earthquake experience" as the reference group.” (Page 10 Lines 203-204)

26. It would be helpful if the authors explained why they adjusted for all these confounders. Could these variables be thought to play a role on a potential causal chain, and should they all be adjusted for? And why were hypertension, diabetes and dyslipidemia chosen as confounders as opposed to other health conditions?

Response: We agree that this is an important consideration. First, the selected covariates were factors known to be predictive of depression and/or potentially correlated with earthquake exposure, including age at the time of the earthquake, gender, education, income, smoking status, drinking status, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidemia[1-6]. Second, we used logistic regression to examine the association between earthquake experience and current depression, with "no earthquake experience" as the reference group. Four multivariate models were fitted (Table 1). However, no major changes were found.

Table 1. Odds ratios for the association between earthquake experience and depression

	no earthquake experience (n=4383, 87.2%)	experience without bereavement (n=543, 10.8%)	experience with bereavement (n=98, 2.0%)
Model 1	1	1.42 (0.99-2.20)	2.46 (1.32-4.59)
Model 2	1	1.43 (1.01-2.04)	2.50 (1.34-4.68)
Model 3	1	1.61 (0.88 -2.95)	2.88 (1.26 -6.57)
Model 4	1	1.69 (0.93 -3.08)	2.82 (1.24 -6.39)

Model 1 refers to the unadjusted model

Model 2 refers to the model adjusted for gender and age at the time of the earthquake

Model 3 refers to the model adjusted for gender, age at the time of the earthquake, smoking status, drinking status, education, income, and residence in Tangshan 1-2 years after the earthquake

Model 4 refers to the model adjusted for gender, age at the time of the earthquake, smoking status, drinking status, education, income, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidemia

References:

[1] Madden JS. Alcohol and depression. British journal of hospital medicine 1993;50(5):261-4.

[2] Gu L, Xie J, Long J, et al. Epidemiology of major depressive disorder in mainland china: a systematic review. PloS one 2013;8(6):e65356.

[3] Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). Jama 2003;289(23):3095-105.

[4] van Griensven F, Chakkraband ML, Thienkrua W, et al. Mental health problems among adults in tsunami-affected areas in southern Thailand. Jama 2006;296(5):537-48.

[5] Fergusson DM, Horwood LJ, Boden JM, et al. Impact of a major disaster on the mental health of a well-studied cohort. JAMA psychiatry 2014;71(9):1025-31.

[6] Li N, Wang Y, Yu L, et al. Long-term effects of earthquake experience of young persons on cardiovascular disease risk factors. Archives of medical science : AMS 2017;13(1):75-81.

27. Could the authors explain more in detail how the subgroup analyses were done? Did they do 5 + 2 separate regressions to arrive at Fig 2?

Response: Yes, we performed 5 + 2 separate regressions to arrive at Fig 2.

We used multiple logistic regression to examine the association stratified by gender and age at the time of earthquake (<=6, 6-18, >18). To evaluate whether the effect of earthquake experience on depression would be modified by gender and age at the time of the earthquake, we tested the statistical significance of earthquake × gender and earthquake × age at the time of the earthquake in a multiple-adjustment logistic model by a postestimation Wald test to obtain an omnibus P value for the interactions between earthquake categories and depression. (Page 11 Lines 210-216)

Results:
28. Could the authors explain what is meant by ‘baseline’ in this context?

Response: We have reorganized the manuscript and revised “baseline” to correct terms. (Page 11 Lines 227-229)

29. Table 1. I was surprised to see that men seemed to be under-represented in the bereaved group. Any explanation for this?

Response: We also find this interesting, but we have no special explanation. Possibly, women may have a higher probability of survival in this earthquake.

30. Table 2: Why are there 3 groups in Table 1 and 4 groups in Table 2? It took me some time to figure out that the ‘experience’ group included both groups (with and without bereavement). Why should there be such a collapsed group, and if there is a need for a collapsed group – why not also in Table 1?

Response: Thank you for your reminder. We deleted this column in Table 2 to avoid confusion. Please see Table 2.

31. The row giving n (%) only gives the %. Consider placing the % somewhere else, I think this row makes the table less easy to read.

Response: Thank you, we have modified it. Please see Table 2.

32. I wonder if the models are over-adjusted.

Response: Thank you for pointing this out. It is difficult to judge whether the model is over or less-adjusted; however, to avoid over-adjustment, we added two other models adjusted for different confounders, and the results are similar. Please see Table 2.

33. Figure 1: This figure can be omitted, as %s are given in Table 1.
Response: Thank you for your suggestion, we deleted the Figure 1.

34. Bottom of page 10: “There were significant associations between the earthquake and depression in females…” This part of the sentence is just a repetition of the previous sentence.
Response: We deleted the sentence in the modified manuscript.

35. Figure 2: The rationale for studying age is not given in the Introduction. The reader needs to understand why the authors looked into age, why they did it in this particular way, and the results need to be explained.

Response: Thank you for your question regarding the age grouping in our study. We added the rationale for studying age in the Introduction (Page 6 Lines 97-98; Page 7 Lines 116-118) and explained this in the Discussion (Page 15-16 Lines 316-331).

Introduction

“Overall levels of psychological symptoms may be associated with different age stages[17 18]”
“Considering that age and gender may confound the association between earthquake experience and depression, we also performed an analysis stratified by age and gender.”

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994

[18] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

Discussion

“Evidence shows that trauma experience in childhood and adolescence may have a determining effect on brain structural development, sympathetic nervous system responsivity, and the hypothalamic pituitary adrenal axis, especially in younger children (preschool) and school-age children (late childhood and early adolescence), resulting in a large stress response and some psychological problems[18]. Therefore, we classified age into 0-6, 6-18 and older than 18 years to investigate the long-term impact of disaster on mental health at different age stages. However, statistically significant associations were found only in individuals over 18 years. One possible explanation is that perception of disaster-related stressors in the <=6 and 6-18 years age groups is different from that in the >18 years age group. Disaster trauma as a stressor is not sufficient to promote mental illness among individuals at the ages of 0-6 and 6-18 years. A preschool child has less specific cognitive awareness of the nature and meaning of disaster trauma[39]. Although a school-age child has a more mature cognitive understanding of the nature of a trauma situation and may respond with symptoms related to depression, parental care and family play important roles in determining the risk of psychological disorder among school-age children[40]. ”

References:

[18] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

[39] Green BL, Korol M, Grace MC, et al. Children and disaster: age, gender, and parental effects on PTSD symptoms. Journal of the American Academy of Child and Adolescent Psychiatry 1991;30(6):945-51.

[40]McFarlane AC. Posttraumatic phenomena in a longitudinal study of children following a natural disaster. Journal of the American Academy of Child and Adolescent Psychiatry 1987;26(5):764-9.

36. I also wondered why age was entered as a continuous variable in Table 2 but separated into age groups here? (This may be OK, but it could be explained.)
Response: Age was adjusted in the multivariate analysis as a continuous variable, which may avoid the confounding bias caused by age differences in the same age groups. Figure 2 is a stratified analysis based on age groups.

Discussion
37. This is not the only study of long-term (decades) mental health after a disaster, and I think the authors could link their findings up with this literature.

