

Relationship between Traumatic Exposure and Posttraumatic Stress Disorder among Flood Victims: Roles of Fear and Self-Disclosure

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Abstract

Background: Posttraumatic Stress Disorder (PTSD) is one of the most prevalent psychopathologies experienced by victims following natural disasters. The severity of traumatic experience may be a critical risk factor for the development of PTSD. Nevertheless, other factors may also lead to PTSD. We propose that fear and self-disclosure could be two important factors. Previous studies have examined their unique roles in PTSD, but their combined role in PTSD has been rarely assessed. To fill this gap, the aim of this study was to examine the relationship between severity of traumatic exposure, fear, self-disclosure, and PTSD among victims following flood disaster.

Methods: one hundred ninety-nine participants completed self-report questionnaires. Descriptive statistics were obtained using SPSS 17.0 and Pearson correlation coefficients were calculated to obtain correlations between major variables.

Results: results indicated that severity of traumatic exposure not only had a direct effect on PTSD, but also it had an indirect effect on PTSD via activating victims' fear. Moreover, self-disclosure played a buffering role between fear and PTSD. However, the role of fear in PTSD may decrease with increases in levels of self-disclosure.

Conclusions: Traumatic exposure had positive predictive effects for PTSD and fear. Self-disclosure had negative predictive effects for PTSD. Fear played a mediating role between severity of traumatic exposure and PTSD, self-disclosure played a moderating role in the relationship between fear and PTSD. Psychological interventions should focus on the regulation of fear and improvement of self-disclosure following traumatic exposure.

Background

Between June and July 2016, continuous heavy rainfall in the middle and lower reaches of the Yangtze River in China caused extremely severe flooding. Wuhu City (Anhui Province), located in this area, was heavily affected by the disaster. Over 1,960,000 people directly experienced the flood, 130,000 people needed to be urgently transferred to safety, and over 2,447 buildings were destroyed. The flood not only caused a devastating loss of human life and property, but also led to various psychological problems among the afflicted victims (Quan, Zhen, Yao, & Zhou, 2017; Zhen, Quan, Yao, & Zhou, 2016). Posttraumatic stress disorder (PTSD) is one of common negative psychological consequences following the experience of trauma, including flood disaster (Stanke, Murray, Amlôt, Nurse, & Williams, 2012; Dai et al., 2016). For example, Quan et al. (2017) found that after the flood disaster, the incidence of PTSD among the victims as high as 25.1%. Zhi et al. (2016) found that the incidence after the flood disaster was in the range of 26–50%.

After the flood disaster, the high incidence of PTSD triggered further research aiming to identify the factors which may influence its development (Quan et al., 2017). Studies found that various factors influence the development of PTSD and they can be divided into pre-trauma (e.g., sex, age), intra-trauma

(e.g., degree of exposure to the disaster), and post-trauma (e.g., responding method) factors, based on posttraumatic risk factor model (e.g., Freedy, Resnick, & Kilpatrick, 1992). By definition, exposure (to disaster or any other traumatic event) is a precondition for the occurrence of PTSD (e.g., Tracy, Norris, & Galea, 2011; Boden, Fergusson, Horwood, & Mulder, 2015; Mcguire et al., 2018; Zhou, Wu, Fu, & An, 2015). Here, the shattered assumptions theory (Janoff-Bulman, 2010) proposes that traumatic exposure can lead to cognitive distortions, specifically, negative assumptions about oneself, others, and the whole world, finally inducing PTSD.

Furthermore, in the cognitive model of persistence of PTSD (Ehlers & Clark, 2000), traumatic exposure has both direct and indirect predictive effects on the development of PTSD by certain mediators. Fear is one of the important mediators in this model. It is proposed that following trauma such as flooding, for example, an individual may feel threatened, worry about the house being destroyed by rushes of water, crops being submerged, families and/or friends getting hurt, and as a consequence, cannot live a normal life (e.g., Foa, Riggs, Massie, & Yarczower, 1995). The cognitive process of excessive concern and worry will in itself cause fear (Ehlers & Clark, 2000). This may lead to the development of conditioned fear responses to specific trauma-related clues (e.g., Heinrichs, Wagner, Schoch, Soravia, Hellhammer, & Ehler, 2005), induce an invasion of trauma-related memories (e.g., Fani et al., 2012), and finally result in PTSD. Fear can also suppress the ability to accurately recall traumatic experiences. This suppression can make it difficult to piece the trauma memory together, which may also increase the possibility of developing PTSD (e.g., Farnsworth & Sewell, 2011). Based on this, it was suggested that fear could be a mediator of the influence of traumatic exposure on PTSD.

Although PTSD may be caused directly by traumatic exposure or induced by fear. Some studies found that traumatic exposure does not have a significant relationship with PTSD (Nygaard & Heir, 2012; Zhou, Wu, Yuan, Chen, & Chen, 2015). The question remains as to why some individuals who have experienced traumatic exposure develop PTSD but others do not. We propose that the direct or indirect relationship between traumatic exposure and PTSD is influenced by the regulation of other variables, in particular, self-disclosure.

