

# The Relationship Between Depression, Perceived Social Support, and Suicide Risk in Natural Disaster Survivors

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## ABSTRACT

**Objective:** Natural disasters often cause a wide array of post-traumatic psychological difficulties among survivors. Increased suicide risk was recently added to the list of lingering traumatic reactions that interfere with natural disaster survivors' adjustment and recovery. The purpose of this study was to investigate the relationship between psychological symptoms, perceived social support, and the risk of suicide among natural disaster survivors in Korea.

**Methods:** A total of 451 Korean national disaster survivors participated in this study. Their depressive and post-traumatic stress symptoms, perceived social support, and suicide risk were measured. The participants were classified into three groups (minimal, low, and high suicide risk), and the psychosocial factors of the three groups were compared.

**Results:** The risk of suicide increased with the severity of depressive symptoms and decreased as social support (particularly family support) increased. Depressive symptoms were identified as the most potent predictor of suicidality.

**Conclusion:** Several psychosocial factors, particularly depressive symptoms, may have an impact on suicide risk in natural disaster survivors. Therefore, it is essential to focus on their depressive symptoms when assessing and treating natural disaster survivors.

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## INTRODUCTION

Natural disasters are potentially traumatic events that can lead to the development of post-traumatic stress disorder (PTSD) in survivors.<sup>1</sup> According to the National Comorbidity Survey Replication (NCS-R), the 1-year prevalence of PTSD was 3.5%.<sup>2</sup> A study based on Florida hurricane in 2004 found that the prevalence of post-hurricane PTSD was 3.6%, comparable to that of the general population of the NCS-R.<sup>3</sup> The traumatic effects of natural disasters are associated with the perception of reduced social support, likely because those who experience natural disasters tend to experience feelings of isolation.<sup>4</sup>

Suicide risk increases in people suffering from chronic PTSD and is associated with dysfunction due to depression.<sup>5</sup> Previous studies on suicide rates following a natural disaster have reported mixed results. While a meta-analysis demonstrated that the risk of nonlethal suicide attempts increases during the initial disaster period before being decreased, another study suggested that exposure to natural disaster does not increase lifetime suicide risk.<sup>6,7</sup> However, a 5-year follow-up study of those who had been exposed to natural disasters found that mental

illnesses, such as psychosis and stress-related disorders, as well as suicide attempts were more prevalent.<sup>8</sup> As such, the effect of natural disaster exposure on suicide risk can be considered inconclusive.

Thomas Joiner's interpersonal theory of suicide suggests that thwarted belongingness and perceived burdensomeness are the most influential factors in suicidal ideation, thus giving rise to the desire to commit suicide.<sup>9,10</sup>

"Perceived social support" refers to a person's awareness that they can receive emotional and practical help from family, friends, and significant others.<sup>11</sup> Reports suggest that the absence of perceived social support has a significant negative correlation to risk factors, such as stress, depression, hopelessness, and PTSD.<sup>12</sup> Research indicates that perceived low social support causes individuals to be vulnerable to depressive disorders.<sup>9</sup> Previous research has also shown that perceived social support moderates the risk of anxiety disorders and PTSD in addition to reducing suicide risk.<sup>13</sup>

Depression is known to be a primary risk factor for suicide.<sup>14</sup> Therefore, it is important to investigate the effect

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of social support on the relationship between depressive symptoms and suicide. Suicide is affected by the complex interaction of emotional factors, such as PTSD symptoms, depressive symptoms, and social support systems—all of which may influence disaster victims. Thus, it is also important to investigate the effect of depressive symptoms on the relationship between PTSD symptoms and suicide risk.

This study aims to investigate the relationship between PTSD and depressive symptoms, perceived social support, and suicide risk in natural disaster survivors. It also aims to investigate the mediation of depressive symptoms in the relationship between post-traumatic symptoms and suicide risk.

## METHODS

### Participants

A total of 451 natural disaster (earthquake, typhoon, and others) survivors participated in this study. They experienced one of the two (5.1- and 5.8-magnitude) earthquakes that occurred on September 12, 2016, in Gyeongju or the damage from the typhoon in Busan, South Korea—where the earthquakes originated—a month following the earthquakes.<sup>15</sup> The participants were assessed on depressive and PTSD symptoms, perceived social support, and suicide risk. Based on suicide risk, the participants were classified into three groups: minimal risk, low risk, and high risk. The groups were compared in terms of age, PTSD symptoms, depressive symptoms, and perceived social support. Ethics approval was obtained from the Institutional Review Board of Hallym University (HIRB-2015-040). All participants provided written consent to participate in the study.