Response: We greatly appreciate your suggestion and have modified the manuscript accordingly.

“Consistent with our findings, a longitudinal study on the Alexander Kiedand oil platform collapse shows that survivors have a higher risk of depression than non-exposed individuals 27 years after the disaster[15]. Similar results are observed in another longitudinal study with 10 years of follow-up, which indicates that survivors of the Piper Alpha oil platform disaster show continued problems of mental health compared with non-exposed individuals[16]. In contrast, some previous studies report no significant differences between exposed population and non-exposed population in mental health[13 14]. The inconsistent results may be explained by 3 reasons. First, subclinical psychotic experiences (SPE) and depression reflect different aspects of psychological problems. SPE is defined as symptoms or experiences of or experiences resembling hallucinations, delusions or both[34], whereas depressive disorder is characterized by sadness or irritability[35]. Differences in symptoms may explain why our findings differ from the results of the 20-year follow-up study of Australian bush fires. Second, psychological problems may depend on the severity of a trauma. For example, Galletly C et al reported that the risk of psychological disorder is associated with multiple traumas rather than a single major trauma[14]. Third, the trauma experiences of the participants in these studies are different. In the study on Buffalo Creek survivors, few survivors suffer from bereavement[13], which is different from the survivors in our study. Different characteristics of trauma experiences between the two studies may account for the discrepancy.

The long-term effect of disaster on depression seems to depend on traumatic experience. In our study, a statistically significant association between earthquake experience and depression was observed in bereaved survivors but not in non-bereaved survivors 37 years after the earthquake. The finding was consistent with a longitudinal study carried out in Italian, which shows that exposure to loss and damage during the earthquake is of higher risk of negative psychological consequences than these merely live in the earthquake zone[10]. Similarly, a longitudinal study on MS Estonia Disaster indicates that psychological disorders can persist in bereaved survivors but not in non-bereaved survivors 14 years after the disaster[12]. Traumatic bereavement may be associated with more severe long-term posttraumatic stress reactions after disasters[36], which is considered to be involved in the onset of depression[4].” (Page 13-14 Lines 268-299)

References:

[4] Yang L, Zhao Y, Wang Y, et al. The Effects of Psychological Stress on Depression. Current neuropharmacology 2015;13(4):494-504

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

[12] Arnberg FK, Eriksson NG, Hultman CM, et al. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. Journal of traumatic stress 2011;24(2):183-90.

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[14] Galletly C, Van Hooff M, McFarlane A. Psychotic symptoms in young adults exposed to childhood trauma--a 20 year follow-up study. Schizophrenia research 2011;127(1-3):76-82.

[15] Boe HJ, Holgersen KH, Holen A. Mental health outcomes and predictors of chronic disorders after the North Sea oil rig disaster: 27-year longitudinal follow-up study. The Journal of nervous and mental disease 2011;199(1):49-54.

[16] Hull AM, Alexander DA, Klein S. Survivors of the Piper Alpha oil platform disaster: long-term follow-up study. The British journal of psychiatry : the journal of mental science 2002;181:433-8.

[34] van Os J, Linscott RJ, Myin-Germeys I, et al. A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. Psychological medicine 2009;39(2):179-95.

[35] Belmaker RH, Agam G. Major depressive disorder. The New England journal of medicine 2008;358(1):55-68.

[36] Green BL, Lindy JD, Grace MC, et al. Chronic posttraumatic stress disorder and diagnostic comorbidity in a disaster sample. The Journal of nervous and mental disease 1992;180(12):760-6.

38. What is the 'ensuring' period? I'm not sure that the authors are correct about the short-lived responses to acute stressors. Very long-term negative health outcomes have been identified for other disasters as well.

Response: Thank you. To avoid confusion, we deleted the sentence.

39. Why is the Italian study not mentioned in the Introduction? (or did I miss it?)

Response: Thank you. We have added the Italian study in the Introduction. (Page 6 Lines 96)

40. Pls rephrase 'merely lived in an earthquake zone' (might not be perceived as 'merely' for those who did).

Response: Thank you. We have modified the sentence as follows:

"The finding was consistent with a longitudinal study carried out in Italian, which shows that exposure to loss and damage during the earthquake is of higher risk of negative psychological consequences than these merely live in the earthquake zone[10]." (Page 14 Lines 291-294)

Reference:

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

41. The sentence (p 12) 'Although these studies…': I did not completely understand the meaning of this sentence.

Response: Thank you. We revised this text as follows:

"Although the time and severity of a disaster, the ethnicity of the affected population, and the growing environment are different, the stressors caused by disasters may be similar. " (Page 16-17 Lines 354-356)

42. I think the authors should discuss their findings on age groups and relate those findings to existing literature.

Response: Thank you for pointing this out. We agree with the reviewer's comments. We have added a discussion regarding age differences in the modified manuscript as follows:

“Evidence shows that trauma experience in childhood and adolescence may have a determining effect on brain structural development, sympathetic nervous system responsivity, and the hypothalamic pituitary adrenal axis, especially in younger children (preschool) and school-age children (late childhood and early adolescence), resulting in a large stress response and some psychological problems[18]. Therefore, we classified age into 0-6, 6-18 and older than 18 years to investigate the long-term impact of disaster on mental health at different age stages. However, statistically significant associations were found only in individuals over 18 years. One possible explanation is that perception of disaster-related stressors in the <=6 and 6-18 years age groups is different from that in the >18 years age group. Disaster trauma as a stressor is not sufficient to promote mental illness among individuals at the ages of 0-6 and 6-18 years. A preschool child has less specific cognitive awareness of the nature and meaning of disaster trauma[39]. Although a school-age child has a more mature cognitive understanding of the nature of a trauma situation and may respond with symptoms related to depression, parental care and family play important roles in determining the risk of psychological disorder among school-age children[40]. ” (Page 15 Lines 316-331)

References:

[18] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

[39] Green BL, Korol M, Grace MC, et al. Children and disaster: age, gender, and parental effects on PTSD symptoms. Journal of the American Academy of Child and Adolescent Psychiatry 1991;30(6):945-51.

[40] McFarlane AC. Posttraumatic phenomena in a longitudinal study of children following a natural disaster. Journal of the American Academy of Child and Adolescent Psychiatry 1987;26(5):764-9.

43. I also think the authors should discuss their control for potential confounders. They have adjusted for a lot of factors that may have had a place on a potential causal chain.

Response: Thank you. We have added a discussion about controlling for potential confounders in the modified manuscript. Please see

“Gender, age, education, income, smoking, drinking, living in the affected area after a disaster, hypertension, diabetes and hyperglycemia were controlled in the multiple variable analysis. To avoid over-adjustment, four models were used to adjust confounding variables step by step. The resulting ORs reflected minor changes in the 4 models, suggesting that earthquake experience may be an independent risk factor for the occurrence of depression.” (Page 15 Lines 310-315)

44. Limitations: Was the study conducted over a long period? Was it a follow-up? I wonder if I have misunderstood the description in Methods – I thought this was a cross-sectional study conducted in 2013-2014? If the study was cross-sectional, this should be mentioned as a limitation.