Self-disclosure is a process during which personal information is disclosed to others (Sprecher & Treger, 2015). Studies related to trauma found that the disclosure of traumatic experiences can moderate pain (Paine & Hansen, 2002; Pennebaker, Zech, & Rimé, 2001), and alleviate PTSD symptoms (e.g., Bolton, Glenn, Orsillo, Roemer, & Litz, 2003; Davidson & Moss, 2008; Pietruch, & Jobson, 2012). Theoretically, based on the perspective of Foa and Kozak (1986), talking about emotional experience after trauma can promote emotional processing and assist with the integration of trauma-related memories, which is critical for the recovery of PTSD following trauma. Thus, individuals with high levels of self-disclosure can consider and evaluate the traumatic event or their emotion by expressing their thoughts and feels about it, and in doing so buffer PTSD symptoms and/or recover more rapidly by seeking help and releasing psychological pressure (Currier, Lisman, Harris, Tait, & Erbes, 2013; Hoyt, Pasupathi, Smith, Yeater, Kay, & Tooley, 2015; Tedeschi & McNally, 2011). Individuals with low levels of self-disclosure tend to repress and avoid negative experiences and emotions (e.g., fear) (Tedeschi & Calhoun, 2004; Purves, &

Erwin, 2004). The repression of traumatic cognitions and negative emotions will reduce an individual's ability to effectively regulate emotions, and thus, contribute to the development of emotion regulation disorders (Liverant, *et.al.*, 2008) and risk for PTSD. On this basis, self-disclosure may be argued to moderate the influences of traumatic exposure and fear on PTSD.

Although some research has noted the relationships among PTSD and traumatic exposure, fear, and self-disclosure, the precise effects of these have not been evaluated in victims who have experienced a flood disaster. Given the inherently unpredictable nature of natural disasters and that such traumatic events cannot be controlled, natural disasters are likely to severely impact upon the cognitions and assumptions of the victims (Ehlers & Clark, 2000). To reduce the incidence of PTSD after disasters, it is necessary to help victims adapt and adjust, and to understand the mediating and moderating factors associated with the development of PTSD. Thus, our study tested the potential effects of fear and self-disclosure on the relationship between traumatic exposure and PTSD after the flood disaster in Wuhu City. Based on the existing literature, we made the following predictions: a) post-traumatic fear plays a mediating effect between traumatic exposure and PTSD; b) self-disclosure moderates the relation between traumatic exposure / fear and PTSD.

Methods

Procedures and Participants

This study was approved by the Research Ethics Committee of Anhui Normal University. We wanted to focus on individuals who had been severely affected by the disaster in Wuhu city and thus selected participants who had been transferred to makeshift shelters for safety following the flood. Participants consisted mainly of older adults and adolescents as most adults between 20–40 had migrated into the cities for work.

Five makeshift shelters were selected with the help of related institutions. In each of the makeshift shelters, we gathered the victims together with the help of the administrators based there and introduced the purpose of our investigation. The voluntary nature of participation in the study was emphasized and, after ensuring that individuals understood the purpose of the study, we asked for volunteers to participate. Those who agreed were asked to complete a series of questionnaires. Because the participants included both adults and adolescents, informed consent was obtained from adult participants directly and from the parents/guardians of adolescent participants. The assessment was conducted under the supervision of trained individuals with master's degrees or associate professors in psychology. For participants with low levels of education and/or who had difficulties understanding the questionnaires, the researchers read the items aloud and recorded the participants' verbal responses. After the questionnaires were completed, compensation was provided (e.g., toothbrushes, teacups). Participants were also told that the researchers could provide some psychological/counseling services if needed.

One hundred and ninety-nine flood victims participated in the study. Data from 12 participants were excluded from analyses due to invalid responses according to the simple, repetitive and incomplete answers. One hundred and eighty-seven valid questionnaire packages were obtained, indicating a valid response rate of 94.0%. The mean participant age was 41.9 (SD = 19.32) years, and the age range was 13– 80 years. Of the participants, 84 (44.9%) were female, 94 (49.7%) were male, and nine did not report their sex.

Measures

Traumatic exposure. We used Quan et al.' (2017) traumatic exposure questionnaire to assess the severity of traumatic exposure of flood victims. This questionnaire has six items (e.g., I was injured during the flood). Each item was rated on a 5-point Likert scale ranging from 0 (completely disagree) to 4 (completely agree). The questionnaire had good internal consistency ($\alpha = 0.75$).

PTSD. PTSD was assessed using the PTSD Checklist for DSM–5 translated and revised by Quan et al. (2017). This measure included 20 items engaging in assessing the occurrence and frequency of PTSD symptoms in relation to the most distressing event experienced by an individual perceived severity about this (e.g., I have an exaggerated startle response), in this study, we believe that continuous rainstorms are a traumatic event for our participants. The respondents rated the frequencies of symptoms during the last two weeks on a 4-point scale ranging from 0 (not at all) to 3 (almost always). The scale has four subscales: intrusions, negative cognitions and emotion alteration, avoidance, and hyper-arousal. An overall severity score is generated by summing the four symptom subscale scores. In this sample, the scale demonstrated excellent internal consistency ($\alpha = 0.96$).