### Measures

**Impact of Event Scale-Revised:** The Impact of Event Scale-Revised (IES-R) was developed by adding items on hyperarousal, a key symptom of PTSD, to the IES, which measures intrusion and avoidance symptoms following a trauma.<sup>16</sup> The IES-R contains 22 items on a 5-point Likert scale (0: Not at all-4: Extremely) to measure post-traumatic stress symptoms experienced during the previous week, and the total scores range between 0 and 88. This study used the Korean version of the IES-R.<sup>17</sup>

**Patient Health Questionnaire-9:** The Patient Health Questionnaire-9 (PHQ-9) is a self-report measure for depression screening, which is developed based on nine Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) diagnostic criteria for a major depressive disorder.<sup>18</sup> Items are rated on a 4-point scale (0-3), and the total scores range between 0 and 27. This study used the Korean version of the PHQ-9.<sup>19</sup>

**Multidimensional Scale of Perceived Social Support:** This 12-item scale measures the degree of perceived social support from family, friends, and significant others. The

measure contains three 4-item subscales (Family, Friends, and Significant Others).<sup>11</sup> Items are rated on a 7-point Likert scale (1: Strongly Disagree-7: Strongly Agree), and the total scores range between 12 and 84. Higher scores indicate higher levels of perceived social support. This study used the Korean version of the Multidimensional Scale of Perceived Social Support (MSPSS) and used the mean scores in the analysis.<sup>20</sup>

**Suicide Risk Screening Tool:** This measure is a Korean adaptation of the Screening for Depression and Thoughts of Suicide.<sup>21</sup> It contains two items: (1) “For the past few weeks, have you felt sad or hopeless?” and (2) “For the past few weeks, have you thought of harming or planned to harm yourself?”.<sup>22</sup> It classifies suicide risk into three levels (minimal, low, and high). Those who answer “Yes” to either of the items above are placed in the low-suicide-risk group. Those who answer “Somewhat Agree” or “Strongly Agree” to the item on likelihood of committing suicide or “None” to the item on protective factors are placed in the high-suicide-risk group. All study participants were placed into three different groups based on this criteria.

### Statistical Analysis

The general characteristics of the participants were analyzed using frequency analysis and descriptive statistics. A skewness-kurtosis test was used to evaluate the normal distribution of values.<sup>23</sup> To verify differences between groups, the analysis of variance with post hoc Bonferroni was used. And to examine the relationships among psychosocial variables that affect suicide risk, a logistic regression was used. In the exploratory stage of variable selection, as clinically plausible predictors as possible were applied to a hierarchical variable selection method to make the best-fit model. The analyses regarding the relationship between suicidal risk and independent factors, including IES-R and MSPSS subscales (MSPSS\_FAM, MSPSS\_FRI, and MSPSS\_SO), were performed. Model 1 was adjusted for age and sex and model 2 was adjusted for age, sex, and depressive mood (PHQ-9). All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 24.0 (IBM SPSS Corp.; Armonk, NY, USA). The significance level was  $P < 0.05$ . A Bonferroni correction was applied to adjust for multiple comparisons.

## RESULTS

The mean age of the participants was 27.6 years, and of the 451 participants, 197 were men (43.7%) (Table 1). All variables did not exceed the absolute skewness value of 2 and the absolute value of kurtosis of 7,<sup>24</sup> which did not significantly violate the normal distribution assumption. The level of PTSD symptoms as measured on the IES-R scale was higher in both the low-risk and high-risk groups than in the minimal-risk group (Table 2). When depressive

**Table 1.** General Characteristics of the Participants (n = 451)

Characteristics	Values
Sex (male)	197 (43.7%)
Age	27.61±13.80
Education (year)	12.48±2.33
Index trauma	
Earthquake	267 (59.2%)
Typhoon	30 (6.7%)
Marital status	
Unmarried	367 (81.4%)
Married	68 (15.1%)

Values were presented as mean ± SD or n (%).

symptoms as measured on the PHQ-9 scale increased but the perceived social support from the family (MSPSS\_FAM) score decreased, suicide risk increased. Depressive symptoms emerged as the most influential predictor of suicide risk, even after controlling for other predictors. Unlike in the minimal-risk group, suicide risk decreased as perceived social support from the family increased (0.895, 95% CI, 0.832-0.963). PTSD symptoms were positively associated with suicide risk when we did not control for depressive symptoms; however, the former did not have a significant effect on the latter when we controlled for depressive symptoms (Table 3).