Response: We have revised the entire manuscript to avoid the terms in the cohort study. We also added the cross-sectional design as a limitation as follows:

“Fourth, this is a cross-sectional study, which precludes causal inferences. However, since the earthquake is immutable, the earthquake is highly likely to be the cause of depression.”(Page 16 Lines 348-350)

45. The authors state that '…it was unlikely that people who experienced an earthquake were more likely to be depressed prior to the earthquake'. Are the authors sure about this? What do the authors know about the sociodemographic makeup of the district at the time before the earthquake? Are there potential sociodemographic differences between those staying in the district and those moving into the district? There must have been quite substantial mobility, as only about 13% (?) of those living in the district now lived there at the time of the earthquake.
Also, during the 37 years that had passed, many disaster victims may have died, and early death may have been related to depression and illnesses. How would this impact the results?
Limitations should include reflections on non-response, which I miss from Methods. I also think the authors could discuss generalizability.

Response: We agree that this is an important consideration. We have modified the manuscript as follows:

"Additionally, the sample was not representative of all survivors of the Tangshan earthquake. We did not include survivors who had died in the past 37 years. Premature death may be related to depression and disease. Meanwhile, in our sample, nearly 20% of the survivors did not live in the earthquake zone 1-2 years after the earthquake. These people left the painful environment and may have attended school or worked in another place for several years, which may have largely relieved psychological stress and alleviated the symptoms of depression. Therefore, the potential impacts of the earthquake on depression may have been underestimated. " (Page 16 Lines 339-348)

46. The sentence (p 13): '…because they may obtain benefit from early intervention policies and strategies'. This was not completely clear to me, could the authors be more specific. Do we have evidence that early intervention can prevent depression?

Response: Thank you for pointing this out, and we apologize for our misleading expression. We revised this to:

"Intervention is highly effective in facilitating recovery from disaster trauma[45 46] . Clinicians and policymakers in public health should direct more attention toward high-risk survivors of disasters, which may reduce the incidence of mental health problems, including depression, in disaster zones[47], even if the disaster has passed for a long time."(Page 17 Lines 356-360)

References:

[45] North CS, Pfefferbaum B. Mental health response to community disasters: a systematic review. Jama 2013;310(5):507-18.

[46] Hiroyuki H, Jun A, Toru T, et al. Can Community Social Cohesion Prevent Posttraumatic Stress Disorder in the Aftermath of a Disaster? A Natural Experiment From the 2011 Tohoku Earthquake and Tsunami. American Journal of Epidemiology 2016;183(10):902-10.

[47] Salcioglu E, Basoglu M. Psychological effects of earthquakes in children: prospects for brief behavioral treatment. World journal of pediatrics : WJP 2008;4(3):165-72.

47. Conclusions: "an earthquake increases the risk of depression and has long-lasting effects on depression": Pls explain what the difference is between the two (risk and effect).

Response: Thank you for your question. We revised this to:

"Earthquake experience had long-lasting effects on depression among bereaved survivors, women and individuals over 18 years old 37 years later." (Page 17 Lines 363-366)

48. (cont)… “particularly women”: Only women?

Response: Thank you. To avoid confusion, we deleted this sentence.

VERSION 2 – REVIEW

REVIEWER	Talya Greene University of Haifa, Israel
REVIEW RETURNED	07-Feb-2019

GENERAL COMMENTS	The authors have done a good job in addressing the comments made by the reviewers. I still have a few outstanding minor comments/recommendations, as outlined below. 1. In the strengths and limitations - first bullet point. I would remove ‘as long as’. The same goes for this phrase in the first paragraph of the discussion. 2. Strengths and limitations – final bullet point. This could be better phrased – I presume the point here is that only participants who were still alive 37 years after the earthquake were able to participate in the study. 3. Line 118 – change ‘even leads’ to ‘may lead’ 4. The English could still be improved – for example line 120 - ‘Participants exposed to disasters at early life stage’ should be ‘at an early life stage’, and I would change ‘independent to’ to ‘independent of’ line 121. I would recommend a final proofread. 5. Line 130 – It should be ‘evidence’ and not ‘evidences’. 6. The authors could expand more on the ‘age stages’ aspect of their rationale, beyond the sentence included (line 132). 7. In the discussion – line 396. The authors write ‘Second, psychological problems may depend on the severity of a trauma. For example, Galletly C et al reported that the risk of psychological disorder is associated with multiple traumas rather than a single major trauma.’ However, severity is not equivalent to polytrauma. This should be clarified. 8. Line 407 – carried out in Italy and not in Italian. 9. Line 409 - I would change ‘merely live’ to ‘above and beyond living’ 10. I think that some of the discussion content between lines 415-449 would be better situated in the introduction, and the authors might want to consider moving certain elements. 11. In the limitations – the authors write that the earthquake is likely to be the cause of depression. I understand here that they mean that depression cannot (obviously) cause an earthquake. However, I would suggest being slightly more cautious in their statement that ‘the earthquake is likely to be the cause of depression’. Especially given that mental disorders are related to multiple factors. 12. I would change lines 501-2 to ‘Intervention can facilitate recovery’. 13. Line 529 - rather than writing about ‘long-lasting effects on depression’, I would write about associated with higher rates of

	depression, or some other phrase that doesn't make causal claims.

REVIEWER	Siri Thoresen Norwegian Center for Violence and Traumatic Stress Studies
REVIEW RETURNED	28-Jan-2019

GENERAL COMMENTS	The authors have responded sufficiently to most of my previous comments, but I still have some concerns. There are typos and language errors throughout the manuscript. There are some sentences that are hard to understand. In some cases, I'm not sure that the sentence reflects the authors' intended meaning. Introduction: When discussing long-term studies of other types of disasters, the authors state that : "However, in these studies, the samples were relative small and not representative of the affected population". I don't think this is correct. Most previous studies have tried to identify direct victims, whereas this study tries to look at the population as a whole. I don't think it's a shortcoming of previous studies that they studied victims, but it's useful to be aware of the population under study. "One study with a sample of 529 people followed the childhood survivors of natural disasters for 20 years, while depression was not investigated14." Comment: Is this double-checked? I think this study has several other publications you may need to look at, and this reference is maybe not the most relevant. In any case, I'm not sure why the reader needs to know that one study did not measure depression? Aims/confounding: The authors state in the Introduction: "Overall levels of psychological symptoms may be associated with different age stages17" and in Aims: "Considering that age and gender may confound the association between earthquake experience and depression, we also performed an analysis stratified by age and gender." Comment: Please check the use of the terms confounders and moderators. Methods: The response rate was almost 100%. This needs some more explanation. Was participation voluntary? How did this study recruit participants? What does this mean: "combined selfadministered questionnaires" ? Drinking status: Why the cutoff ever vs never drink alcohol? Is 'ever drinking' supposedly related to the outcome? (And is it correct that about 70% of your adult population never drink?)