Fear. Fear was measured using a fear questionnaire developed by Quan et al. (2017). This questionnaire consists of 7 items measuring fear or worry felt by respondents about the death or injury of their parents, or others (e.g., I fear the death or injury of my parents). Each item of this questionnaire was rated on a 5-point Likert scale ranging from 0 (completely disagree) to 4 (completely agree). The questionnaire had good internal consistency ($\alpha = 0.93$) in this study.

Self-Disclosure. Self-disclosure was measured using the Distress Disclosure Index (Kahn & Hessling, 2009) which contains 12 items. All items are rated on 5-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). To consider the applicability of the measure for use with Chinese flood victims, we reworded some of the items according to these results to ensure the item meanings would be clear to participants. For this study, the internal reliability of the modified DDI was good ($\alpha = 0.60$).

Data Analysis Strategies

Descriptive analyses were conducted for all of the measures. Pearson correlations were calculated to examine the associations between the major variables. Statistical analyses were conducted using SPSS

17.0. Sex and age were used as covariates in the following analysis.

To test the moderated mediating effects, five regression equations were established by hierarchical regression (Zhou, Wu, Li, & Zhen, 2016) to examine the roles of fear and self-disclosure on the relationship between traumatic exposure and PTSD. In the first regression equation, we treated PTSD as the dependent variable and traumatic exposure as the independent variable, and our aim was to examine the effect of traumatic exposure on PTSD. In the second equation, we treated fear as the dependent variable and traumatic exposure as the independent variable, with the aim of assessing whether traumatic exposure significantly affected fear. In the third equation, we treated PTSD as the dependent variable and traumatic exposure, self-disclosure and an interaction term (traumatic exposure \times self-disclosure) as the independent variables, with the aim of assessing the direct impact of self-disclosure on PTSD as well as the moderating role of self-disclosure on the relationship between traumatic exposure and PTSD. The fourth equation was the same as the third with the addition of fear as an independent variable, and our aim was to examine the effect of fear on PTSD after controlling for traumatic exposure. This allowed us to examine whether fear played a mediating role in the relationship between traumatic exposure and PTSD. In the final equation, the dependent variable was PTSD and the independent variables were traumatic exposure, self-disclosure, fear and two interaction terms (traumatic exposure \times self-disclosure and fear \times self-disclosure). This equation allowed us to explore the moderating role of self-disclosure on the relationship between fear and PTSD. All independent variables were centered on their respective means to reduce multicollinearity between the main effects and interaction terms, and to increase the interpretability of the coefficients on interaction terms (Cohen, Cohen, West, & Aiken, 2013).

To test the significance of the indirect effect of traumatic exposure on PTSD via fear, we conducted bias-corrected bootstrap tests with a 95% confidence interval. To test the significance of the moderating role of self-disclosure on the relationship between fear and PTSD, we used the test of simple slopes to further examine the significance of the interaction effect.

Results

Descriptive statistics and correlation between main measures

Sex (man = 1, women = 2), age, and degree of traumatic exposure were controlled for in the correlations for PTSD with traumatic exposure, fear, and self-disclosure. The results of the Pearson correlation analyses are shown in Table 1. Sex had a significant positive correlation with fear, and a positive correlation with PTSD showing marginal significance, but not with other variables. Age had significant positive correlations with fear and PTSD, but not with the other variables. Degree of traumatic exposure had positive correlations with fear and PTSD, but not with self-disclosure. Fear had a positive correlation with PTSD, but not with self-disclosure. Self-disclosure had a significant negative correlation with PTSD.

—Insert Table 1 here approximately—

Moderated mediating effect analysis

Table 2 showed the results of hierarchical regression. We found that equations 1 and 2 indicated that traumatic exposure had significant positive predictive effects for PTSD and fear ($\beta = 0.31, p < 0.001$; $\beta = 0.19, p < 0.05$). Equation 3 demonstrated that self-disclosure had a negative predictive effect for PTSD ($\beta = -0.30, p < 0.001$), but the effect of the interaction term of self-disclosure and traumatic exposure was not significant for PTSD ($\beta = -0.08, p > 0.05$). This indicated that self-disclosure did not buffer the predictive effect of traumatic exposure on PTSD. Equation 4 suggested that after controlling for the traumatic exposure, self-disclosure, and their interaction term, fear had a positive predictive effect for PTSD ($\beta = 0.27, p < 0.01$), and traumatic exposure also had a positive predictive effect for PTSD ($\beta = 0.31, p < 0.001$). The combination of the results from Equations 4, 1 and 2 suggested that fear played a mediating role in the correlation between traumatic exposure degree and PTSD. Equation 5 demonstrated that the interaction item of fear and self-disclosure had a significant negative predictive effect for PTSD ($\beta = -0.18, p < 0.05$). Thus, self-disclosure played a moderating role in the relation between fear and PTSD. All the results indicated that traumatic exposure directly or indirectly led to PTSD by increasing fear. This mediating pathway was buffered by self-disclosure.