The results on the mediating effect were as follows: The results showed that PTSD symptoms (independent variable) had a statistically significant effect on both depressive symptoms (mediator) ( $\beta = 0.424, P < .001$ ) and suicide-risk level (dependent variable) ( $\beta = 0.222, P < .001$ ). In addition, the mediating effect of depressive symptoms was found to be statistically significant ( $\beta = 0.360, P < .001$ ) when we controlled for PTSD symptoms; the effect of PTSD symptoms, on the other hand, was not statistically significant ( $\beta = 0.069, P = .149$ ). This suggests that the relationship between PTSD symptoms and suicide risk is fully mediated by depressive symptoms (Figure 1). That is, PTSD symptoms indirectly influence suicide risk

only through the mediation of depressive symptoms and have no direct effect on suicide risk.

## DISCUSSION

This study investigated the relationship between psychological symptoms, social support, and suicide risk in natural disaster survivors. The results of comparing the three groups classified based on suicide risk suggested that both the low- and high-risk groups showed higher levels of PTSD and depressive symptoms and lower levels of perceived social support from family than those of the minimal-risk group. The effect of perceived social support was less significant than that of depressive symptoms; PTSD symptoms had an indirect effect on suicide risk via the full mediation of depressive symptoms.

It has been reported that the prevalence of severe disorders and the severity of symptoms are lower in natural disaster survivors than those in victims of man-made traumatic events (e.g., rapes, wars, and terror attacks) and technological disasters (e.g., industrial accidents and airplane/ship accidents). However, the victims' daily lives are still affected by the traumatic experience, often for years or even decades after the event, even when their psychological symptoms do not meet the diagnostic criteria for psychiatric disorders. In the present study, those with suicide risk (the low- and high-risk groups) scored significantly higher on the IER-S scale than their counterparts (the individuals in the minimal-risk group). This suggests that it is crucial to assess the suicide risk of those with relatively severe PTSD symptoms and take proper preventive measures, even when the severity of their symptoms is below the clinical level.

The effect of disaster on mental health is still a controversial topic.<sup>25</sup> However, a previous study revealed that natural disaster survivors report PTSD symptoms, such as intrusive symptoms, avoidance, and overarousal, more frequently than others even 13 years after the event.<sup>26</sup> Most of those exposed to an earthquake also reported that the

**Table 2.** The Differences of the IES-R, PHQ-9, and MSPSS by Suicide-Risk Group

	Suicidal Risk			F	P	Post hoc
	Minimal (n = 374)	Lower (n = 43)	Higher (n = 34)			
Age	28.18±14.25	22.60±6.59	27.29±14.17	2.618	.074	M, L, H
IES-R	9.06±12.35	15.09±15.48	19.00±19.24	11.709	<.001	M < L, H
PHQ-9	4.64±4.69	9.88±6.46	11.41±7.86	42.466	<.001	M < L < H
MSPSS total	69.74±13.13	60.17±14.83	53.94±20.15	26.320	<.001	M > L, H
MSPSS_FAM	23.53±5.14	18.12±6.49	17.71±8.13	31.615	<.001	M > L > H
MSPSS_FRI	22.91±5.07	20.93±5.32	17.94±7.57	15.101	<.001	M, L > H
MSPSS_SO	23.28±5.00	21.12±5.96	18.29±7.16	15.751	<.001	M > L, H

IES-R, Impact of Event Scale Revised; PHQ-9, Patient Health Questionnaire; MSPSS, Multidimensional Scale of Perceived Social Support; FAM, family factor; FRI, friends factor; SO, significant other factor; M, minimal suicidal risk; L, lower suicidal risk; H, higher suicidal risk.