	Statistics: The models are clearly described, but I would wish for a rationale for why the authors decided to adjust for all these variables. Results: Why are only results for women, and not for men, reported? And why are the results not reported for the young age group? Does this mean that men over 18 have an increased risk of depression or not? What does it mean that Figure 1 is adjusted for gender and age, when it's stratified for gender and age? Discussion I think the authors need to rewrite the section on the discrepant long-term findings. First, I don't understand why they include psychotic experiences, which I think is beyond the scope of this paper. Second, I don't understand their discussion about multiple traumas: Did the participants in this study have more multiple traumas than in other studies, or did earthquake-exposed have more traumas before and after compared to the non-exposed? Or should this earthquake be considered a multiple trauma? When it comes to the severity of the traumatic experience in this study, the authors could remind the reader of the extreme case of this disaster. The number of casualties was so incredibly high, and also, it seems, the material destruction was devastating (according to Wikipedia). In the case of this disaster, there must have been a long aftermath with people searching for their loved ones, injuries, families being separated, loss of housing, completely destroyed neighborhoods, people losing their income and have to move, and more? (I'm guessing, but I think the authors could use their information about this particular event when they try to make sense of their findings.) In addition, the context of healing may have importance, e.g. in terms of compensations, societal acknowledgement, healthcare, and so on? In light of these and more factors, discrepant results are perhaps not so surprising, when completely different events and contexts are studied? This study can contribute to the knowledge base on long-term effects, because today we don't really understand which disasters create long-term consequences, and why. In the discussion, the authors describe their thoughts about age. This could be presented earlier, it would be easier for the reader to understand why age is treated the way it is in the analyses. Line 292: I don't understand this sentence: "exposure to loss and damage during the earthquake is of higher risk of negative psychological consequences than these merely live in the earthquake Zone». Also please rephrase 'merely', some might find this offensive. Line 356: "Intervention is highly effective in facilitating recovery from disaster trauma45 46 ." Currently, there is not much evidence to support this statement, in case the authors mean early intervention. Pls specify what type of intervention is highly effective.

	I did not understand this sentence (line 349): “However, since the earthquake is immutable, the earthquake is likely to be the cause of depression “ Also, the authors have immediately before this sentence stated that “..precludes causal inferences.” The authors need to communicate less confidence about the interpretations of their results. Line 295: “MS Estonia Disaster indicates that psychological disorders can persist in bereaved survivors but not in non-bereaved survivors…” Pls rephrase. This study did not show that disorders can not persist in non-bereaved. I think the authors need to modify what they say about children and trauma, e.g. : “Disaster trauma as a stressor is not sufficient to promote mental illness among individuals at the ages of 0-6 and 6-18 years.” The section about age and trauma does not read well. The biological argument is not well formulated, and I guess biology may not be the only relevant factor to explain why long-term consequences may differ depending on age at the time of the trauma? The authors could discuss more the finding that depression was increased only in women. The authors state (line 332) “Similar results have been found in several previous studies of disaster, indicating that women may be at a higher risk of depression than men”. We know from several studies that women are at a higher risk of depression compared to men. However, in this study, women were compared to women without the earthquake experience? Why should women, and not men, increase their risk of depression, relative to non-traumatized individuals of the same gender? I don’t think PTSD is mentioned in the paper. The authors could consider making a link between depression, ptsd, and/or other post-trauma mental health problems. Table 1: Please use 3 decimals for all p values.

VERSION 2 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 3
Reviewer Name: Siri Thoresen
Institution and Country: Norwegian Center for Violence and Traumatic Stress Studies
Please state any competing interests or state ‘None declared’: None

Please leave your comments for the authors below
The authors have responded sufficiently to most of my previous comments, but I still have some concerns.
There are typos and language errors throughout the manuscript. There are some sentences that are hard to understand. In some cases, I’m not sure that the sentence reflects the authors’ intended meaning.

Introduction:
1.When discussing long-term studies of other types of disasters, the authors state that : “However, in these studies, the samples were relative small and not representative of the affected population”.
I don’t think this is correct. Most previous studies have tried to identify direct victims, whereas this study tries to look at the population as a whole. I don’t think it’s a shortcoming of previous studies that they studied victims, but it’s useful to be aware of the population under study.

Response: Thank you for your suggestion. We have modified the section as follows: “However, very few of these studies investigated the long-term effect of earthquakes on depression risk in the Chinese population.” (Page 6 Lines 98-100)

2. “One study with a sample of 529 people followed the childhood survivors of natural disasters for 20 years, while depression was not investigated14.”
Comment: Is this double-checked? I think this study has several other publications you may need to look at, and this reference is maybe not the most relevant.
In any case, I’m not sure why the reader needs to know that one study did not measure depression?
Response: Thank you for raising this point. In the modified manuscript, we deleted this cited paper and added the most relevant paper. We rewrote the text as follows: “Findings regarding the long-term impact of disasters on mental health have been mixed. Several studies have reported no significant differences[13][14]”. (Page 6 Lines 89-90)

References:

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[14] McFarlane AC, Van Hooff M. Impact of childhood exposure to a natural disaster on adult mental health: 20-year longitudinal follow-up study. The British journal of psychiatry : the journal of mental science 2009;195(2):142-8.

Aims/confounding:
3.The authors state in the Introduction: “Overall levels of psychological symptoms may be associated with different age stages17”and in Aims: “Considering that age and gender may confound the association between earthquake experience and depression, we also performed an analysis stratified by age and gender.”
Comment: Please check the use of the terms confounders and moderators.
Response: We apologize for the vague description. We revised this sentence to read as follows: “Studies indicate that overall levels of psychological symptoms may vary among children, adolescent, and adults due to differences in physiology and cognition[17 18]”. (Page 6 Lines 95-97)

References:

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994

[18]Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

Methods:
4.The response rate was almost 100%. This needs some more explanation. Was participation voluntary? How did this study recruit participants?
Response: Thank you. The participants in the Jidong are subjected to a physical examination annually, which is paid by the community. Therefore, the response rate was almost 100%. (Page 8 Lines 143-145)

5.What does this mean: “combined self-administered questionnaires” ?
Response: Thank you. The combined self-administered questionnaires included demographic and behavioural characteristics, insomnia, cognition, and depression[1-3]. In order to avoid confusion, we have changed it to "self-administered questionnaires". (Page 8 Lines 127-130)

References:

[1]Song Q, Liu X, Wang A, et al. Associations between non-traditional lipid measures and risk for type 2 diabetes mellitus in a Chinese community population: a cross-sectional study. Lipids in health and disease 2016;15:70.

[2]Hao Z, Zhang Y, Li Y, et al. The Association between Ideal Cardiovascular Health Metrics and Extracranial Carotid Artery Stenosis in a Northern Chinese Population: A Cross-Sectional Study. Scientific reports 2016;6:31720.

[3]Han X, Yang Y, Chen Y, et al. Association between insomnia and atrial fibrillation in a Chinese population: A cross-sectional study. Clinical cardiology 2017;40(9):765-69.

6.Drinking status: Why the cutoff ever vs never drink alcohol? Is ‘ever drinking’ supposedly related to the outcome? (And is it correct that about 70% of your adult population never drink?)
Response: We apologize for our mistakes in translation. We repeatedly checked the original questionnaires and confirmed that drinking status should be categorized into current drinking and no drinking (never drank, drank in the past). We also revised the entire manuscript. (Page 10 Lines 186-188)

7.Statistics: The models are clearly described, but I would wish for a rationale for why the authors decided to adjust for all these variables.
Response: Thank you. Most of these variables are demonstrated to be potential confounders in the association between earthquakes and depression, and it is difficult to judge which factors should not be listed as confounding factors. Consequently, we used 4 models to make adjustments step by step, and the results are listed below.