—Insert Table 2 here approximately—

Bias-corrected bootstrapping was used to test the significance of the mediating effect of fear, and the results found that fear has a significant mediating role between traumatic exposure and PTSD ($\beta = 0.20, 95\% \text{ CI} = (0.02, 0.43)$). Simple slope test was used to test the significance of moderating role of self-disclosure. Then, the predictive effect of fear for PTSD was tested after the participants were divided into high self-disclosure (Means+1 Standardized Deviation) and low self-disclosure groups (Means-1 Standardized Deviation) (Figure 1). Results indicated that in the high self-disclosure group, fear did not have a predictive effect for PTSD (Simple slope = 0.02, $t = 0.07, p = 0.944$). In the low self-disclosure group, fear had a significant positive predictive effect for PTSD (Simple slope = 0.87, $t = 2.29, p = 0.027$).

—Insert Figure 1 here approximately—

Discussion

In this study, we examine the potential moderated mediating effect of traumatic exposure on PTSD among victims following flood. Then, traumatic exposure was found to have positive predictive effects for PTSD and fear, and self-disclosure had negative predictive effects for PTSD. Fear played a mediating role between severity of traumatic exposure and PTSD, self-disclosure buffered the effects of fear on PTSD.

To be specific, the finding that the severity of traumatic exposure experienced by victims had a positive predictive effect for PTSD is consistent with previous studies (e.g. Bokszczanin, 2002; Zhou et al., 2015; Zhen et al., 2016). It suggested that the severity of traumatic exposure is an important factor influencing PTSD (Zhang et al., 2012; Rzeszutek, Oniszczenko, Schier, Biernat-Kaluza, & Gasik, 2016) including incidence, severity, and symptom manifestation (Lowell, et al., 2018; Szogi & Sullivan, 2018).

Nevertheless, we also found that fear was a mediator between severity of traumatic exposure and PTSD, which indicated that the severity of traumatic exposure of flood victims also caused PTSD by increasing fear. Here, experiencing the flood natural disasters, victims may suffer from injury and the loss of properties, which may threaten their safety (e.g., Quan et al., 2017), and cause their fear relating to injury, death, and in the case of flood victims, flood reoccurrence. The anxiety buffer disruption theory (Pyszczynski, & Pelin, 2011) proposes that in fearful states, worry and fear will increase sensitivity of individuals to trauma-relevant clues, causing the appearance of intrusive symptoms, and finally may elicit the occurrence of PTSD.

In addition to the finding that fear mediated the traumatic exposure and PTSD, this study also examined the moderating role of self-disclosure between traumatic exposure/ fear and PTSD. Then, the results found that self-disclosure had a significant negative predictive effect for PTSD, which be consistent with previous studies (e.g. Schackner, Weiss, Edwards, & Sullivan, 2017; Stein, Lahav, & Solomon, 2017) and support the unified theory of repression (Erdelyi, 2006), which proposes that the repression of thoughts, feelings, and behaviors is an active process consuming physiological energy, whereas the disclosure of previous traumatic experience decreases the possibility of occurrence of unhealthy psychological outcomes (Hunkin & Chung, 2012). Here, by disclosing the traumatic experiences or emotion, traumatized individual may talk about their experiences with others and reconstruct the understanding on posttraumatic world (Cordova, Al, 2001; Lowe, 2006), regain a sense of control over their life (Ullman & Peter-Hagene, 2014), and finally relieve the severity of PTSD.

However, we found that self-disclosure did not significantly moderate the predictive effects of severity of traumatic exposure on PTSD. This may be attributed to the characteristics of the flood victims in this study. In our study, the participants were housed in a temporary shelter, wherein full of the negative emotional atmosphere due to the uncertain of their life (e.g., Quan et al., 2017). Living in this shelter, while individuals disclose their experiences and negative emotion to others in shelter, individual with traumatic experiences still was more likely to report PTSD due to the effect of negative group atmosphere. Thus, we suggested that the moderating role of disclosure between trauma and PTSD was non-significant.

Nevertheless, we found that self-disclosure buffered the effects of fear on PTSD. Specifically, in the high self-disclosure group, the predictive effect of fear for PTSD was not significant. This may be attributable to observations that individuals with high levels of self-disclosure were incline to disclose their negative emotion (Hoyt, et al., 2015; Ullman & Peter-Hagene, 2014), where in the negative emotions relating to fear may be released and thus it was difficulty to results in PTSD. In the low self-disclosure group, the stronger the experience of fear and the more severe PTSD was found to be. This may be explained by arguments

that low disclosure of negative emotion can increase arousal levels(Freed & D'Andrea, 2015), induce generation of negative emotions(Maercker & Horn, 2013), and damage cognitive function (Ponnamperuma & Nicolson, 2016). These may increase the stress of traumatized individual with more fear, and thus may increase the opportunity of the occurrence of PTSD.