**Table 3.** The Association Among Social Support, Post-traumatic Stress Symptoms, Depressive Symptoms, and Suicidality Using Multinomial Logistic Regression Analysis

	Low					High				
	B	Std. Error	Wald	Sig.	OR (95% CI)	B	Std. Error	Wald	Sig.	OR (95% CI)
Unadjusted										
IES-R	0.017	0.012	2.033	0.154	1.018 (0.994-1.042)	0.035	0.012	8.548	0.003	1.036 (1.012-1.060)
MSPSS_FAM	-0.148	0.032	21.792	<0.001	0.863 (0.811-0.918)	-0.089	0.037	5.795	0.016	0.915 (0.851-0.984)
MSPSS_FRI	0.013	0.047	0.073	0.788	1.013 (0.924-1.109)	-0.035	0.046	0.572	0.449	0.966 (0.883-1.057)
MSPSS_SO	0.022	0.049	0.210	0.647	1.023 (0.929-1.125)	-0.041	0.049	0.701	0.402	0.960 (0.873-1.056)
Model 1										
IES-R	0.015	0.014	1.134	0.287	1.015 (0.988-1.043)	0.028	0.013	4.774	0.029	1.029 (1.003-1.055)
MSPSS_FAM	-0.147	0.036	16.841	0.000	0.863 (0.805-0.926)	-0.098	0.041	5.597	0.018	0.907 (0.837-0.983)
MSPSS_FRI	0.026	0.061	0.185	0.667	1.026 (0.912-1.156)	0.004	0.053	0.007	0.932	1.005 (0.905-1.115)
MSPSS_SO	0.018	0.059	0.097	0.756	1.019 (0.907-1.143)	-0.059	0.052	1.267	0.260	0.943 (0.851-1.045)
Model 2										
PHQ-9	0.145	0.037	15.299	<0.001	1.156 (1.075-1.243)	0.163	0.038	18.057	<0.001	1.177 (1.092-1.268)
IES-R	-0.008	0.015	0.260	0.610	0.992 (0.963-1.023)	0.000	0.015	0.000	0.985	1.000 (0.970-1.030)
MSPSS_FAM	-0.111	0.037	8.834	0.003	0.895 (0.832-0.963)	-0.061	0.043	2.025	0.155	0.941 (0.866-1.023)
MSPSS_FRI	0.020	0.060	0.109	0.741	1.020 (0.907-1.148)	0.001	0.052	0.000	0.985	1.001 (0.903-1.109)
MSPSS_SO	0.010	0.059	0.029	0.865	1.010 (0.900-1.134)	-0.070	0.052	1.796	0.180	0.932 (0.842-1.033)

Model 1 was adjusted for age and sex. Model 2 was adjusted for age, sex, and depressive mood. OR, odds ratio; IES-R, Impact of Event Scale-Revised; PHQ-9, Patient Health Questionnaire; MSPSS, Multidimensional Scale of Perceived Social Support; FAM, family factor; FRI, friends factor; SO, significant other factor.