Table 1. Odds ratios for the association between earthquake experience and depression

	no earthquake experience (n=4383, 87.2%)	experience without bereavement (n=543, 10.8%)	experience with bereavement (n=98, 2.0%)
Model 1	1	1.42 (0.99-2.20)	2.46 (1.32-4.59)

Model 2	1	1.43 (1.01-2.04)	2.50 (1.34-4.68)
Model 3	1	1.61 (0.88 -2.95)	2.88 (1.26 -6.57)
Model 4	1	1.69 (0.93 -3.08)	2.82 (1.24 -6.39)

Model 1 refers to the unadjusted model

Model 2 refers to the model adjusted for gender and age at the time of the earthquake.

Model 3 refers to the model adjusted for gender, age at the time of the earthquake, smoking status, drinking status, education, income, and residence in Tangshan 1-2 years after the earthquake.

Model 4 refers to the model adjusted for gender, age at the time of the earthquake, smoking status, drinking status, education, income, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidaemia.

8.Results: Why are only results for women, and not for men, reported? And why are the results not reported for the young age group?
Does this mean that men over 18 have an increased risk of depression or not?
Response: Thank you; we have added the following content: “In contrast, no significant association was found between earthquake experience and the risk of depression among male subjects in either the bereaved (OR, 2.09; 95% CI, 0.58-7.61) or the non-bereaved (OR, 0.84; 95% CI, 0.32-2.20) subgroup”; “No statistically significant association was found in survivors under 6 years old whether they had been bereaved (OR, 1.65; 95% CI, 0.42-6.49) or not (OR, 1.09; 95% CI, 0.36-3.27), and there was also no significant association in survivors aged between 6 and 18 years whether they had lost relatives (OR, 1.11; 95% CI, 0.21-5.99) or not (OR, 1.30; 95% CI, 0.47-3.61).” (Page 13 Lines 260-263; 266-270)

9.What does it mean that Figure 1 is adjusted for gender and age, when it’s stratified for gender and age?
Response: We apologize for our mistakes. We clarified the legend as follows:

“Figure 1 Odds ratio of depression given earthquake experience, stratified by gender and age at the time of the earthquake.

Groups stratified by gender, adjusted for age at the time of the earthquake, smoking status, drinking status, education, income, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidaemia. Groups stratified by age at the time of the earthquake, adjusted for gender, smoking status, drinking status, education, income, residence in Tangshan 1-2 years after the earthquake, hypertension, diabetes, and dyslipidaemia.” (Page 24)

Discussion
10.I think the authors need to rewrite the section on the discrepant long-term findings. First, I don’t understand why they include psychotic experiences, which I think is beyond the scope of this paper. Second, I don’t understand their discussion about multiple traumas: Did the participants in this study have more multiple traumas than in other studies, or did earthquake-exposed have more traumas before and after compared to the non-exposed? Or should this earthquake be considered a multiple trauma? When it comes to the severity of the traumatic experience in this study, the authors could

remind the reader of the extreme case of this disaster. The number of casualties was so incredibly high, and also, it seems, the material destruction was devastating (according to Wikipedia). In the case of this disaster, there must have been a long aftermath with people searching for their loved ones, injuries, families being separated, loss of housing, completely destroyed neighborhoods, people losing their income and have to move, and more? (I'm guessing, but I think the authors could use their information about this particular event when they try to make sense of their findings.) In addition, the context of healing may have importance, e.g. in terms of compensations, societal acknowledgement, healthcare, and so on? In light of these and more factors, discrepant results are perhaps not so surprising, when completely different events and contexts are studied? This study can contribute to the knowledge base on long-term effects, because today we don't really understand which disasters create long-term consequences, and why.
Response：Thank you for your suggestion. We have modified the section as follows:

"In contrast, two studies indicate that disaster has little long-term effect on depression[13 14]. The inconsistency of the results may be explained by the severity of the disaster. The Tangshan earthquake caused more damage than the Buffalo Creek dam collapse or the Australian bushfire disaster. The earthquake reduced Tangshan to ruins in a few minutes, with approximately 85% of the buildings collapsed and at least 400,000 casualties[20 48]. The earthquake afflicted the survivors with not only the loss of their homes but also, more importantly, the tension and fear brought by the disaster itself, the loss of loved ones, the complete destruction of social networks and a sense of despair [49 50]. During the long-term urban reconstruction process, all these effects of the disaster might lead to long-term adverse psychological effects on the survivors. In addition, the Tangshan earthquake broke out at the end of the decade of the Cultural Revolution. The consequences of the Cultural Revolution, which include a fragile economic foundation, low economic compensation, lack of societal acknowledgement, and destruction of the health care service network, may have delayed recovery."(Page 16 Lines 329-343)

References:

[13]Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[14]McFarlane AC, Van Hooff M. Impact of childhood exposure to a natural disaster on adult mental health: 20-year longitudinal follow-up study. The British journal of psychiatry : the journal of mental science 2009;195(2):142-8.

[20] Sheng ZY. Medical support in the Tangshan earthquake: a review of the management of mass casualties and certain major injuries. The Journal of trauma 1987;27(10):1130-5.

[48] Liu H, Housner GW, Xie L, et al. The Great Tangshan Earthquake of 1976. California Institute of Technology 2002

[49] Armenian HK, Morikawa M, Melkonian AK, et al. Loss as a determinant of PTSD in a cohort of adult survivors of the 1988 earthquake in Armenia: implications for policy. Acta psychiatrica Scandinavica 2000;102(1):58-64.

[50] Carr VJ, Lewin TJ, Webster RA, et al. Psychosocial sequelae of the 1989 Newcastle earthquake: II. Exposure and morbidity profiles during the first 2 years post-disaster. Psychological medicine 1997;27(1):167-78.

11.In the discussion, the authors describe their thoughts about age. This could be presented earlier, it would be easier for the reader to understand why age is treated the way it is in the analyses.

Response：Thank you; we have modified the order according to your suggestion. (Page 14-15 Lines 282-301)

12.Line 292: I don't understand this sentence: "exposure to loss and damage during the earthquake is of higher risk of negative psychological consequences than these merely live in the earthquake Zone».
Also please rephrase 'merely', some might find this offensive.
Response：Thank you. As the suggestion of Review 2, we have modified the sentences as follows: "exposure to loss and damage during an earthquake confers an additional risk of negative psychological consequences above and beyond living in the earthquake zone[10]". (Page 16-17 Lines 348-350)

References:

[10] Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

13.Line 356: "Intervention is highly effective in facilitating recovery from disaster trauma45 46 ."
Currently, there is not much evidence to support this statement, in case the authors mean early intervention. Pls specify what type of intervention is highly effective.
Response：Thank you. We have specified the type of intervention as follows: "Strengthening community social cohesion can facilitate recovery from disaster trauma[63 64]". (Page 18-19 Lines 398-399)

References:

[63] Hikichi H, Aida J, Tsuboya T, et al. Can Community Social Cohesion Prevent Posttraumatic Stress Disorder in the Aftermath of a Disaster? A Natural Experiment From the 2011 Tohoku Earthquake and Tsunami. Am J Epidemiol 2016;183(10):902-10.