Some limitations to this research. First, as a cross-sectional study, the results cannot test whether there were causal relationships between the variables. Second, except for sex and age, other demographic characteristics (e.g., socioeconomic status and education) were not considered. Finally, all variables were measured by self-report, and so associations between the main measures might be affected by some common underlying factor not examined here. Despite these limitations, we still provide a new perspective in identifying a correlation between degree of traumatic exposure and PTSD. Our findings expand upon those from previous research by exploring the combined effects of fear and self-disclosure. From intervention and health promotion perspectives, psychological interventions should focus on the regulation of fear and improvement of self-disclosure following traumatic exposure. Thus, government and social organizations should provide information about disasters to alleviate uncertainty and fear (Koivula, Paunonen, Tarkka, Tarkka, & Laippala, 2002). It is necessary to eliminate the atmosphere of fear experienced by people following natural disasters such as floods. We believe that encouraging victims to talk and increasing their levels of self-disclosure are very important for the success of interventions.

Conclusions

1.Traumatic exposure had positive predictive effects for PTSD and fear.

2.Self-disclosure had negative predictive effects for PTSD.

3. Fear played a mediating role between severity of traumatic exposure and PTSD, self-disclosure played a moderating role in the relationship between fear and PTSD.

Declarations

Posttraumatic stress disorder = PTSD

-Ethics approval and consent to participate

This study was approved by the Research Ethics Committee of Anhui Normal University.

We gathered the victims together with the help of the administrators based there and introduced the purpose of our investigation. The voluntary nature of participation in the study was emphasized and, after ensuring that individuals understood the purpose of the study, we asked for volunteers to participate. Because the participants included both adults and adolescents, their verbal informed consent was obtained from adult participants directly and from the parents/guardians of adolescent participants. On the one hand, most of the volunteers who participated in the experiment were not very high-educated or so young, and could not write their own names, we have obtained the consent of their parents or guardians. On the other hand, because the written consent was given, the participants felt that confidentiality was difficult to guarantee. Therefore, the professional testers have adopted the method of obtaining verbal consent instead of written consent.

-Consent to publish

Not Applicable

-Availability of data and materials

For the data of this study, the authors do not want to share them.

Because the authors promise that the volunteers who participate in the research will not use their results for other purposes than academic research, and the share of data will not guarantee that the users' use is in line with our commitment to the participants.

In addition, the data involved in this paper are part of a large research database. The publication of relevant data in this paper will affect the innovation and confidentiality in later research.

The datasets used during the current study are available from the corresponding author (Professor Qingsong Sang) on reasonable request.

-Competing interests

The authors have no Competing interests to declare.

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No funding was associated with the preparation of this manuscript.

-Authors' Contributions

LQ designed the concept and drafted the manuscript.

BL confirmed that data/figures/materials/code presentation accurately reflects the original.

XZ analyzed and interpreted the data.

GH improved the expression of the article and revised the citations.

QS: corresponding author. He has ensured that all listed authors have approved the manuscript before submission, including the names and order of authors, and that all authors receive the submission and all substantive correspondence with editors, as well as the full reviews, verifying that all data, figures, materials.

All authors read and approved the final manuscript.

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References

- Bokszczanin, A. (2002). Long-term negative psychological effects of a flood on adolescents. *Polish Psychological Bulletin*, 33(1), 55–61.
- Boden, J. M., Fergusson, D. M., Horwood, L. J., & Mulder, R. T. (2015). The role of peri-traumatic stress and disruption distress in predicting post-traumatic stress disorder symptoms following exposure to a natural disaster. *BJPsych Open*, 1, 81.
- Bolton, E. E., Glenn, D. M., Orsillo, S., Roemer, L., & Litz, B. T. (2003). The relationship between self-disclosure and symptoms of posttraumatic stress disorder in peacekeepers deployed to somalia. *Journal of Traumatic Stress*, 16, 203–210.
- Purves, D. G., & Erwin, P. G. (2004). Post-traumatic stress and self-disclosure. *The Journal of Psychology*, 138, 23–34.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression or correlation analysis for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Cordova, M., & Al, E. (2001). Characterization of two cysteine proteinases secreted by *fasciola hepatica* and demonstration of their kininogenase activity. *Molecular & Biochemical Parasitology*, *116*, 109–115.

Currier, J. M., Lisman, R., Harris, J. I., Tait, R., & Erbes, C. R. (2013). Cognitive processing of trauma and attitudes toward disclosure in the first six months after military deployment. *Journal of Clinical Psychology*, *69*, 209–221.

Dai W, Chen L, Tan H, Wang J, Lai Z, & Kaminga AC, et al. (2016). Association between social support and recovery from post-traumatic stress disorder after flood: A 13–14 year follow-up study in human, China. *BMC Public Health*, *16*, 194–202.

Davidson, A. C., & Moss, S. A. (2008). Examining the trauma disclosure of police officers to their partners and officers' subsequent adjustment. *Journal of Language & Social Psychology*, *27*, 51–70.

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research & Therapy*, *38*, 319–345.

Erdelyi, M. H. (2006). The unified theory of repression. *Behavioral & Brain Sciences*, *29*, 499–551.

Fani, N., King, T. Z., Jovanovic, T., Glover, E. M., Bradley, B., & Choi, K. S., et al. (2012). White matter integrity in highly traumatized adults with and without post-traumatic stress disorder. *Neuropsychopharmacology*, *37*, 2740–2746.

Farnsworth, J. K., & Sewell, K. W. (2011). Fear of emotion as a moderator between PTSD and fire-fighter social interactions. *Journal of Traumatic Stress*, *24*, 444–450.

Foa, E. B., Riggs, D. S., Massie, E. D., & Yarczower, M. (1995). The impact of fear activation and anger on the efficacy of exposure treatment for posttraumatic stress disorder. *Behavior Therapy*, *26*, 487–499.

Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, *99*, 20–35.

Freed, J., Resnick, H., & Kilpatrick, D. G. (1992). Conceptual framework for evaluating disaster impact: Implications for clinical intervention. In L. S. Austin (Ed.), *Clinical response to trauma in the community*, 3–23. Washington, DC: American Psychiatric Press.

Freed, S., & D'Andrea, W. (2015). Autonomic arousal and emotion in victims of interpersonal violence: shame proneness but not anxiety predicts vagal tone. *Journal of Trauma Dissociation*, *16*, 367–383.

Heinrichs, M., Wagner, D., Schoch, W., Soravia, L. M., Hellhammer, D. H., & Ehlert, U. (2005). Predicting posttraumatic stress symptoms from pretraumatic risk factors: a 2-year prospective follow-up study in

firefighters. *American Journal of Psychiatry*, *162*, 2276–2286.

Hoyt, T., Pasupathi, M., Smith, B. W., Yeater, E. A., Kay, V. S., & Tooley, E. (2015). Disclosure of emotional events in groups at risk for posttraumatic stress disorder. *International Journal of Stress Management*, *17*, 78–95.

Hunkin, V., & Chung, M. C. (2012). Chronic idiopathic urticaria, psychological co-morbidity and posttraumatic stress: The impact of alexithymia and repression. *Psychiatric Quarterly*, *83*, 431–447.

Janoff-Bulman, R. (2010). *Shattered Assumptions*. New York: Simon and Schuster, Inc.

Kahn, J. H., & Garrison, A.M. (2009). Emotional self-disclosure and emotional avoidance: relations with symptoms of depression and anxiety. *Journal of Counseling Psychology*, *56*, 573–584.

Koivula, M., Tarkka, M. T., Tarkka, M., Laippala, P., & Paunonen-Ilmonen, M. (2002). Fear and in-hospital social support for coronary artery bypass grafting patients on the day before surgery. *International Journal of Nursing Studies*, *39*, 415–427.

Liverant, Gabrielle I, Brown, Timothy A, Barlow, David H, & Roemer, Lizabeth. (2008). Emotion regulation in unipolar depression: the effects of acceptance and suppression of subjective emotional experience on the intensity and duration of sadness and negative affect. *Behaviour Research and Therapy*, *46*, 1201–1209.

Lowe, G. (2006). Health-related effects of creative and expressive writing. *Health Education*, *106*, 60–70.

Lowell, A., Suarez-Jimenez, B., Helpman, L., Zhu, X., Durosky, A., Hilburn, A., Neria, Y. (2018). 9/11-related PTSD among highly exposed populations: A systematic review 15 years after the attack. *Psychological Medicine*, *48*, 537–553.

Maercker, A., & Horn, A. B. (2013). A socio-interpersonal perspective on PTSD: The case for environments and interpersonal processes. *Clinical Psychology & Psychotherapy*, *20*, 465–481.

Magdalena Pietruch, & Laura Jobson. (2012). Posttraumatic growth and recovery in people with first episode psychosis: an investigation into the role of self-disclosure. *Psychosis*, *4*, 213–223.

Mcguire, A. P., Gauthier, J. M., Anderson, L. M., Hollingsworth, D. W., Tracy, M., & Galea, S., et al. (2018). Social support moderates the effects of natural disaster exposure on depression and PTSD symptoms: effects for displaced and non-displaced residents. *Journal of Traumatic Stress*, *31*, 223–233.

Nygaard, E., & Heir, T. (2012). World assumptions, posttraumatic stress and quality of life after a natural disaster: A longitudinal study. *Health and Quality of Life Outcomes*, *10*, 76–83.

Paine, M. L., & Hansen, D. J. (2002). Factors influencing children to self-disclose sexual abuse. *Clinical Psychology Review*, *22*, 271–295.