[64] North CS, Pfefferbaum B. Mental health response to community disasters: a systematic review. Jama 2013;310(5):507.

14.I did not understand this sentence (line 349): "However, since the earthquake is immutable, the earthquake is likely to be the cause of depression "
Also, the authors have immediately before this sentence stated that "..precludes causal inferences."
The authors need to communicate less confidence about the interpretations of their results.
Response：Thank you for raising this point. To be more cautious, we deleted our claim that "the earthquake is likely to be the cause of depression". (Page 18 Lines 390-391)

15.Line 295: "MS Estonia Disaster indicates that psychological disorders can persist in bereaved survivors but not in non-bereaved survivors…"
Pls rephrase. This study did not show that disorders can not persist in non-bereaved.
Response：Thank you for this suggestion. We have rephrased the claim as follows: "a longitudinal study 14 years after MS Estonia Disaster indicated that non-bereaved survivors recovered from their posttraumatic stress reactions, while little change was found over that period in the reaction of the bereaved." (Page 17 Lines 350-353)

16.I think the authors need to modify what they say about children and trauma, e.g. : “Disaster trauma as a stressor is not sufficient to promote mental illness among individuals at the ages of 0-6 and 6-18 years.” The section about age and trauma does not read well. The biological argument is not well formulated, and I guess biology may not be the only relevant factor to explain why long-term consequences may differ depending on age at the time of the trauma?

Response：Thank you for your suggestion. We have modified the manuscript as follows: “we classified the participants into age categories of 0-6, 6-18 and older than 18 years to investigate the long-term impact of disaster on mental health during different stages of life. However, statistically significant associations were found only in individuals over 18 years of age. One explanation is that different ages have different needs for social networks. Social networking is associated with the onset of depression[34]. Children’s and adolescents' social needs are met by parental care and family[35]. Adults, in contrast, need support from social interaction in the neighbourhood, the communities, and the work place in addition to family support [36]. The advent of the earthquake destroyed the previously stable social networks and economic foundation of the community. Social-network destruction may lead to some mental health disorders. Additionally, survivors under 18 years old recover from disaster more easily than older survivors do. Insensitivity to the nature and meaning of disaster trauma[37]and access to mental health intervention in the early postdisaster stages[38] may contribute to recovery from psychological problems among child and adolescent survivors." (Page 14-15 Lines 286-301)

References:

[34]Rosenquist JN, Fowler JH, Christakis NA. Social network determinants of depression. Molecular psychiatry 2011;16(3):273-81.

[35]McFarlane AC. Posttraumatic phenomena in a longitudinal study of children following a natural disaster. Journal of the American Academy of Child and Adolescent Psychiatry 1987;26(5):764-9.

[36] Bland SH, O'Leary ES, Farinaro E, et al. Social network disturbances and psychological distress following earthquake evacuation. The Journal of nervous and mental disease 1997;185(3):188-94.

[37]Green BL, Korol M, Grace MC, et al. Children and disaster: age, gender, and parental effects on PTSD symptoms. Journal of the American Academy of Child and Adolescent Psychiatry 1991;30(6):945-51.

[38]Wang CW, Chan CL, Ho RT. Prevalence and trajectory of psychopathology among child and adolescent survivors of disasters: a systematic review of epidemiological studies across 1987-2011. Social psychiatry and psychiatric epidemiology 2013;48(11):1697-720.

17.The authors could discuss more the finding that depression was increased only in women.
The authors state (line 332) “Similar results have been found in several previous studies of disaster, indicating that women may be at a higher risk of depression than men”.
We know from several studies that women are at a higher risk of depression compared to men. However, in this study, women were compared to women without the earthquake experience? Why should women, and not men, increase their risk of depression, relative to non-traumatized individuals of the same gender?

Response：Thank you. In response to the reviewer’s suggestion, we have modified the manuscript as follows: “With regard to gender, we found a significant association between earthquake experience and depression in females but not in males. Similar results have been found in several previous studies of disaster, indicating that women may be at a higher risk of depression than men[13 19].One explanation of this gender difference is that men tend to externalize stress, while women tend to internalize it[39]. Thus, of the two genders, women have higher rates of anxiety and depression

(internalizing disorders), and men have higher rates of substance abuse (externalizing disorders)[40]. Additionally, difference may be related to the culturally taught goals and roles of men and women in society and the family. Men are required to have innate masculinity and strength, while women are required to show empathy and tender-mindedness[41 42]. Consequently, in the face of disasters, men are more stress-resistant than women and recover more quickly. Women are more likely than men to be sentimental than men[43 44]. Once women fall into deep emotional pain, it is difficult for them to extricate themselves[45]. We also found that, in female, the risk of depression was 3 times higher in the group with earthquake experience group than in the group without. One interpretation of this finding is that there are some components of earthquake-related aftermath that weaken women's psychological defence mechanisms. Evidence show that women are more likely than men to carry out rumination[46],which is characterized by continuous and repetitive thinking about painful memories[47]. When fear memories of earthquake-related morbidity, mortality, and destruction constantly resurface, women who have experienced earthquake face long-lasting emotional pain that can lead to depression." (Page 15 Lines 302-323)

References:

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[19] Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

[39]Ekpenyong CE, Daniel NE, Aribo EO. Associations between academic stressors, reaction to stress, coping strategies and musculoskeletal disorders among college students. Ethiopian journal of health sciences 2013;23(2):98-112.

[40]Afifi M. Gender differences in mental health. Singapore medical journal 2007;48(5):385-91.

[41]Feingold A. Gender differences in personality: a meta-analysis. Psychological bulletin 1994;116(3):429-56.

[42]Christov-Moore L, Simpson EA, Coude G, et al. Empathy: gender effects in brain and behavior. Neuroscience and biobehavioral reviews 2014;46 Pt 4:604-27.

[43]Ranasinghe PD, Levy BR. Prevalence of and sex disparities in posttraumatic stress disorder in an internally displaced Sri Lankan population 6 months after the 2004 Tsunami. Disaster medicine and public health preparedness 2007;1(1):34-41; discussion 41-3.

[44]Aksaray G, Kortan G, Erkaya H, et al. Gender differences in psychological effect of the August 1999 earthquake in Turkey. Nordic journal of psychiatry 2006;60(5):387-91.

[45]Sandanger I, Nygard JF, Sorensen T, et al. Is women's mental health more susceptible than men's to the influence of surrounding stress? Social psychiatry and psychiatric epidemiology 2004;39(3):177-84.

[46]Nolen-Hoeksema S, Harrell ZA. Rumination, Depression, and Alcohol Use: Tests of Gender Differences. Journal of Cognitive Psychotherapy 2002;16(4):391-403.

[47]Watkins E, Moulds M. Distinct modes of ruminative self-focus: impact of abstract versus concrete rumination on problem solving in depression. Emotion (Washington, DC) 2005;5(3):319-28.

18.I don’t think PTSD is mentioned in the paper. The authors could consider making a link between depression, ptsd, and/or other post-trauma mental health problems.
Response：Thank you. We have added the following content: " Several plausible explanations may link earthquake exposure to the prevalence of depressive symptoms. Earthquakes can cause tremendous, immediate damage to the environment and even lead to adverse life events such as the death of a family member and related events, thus exerting negative effects on individuals’ emotions and resulting in posttraumatic stress disorder (PTSD) after the disaster[4 12]. PTSD, as a frequent comorbidity of depression[52 53], may persist for decades following disaster[54-56]. These findings suggest that traumatic bereavement might be a common mediating mechanism of both depression and PTSD. The pain of loss in survivors may have neurobiological effects on several brain areas (the frontolimbic and striatalareas)[51 57]. These areas and the functional connectivity within the fronto-striato-thalamic and default-mode networks have been found to be correlated with the progression of mental health problems and may play important roles in adaptation to trauma[4 58]. The trauma caused by disasters has a variety of mechanisms. Whether PTSD symptoms further transform into depression or other mental illnesses in the long term will require further exploration." (Page 17 Lines 356-370)

References:

[4]Yang L, Zhao Y, Wang Y, et al. The Effects of Psychological Stress on Depression. Current neuropharmacology 2015;13(4):494-504.

[12]Arnberg FK, Eriksson NG, Hultman CM, et al. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. Journal of traumatic stress 2011;24(2):183-90.

[51] Green BL, Lindy JD, Grace MC, et al. Chronic posttraumatic stress disorder and diagnostic comorbidity in a disaster sample. The Journal of nervous and mental disease 1992;180(12):760-6.

[52] Breslau N, Davis GC, Peterson EL, et al. A second look at comorbidity in victims of trauma: the posttraumatic stress disorder-major depression connection. Biological psychiatry 2000;48(9):902-9.

[53]Basoglu M, Kilic C, Salcioglu E, et al. Prevalence of posttraumatic stress disorder and comorbid depression in earthquake survivors in Turkey: an epidemiological study. Journal of traumatic stress 2004;17(2):133-41.

[54]Marshall GN, Schell TL, Elliott MN, et al. Mental health of Cambodian refugees 2 decades after resettlement in the United States. Jama 2005;294(5):571-9.

[55]Goenjian AK, Khachadourian V, Armenian H, et al. Posttraumatic Stress Disorder 23 Years After the 1988 Spitak Earthquake in Armenia. Journal of traumatic stress 2018;31(1):47-56.

[56]Morgan L, Scourfield J, Williams D, et al. The Aberfan disaster: 33-year follow-up of survivors. The British journal of psychiatry : the journal of mental science 2003;182:532-6.

[57]McFarlane AC. The prevalence and longitudinal course of PTSD. Implications for the neurobiological models of PTSD. Annals of the New York Academy of Sciences 1997;821:10-23.
[56]Long J, Huang X, Liao Y, et al. Prediction of post-earthquake depressive and anxiety symptoms: a longitudinal resting-state fMRI study. Scientific reports 2014;4:6423.

[58] Long J, Huang X, Liao Y, et al. Prediction of post-earthquake depressive and anxiety symptoms: a longitudinal resting-state fMRI study. Scientific reports 2014;4:6423.

19.Table 1: Please use 3 decimals for all p values.
Response：We have modified Table 1 in response to the reviewer's suggestion. Please see Table 1.

Reviewer: 2
Reviewer Name: Talya Greene
Institution and Country: University of Haifa, Israel
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
The authors have done a good job in addressing the comments made by the reviewers. I still have a few outstanding minor comments/recommendations, as outlined below.
1. In the strengths and limitations - first bullet point. I would remove 'as long as'. The same goes for this phrase in the first paragraph of the discussion.

Response：Thank you. We have removed "as long as" in the modified manuscript. (Page 4 Lines 69-70; Page 13 Lines 276)

2. Strengths and limitations – final bullet point. This could be better phrased – I presume the point here is that only participants who were still alive 37 years after the earthquake were able to participate in the study.

Response：Thank you. We have modified the sentence to read as follows: "Only participants who were still alive 37 years after the earthquake were able to participate in the study." (Page 4 Lines 74-75)

3. Line 118 – change 'even leads' to 'may lead'

Response：Thank you. We have changed it. (Page 6 Line 80)

4. The English could still be improved – for example line 120 - 'Participants exposed to disasters at early life stage' should be 'at an early life stage', and I would change 'independent to' to 'independent of' line 121. I would recommend a final proofread.

Response：Thank you. The manuscript has been revised according to your suggestion. (Page 6 Lines 82-83)

5. Line 130 – It should be 'evidence' and not 'evidences'.

Response：Thank you. We have modified the wording. (Page 6 Line 80)

6. The authors could expand more on the 'age stages' aspect of their rationale, beyond the sentence included (line 132).

Response：Thank you for your suggestion. We have modified the sentence as follows: “Studies indicate that overall levels of psychological symptoms may vary among children, adolescents, and adults due to differences in physiology and cognition[17 18].” (Page 6 Lines 94-97)

References:

[17] Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994

[18] Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

7. In the discussion – line 396. The authors write ‘Second, psychological problems may depend on the severity of a trauma. For example, Galletly C et al reported that the risk of psychological disorder is associated with multiple traumas rather than a single major trauma.’ However, severity is not equivalent to polytrauma. This should be clarified.

Response：Thank you for raising this point. Based on your suggestion combined with that of Reviewer 3, we have rephrased the section as follows: “The inconsistency of the results may be explained by the severity of the disaster. The Tangshan earthquake caused more damage than the Buffalo Creek dam collapse or the Australian bushfire disaster. The earthquake reduced Tangshan to ruins in a few minutes, with approximately 85% of the buildings collapsed and at least 400,000 casualties[20 48]. The earthquake afflicted the survivors with not only the loss of their homes but also, more importantly, the tension and fear brought by the disaster itself, the loss of loved ones, the complete destruction of social networks and a sense of despair [49 50]. During the long-term urban reconstruction process, all these effects of the disaster might lead to long-term adverse psychological effects on the survivors. In addition, the Tangshan earthquake broke out at the end of the decade of the Cultural Revolution. The consequences of the Cultural Revolution, which include a fragile economic foundation, low economic compensation, lack of societal acknowledgement, and destruction of the health care service network, may have delayed recovery."(Page 16 Lines 329-343)

References:

[20] Sheng ZY. Medical support in the Tangshan earthquake: a review of the management of mass casualties and certain major injuries. The Journal of trauma 1987;27(10):1130-5.

[48] Liu H, Housner GW, Xie L, et al. The Great Tangshan Earthquake of 1976. California Institute of Technology 2002

[49] Armenian HK, Morikawa M, Melkonian AK, et al. Loss as a determinant of PTSD in a cohort of adult survivors of the 1988 earthquake in Armenia: implications for policy. Acta psychiatrica Scandinavica 2000;102(1):58-64.

[50] Carr VJ, Lewin TJ, Webster RA, et al. Psychosocial sequelae of the 1989 Newcastle earthquake: II. Exposure and morbidity profiles during the first 2 years post-disaster. Psychological medicine 1997;27(1):167-78.