- Pennebaker, J. W., Zech, E., & Rimé, B. (2001). Disclosing and sharing emotion: psychological, social and health consequences. In M. S. Stroebe, W. Stroebe, R. O. Hansson & H. Schut (Eds.), *The handbook of bereavement research: Consequences, coping and care*, 517–539. Washington, DC: American Psychological Association.
- Ponnamperuma, T., & Nicolson, N. A. (2016). Negative trauma appraisals and PTSD symptoms in Sri Lankan adolescents. *Journal of Abnormal Child Psychology*, 44, 245–255.
- Tom Pyszczynski, & Pelin Kesebir. (2011). Anxiety buffer disruption theory: A terror management account of posttraumatic stress disorder. *Anxiety Stress & Coping*, 24, 3–26.
- Quan, L. J., Zhen, R., Yao, B. X., & Zhou, X. (2017). Traumatic exposure and post-traumatic stress disorder among flood victims: testing a multiple mediating model. *Journal of Health Psychology*, 1359105317707568.
- Rzeszutek, M., Oniszczenko, W., Schier, K., Biernat-Kaluza, E., & Gasik, R. (2016). Temperament traits, social support, and trauma symptoms among HIV/AIDS and chronic pain patients. *International Journal of Clinical and Health Psychology*, 16, 137–146.
- Schackner, J. N., Weiss, N. H., Edwards, K. M., & Sullivan, T. P. (2017). Social reactions to IPV disclosure and PTSD symptom severity: Assessing avoidant coping as a mediator. *J Interpers Violence*, 088626051772749.
- Sprecher, S., & Treger, S. (2015). Virgin college students' reasons for and reactions to their abstinence from sex: results from a 23-years study at a midwestern U.S. university. *Journal of Sex Research*, 52, 936–948.
- Stanke, C., Murray, V., Amlôt, R., Nurse, J., & Williams, R. (2012). The effects of flooding on mental health: outcomes and recommendations from a review of the literature. *PLOS Currents Disasters*, 4, 1–14.
- Stein, J. Y., Lahav, Y., & Solomon, Z. (2017). Self-disclosing trauma and post-traumatic stress symptoms in couples: a longitudinal study. *Psychiatry-interpersonal & Biological Processes*, 80, 79–91.
- Szogi, E. G., & Sullivan, K. A. (2018). Malingered posttraumatic stress disorder (PTSD) and the effect of direct versus indirect trauma exposure on symptom profiles and detectability. *Psychological Injury & Law*, (8), 1–11.
- Tedeschi, R. G. & Calhoun, L. G. (2004). Posttraumatic growth: Conceptual foundations and empirical science. *Psychological Inquiry*, 15, 1–18.
- Tedeschi, R. G., & McNally, R. J. (2011). Can we facilitate posttraumatic growth in combat veterans? *American Psychologist*, 66, 19–24.

- Tracy, M., Norris, F. H., & Galea, S. (2011). Differences in the determinants of posttraumatic stress disorder and depression after a mass traumatic event. *Depression & Anxiety, 28*, 666–675.
- Ullman, S. E., & Peter-Hagene, L. (2014). Social reactions to sexual assault disclosure, coping, perceived control and PTSD symptoms in sexual assault victims. *Journal of Community Psychology, 42*, 495–508.
- Zhang, Z., Ran, M., Li, Y., Ou, G., Gong, R., Li, R., Fang, D. (2012). Prevalence of post-traumatic stress disorder among adolescents after the Wenchuan earthquake in China. *Psychological Medicine, 42*, 1687–1693.
- Zhen, R., Quan, L. J., Yao, B. X., & Zhou, X. (2016). Understanding the relationship between rainstorm-related experiences and PTSD among Chinese adolescents after rainstorm disaster: the roles of rumination and social support. *Frontiers in Psychology, 7*, 7–15.
- Zhi, X. C., Jia, H. H., Chang, W. L., Chong, W. L., Khong, S. C., Shan, K. I., Maruzairi bin, H., & Mohd bin, J. Y. (2016). Prevalence of post-traumatic stress disorder (PTSD) among flood victims in Malaysia: Difference between Kuala Lumpur and Kelantan. *International Medical Journal, 23*, 114.
- Zhou, X., Wu, X., Fu, F., & An, Y. (2015). Core belief challenge and rumination as predictors of PTSD and PTG among adolescent survivors of the Wenchuan earthquake. *Psychological Trauma Theory Research Practice & Policy, 7*, 391–397.
- Zhou, X., Wu, X., Li, X., & Zhen, R. (2016). The role of posttraumatic fear and social support in the relationship between trauma severity and posttraumatic growth among adolescent survivors of the Yaan earthquake. *International Journal of Psychology, 53*, 150–156.
- Zhou, X., Wu, X., Yuan, X., Chen, J., & Chen, Q. (2015). The role of core beliefs challenge, subjective fear and intrusive rumination in associations between the severity of traumatic expose and posttraumatic stress disorder in adolescent survivors after Yaan earthquake in China. *Acta Psychologica Sinica, 47*, 455–465.