8. Line 407 – carried out in Italy and not in Italian.

Response：Thank you. We have changed the word to “Italy”. (Page 16 Line 348)

9. Line 409 - I would change ‘merely live’ to ‘above and beyond living’

Response：Thank you. We have changed the text to read as follows: “exposure to loss and damage during an earthquake confers an additional risk of negative psychological consequences above and beyond living in the earthquake zone[10]” (Page 16-17 Line 348-350)

References:

[10]Bland SH, O'Leary ES, Farinaro E, et al. Long-term psychological effects of natural disasters. Psychosomatic medicine 1996;58(1):18-24.

10. I think that some of the discussion content between lines 415-449 would be better situated in the introduction, and the authors might want to consider moving certain elements.

Response：Thank you, we have moved the following elements to the Introduction: " Additionally, the association between earthquakes and depression may vary according to age or gender. Studies indicate that overall levels of psychological symptoms may vary among children, adolescents, and adults due to differences in physiology and cognition[17 18].In response to disaster, women appear develop more intense and longer-lasting psychological symptoms than men[13 19]." (Page 6 Lines 93-98)

References:

[13]Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[17]Norris F PJ, Kaniasty K. Individual and Community Responses to Trauma and Disaster: Individual and community reactions to the Kentucky floods: findings from a longitudinal study of older adults. Cambridge University Press 1994

[18]Shaw JA. Children, adolescents and trauma. The Psychiatric quarterly 2000;71(3):227-43.

[19]Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

11. In the limitations – the authors write that the earthquake is likely to be the cause of depression. I understand here that they mean that depression cannot (obviously) cause an earthquake. However, I would suggest being slightly more cautious in their statement that ‘the earthquake is likely to be the cause of depression’. In particular, mental disorders are related to multiple factors.

Response：Thank you for raising this point. To be more cautious, we deleted our claim that “the earthquake is likely to be the cause of depression”. (Page 18 Lines 390-391)

12. I would change lines 501-2 to ‘Intervention can facilitate recovery’.

Response：Thank you. Inspired by your comment, we have changed the text to read as follows: "“Strengthening community social cohesion can facilitate recovery from disaster trauma[63 64]”. (Page 18-19 Lines 398-399)

References:

[63] Hikichi H, Aida J, Tsuboya T, et al. Can Community Social Cohesion Prevent Posttraumatic Stress Disorder in the Aftermath of a Disaster? A Natural Experiment From the 2011 Tohoku Earthquake and Tsunami. Am J Epidemiol 2016;183(10):902-10.

[64] North CS, Pfefferbaum B. Mental health response to community disasters: a systematic review. Jama 2013;310(5):507.

13. Line 529 - rather than writing about 'long-lasting effects on depression', I would write about associated with higher rates of depression, or some other phrase that doesn't make causal claims.

Response：Thank you. We have changed the sentence to read as follows:"Thirty-seven years after the disasters, earthquake experience was associated with depression among bereaved survivors, women and individuals over 18 years old at the time." (Page 19 Lines 405-407)

VERSION 3 - REVIEW

REVIEWER	Siri Thoresen Norwegian Center for Violence and Traumatic Stress Studies
REVIEW RETURNED	15-Apr-2019

GENERAL COMMENTS	The authors have done a good job in revising and improving the manuscript. I have only two small comments: I suggested in the last revision that the authors should try to explain why they observe an increased risk in depression only in women, and not in men. However, I don't think the authors' new text in the discussion adds to the value of the manuscript. I hope the authors will remove this text, and rather perhaps raise this question as a challenge for future research. Abstract: As the increased risk of depression was only observed for women, I think this should be made clear early on in Results. The sentence "…participants…had a higher prevalence…" can be misleading.

VERSION 3 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 3

Reviewer Name: Siri Thoresen

Institution and Country: Norwegian Center for Violence and Traumatic Stress Studies

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

The authors have done a good job in revising and improving the manuscript.

I have only two small comments:

1. I suggested in the last revision that the authors should try to explain why they observe an increased risk in depression only in women, and not in men. However, I don't think the authors' new text in the discussion adds to the value of the manuscript. I hope the authors will remove this text, and rather perhaps raise this question as a challenge for future research.

Response:

Thank you. In response to the reviewer's suggestion, we have modified the section as follows: "With regard to gender, we found a significant association between earthquake experience and depression in women but not in men. Similar results have been found in several previous studies of disaster, indicating that women may be at a higher risk of depression than men when they experienced disasters including large earthquake 13 19. Differences in physiology, personality, social role and rumination between women and men might result in this gender difference in the association between depression and disaster39-43. The exact causal factors leading to gender differences in long-term effects of earthquakes remains a big challenge for future researches." (Page 15 Lines 301-308)

References:

[13] Green BL, Grace MC, Vary MG, et al. Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. Journal of the American Academy of Child and Adolescent Psychiatry 1994;33(1):71-9.

[19] Guo J, He H, Qu Z, et al. Post-traumatic stress disorder and depression among adult survivors 8 years after the 2008 Wenchuan earthquake in China. Journal of affective disorders 2017;210:27-34.

[39] Feingold A. Gender differences in personality: a meta-analysis. Psychological bulletin 1994;116(3):429-56.

[40] Christov-Moore L, Simpson EA, Coude G, et al. Empathy: gender effects in brain and behavior. Neuroscience and biobehavioral reviews 2014;46 Pt 4:604-27.

[41] Ranasinghe PD, Levy BR. Prevalence of and sex disparities in posttraumatic stress disorder in an internally displaced Sri Lankan population 6 months after the 2004 Tsunami. Disaster medicine and public health preparedness 2007;1(1):34-41; discussion 41-3.

[42] Aksaray G, Kortan G, Erkaya H, et al. Gender differences in psychological effect of the August 1999 earthquake in Turkey. Nordic journal of psychiatry 2006;60(5):387-91.

[43] Nolen-Hoeksema S, Harrell ZA. Rumination, Depression, and Alcohol Use: Tests of Gender Differences. Journal of Cognitive Psychotherapy 2002;16(4):391-403.

2. Abstract: As the increased risk of depression was only observed for women, I think this should be made clear early on in Results. The sentence "…participants…had a higher prevalence…" can be misleading

Response:

Thank you. We have revised the Results as follows: "Of the 5024 participants, 641 experienced the Tangshan earthquake, and 98 experienced bereavement due to the earthquake. Thirty-seven years after the earthquake, survivors who had lost relatives during the earthquake were nearly 3 times (OR 2.82, 95% CI 1.24-6.39) as likely to have depression as those who had not experienced the earthquake, while those who had not lost relatives were 1.69 times as likely (OR 1.69, 95% CI 0.93-3.08). Stratified analyses showed that earthquake was significantly associated with depression in women with (OR 3.51, 95% CI 1.21-10.16) or without bereavement (OR 3.07, 95% CI 1.44-6.56) but not in men; this association was also significant in individuals over 18 years old at the time of the earthquake with (OR 13.16, 95% CI 3.08-56.3) or without bereavement (OR 3.39, 95% CI 1.31-8.87) but not in individuals less than 18 years old." (Page 3-4 Lines 52-62)