Tables

Table 1 Correlation analyses for PTSD with degree of traumatic exposure, fear, and self-disclosure

	M±SD	1	2	3	4	5
1. Sex	--	1.00				
2. Age	41.16±19.37	0.00	1.00			
3. Flood exposure	15.38±5.26	0.02	0.07	1.00		
4. Fear	20.63±7.37	0.18*	0.18*	0.18*	1.00	
5. Self-disclosure	26.02±9.12	0.03	-0.07	0.08	-0.12	1.00
6. PTSD	20.52±14.51	0.13 [†]	0.22**	0.32**	0.44**	-0.26**

Note: † $p < 0.08$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2 Test- series regression analyses of regulatory mediating effects

	Equation 1		Equation 2		Equation 3		Equation 4		Equation 5	
	PTSD		Fear		PTSD		PTSD		PTSD	
	β	t	β	t	β	t	β	t	β	t
Sex	0.13	1.84 [†]	0.14	1.64	0.18	2.47*	0.11	1.33	0.06	0.76
Age	0.22	3.09**	0.22	2.59*	0.18	2.48*	0.19	2.46*	0.17	2.20*
Traumatic exposure	0.31	4.30***	0.19	2.26*	0.31	4.33***	0.30	3.91***	2.29	3.91***
Self-disclosure					-0.30	-4.11***	-0.29	-3.87***	-0.29	-3.94***
Traumatic exposure × self-disclosure					-0.08	-1.10	-0.10	-1.26	-0.04	-0.55
fear							0.27	3.36**	0.30	3.83***
Fear × self-disclosure									-0.18	-2.32*
R^2	0.18		0.11		0.27		0.36		0.39	
F	11.43***		5.37**		10.36***		10.63***		10.22***	

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Figures

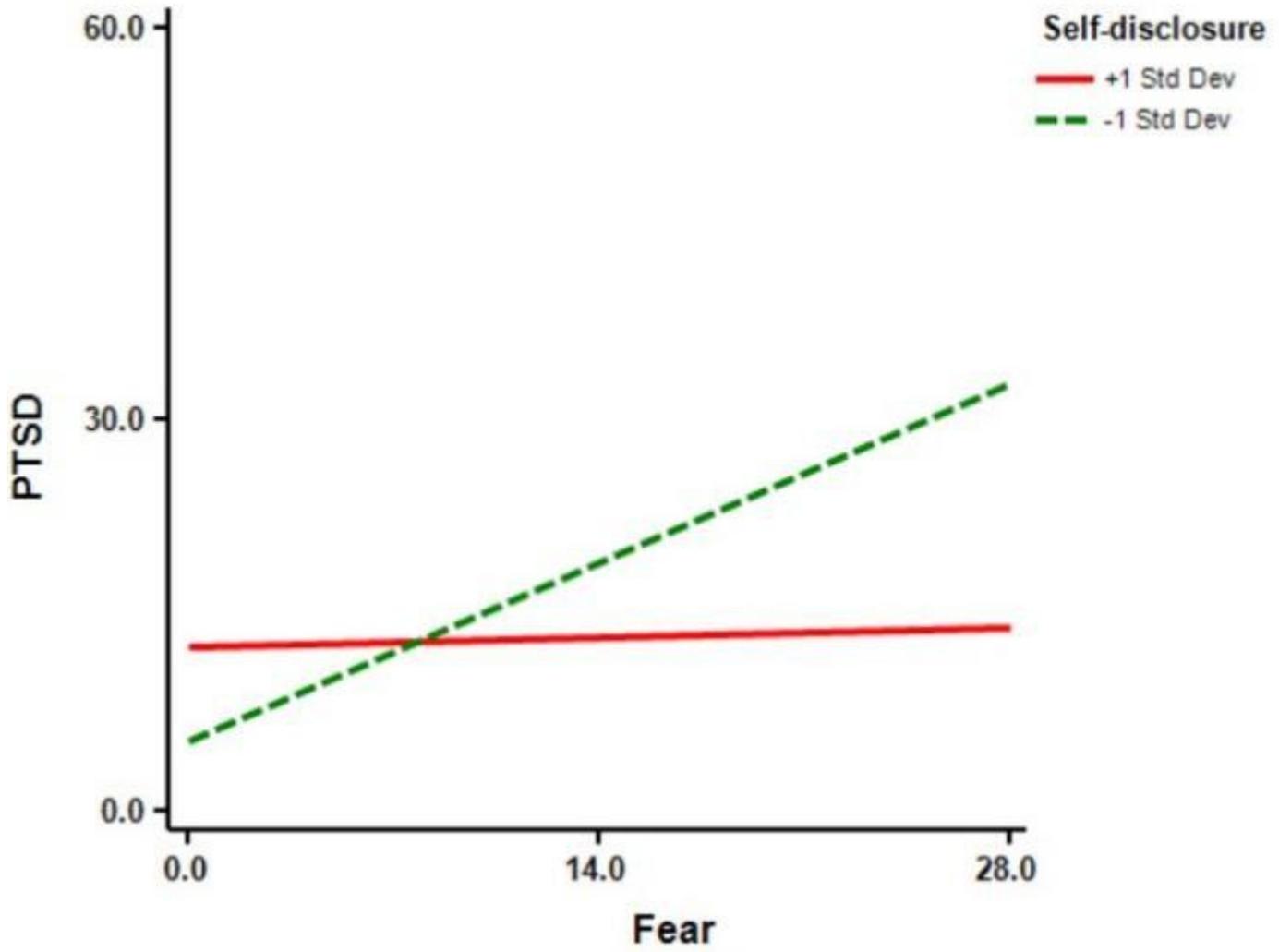


Figure 1

Predictive effect analysis of fear for PTSD under different self-disclosure levels