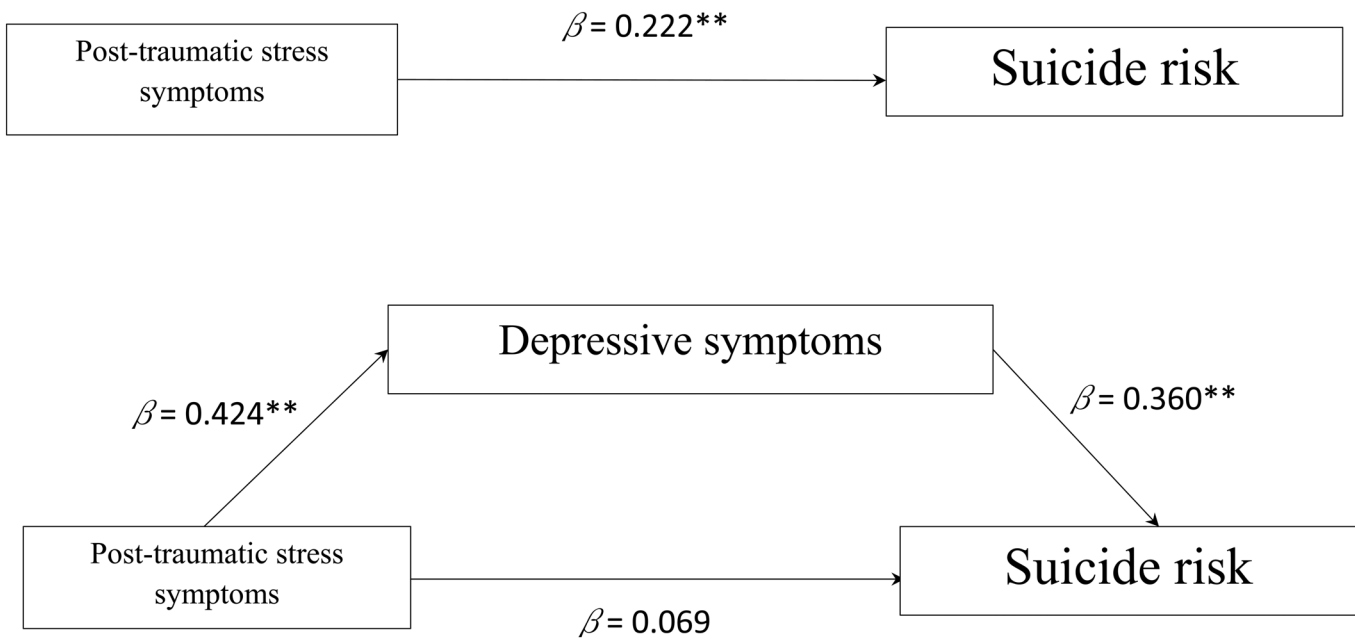


Figure 1. The mediating effect of depressive symptoms in the relationship between post-traumatic stress symptoms and suicide risk. \*\**P* < .001.

experience affected their lives and that they had lingering PTSD symptoms even 50 years after the incident.<sup>27</sup> In particular, for natural disasters, children, adolescents, and women experienced more psychological difficulties in both the long and short terms.<sup>27,28</sup> Therefore, depressive and PTSD symptoms are likely to significantly increase suicide risk in these vulnerable populations.

Previous studies have reported that impulsivity increases suicide risk, while social support serves as a buffer for those with PTSD and anxiety disorders; however, one study showed that the buffering effect of social support was only significant in a patient group and not in the general population.<sup>13</sup> The findings of the present study are consistent with the effects on the patient group, except that the role of perceived social support was weakened when we controlled for the effect of depressive symptoms. This result is also consistent with the extant literature that stresses the importance of current and previous psychiatric issues.<sup>6</sup> Research has also shown that social support mediates the relationship between depression and suicide risk.<sup>29</sup> In the present study, perceived social support was highest in those with minimal suicide risk, suggesting that perceived social support is negatively associated with suicide risk. However, in the results of the multinomial logistic regression analysis, the effect of perceived social support was not significant when depressive symptoms were considered. This is likely due to the highly significant effect of depressive symptoms on suicide risk.

The interpersonal theory of suicide suggests that individuals with repeated exposure to painful experiences may have a higher threshold for pain or a reduced fear

of death, due to habituation and the opponent process, among others.<sup>30</sup> Those who have acquired the capacity to commit suicide have reportedly had numerous painful and challenging experiences; as a consequence, they are familiar with the lethal stimulus required to commit suicide and are positively stimulated by suicidal behavior.<sup>10</sup> This is likely to lead to more severe suicidal behavior. Those with a more extensive history of suicide attempts are more capable of successfully committing suicide. Exposure to a natural disaster may be one such painful experience that can increase the capacity to commit suicide. A recent study on the relationship between exposure to disaster and suicide reported that exposure to repeated disasters, rather than a single disaster, increased suicide risk. Although our study did not assess the frequency of disasters, it did incorporate the degree of subjective impact of the disasters and found the degree of subjective impact to be associated with suicide risk. This suggests that such emotional impact reduces the fear of death or pain, thus increasing suicide risk.

The limitations of this study are as follows. First, while study participants were natural disaster survivors, their clinical diagnoses or clinical histories were not assessed. Second, the instrument used to measure suicide risk was not highly specific, as it included only two items covering mood symptoms and suicide plans. Third, the assessment of natural disaster did not include the frequency or type of natural disasters. Fourth, there was no objective assessment of the economic and human costs of the disasters. Fifth, the study had a cross-sectional design without a follow-up to investigate the long-term relationships between suicide risk, psychological symptoms, and social support.

Nevertheless, this study made the unique contribution of investigating the relationship between natural disaster exposure and psychological problems using a multidimensional assessment that considered perceived social support and suicide risk. While previous research has mainly focused on anxiety and related symptoms following disasters, the present study demonstrated the benefit of the multidimensional approach, including the assessment of depressive symptoms, PTSD symptoms, perceived social support, and suicide risk, in understanding the emotional aspects of the effects of experiencing disaster. Future research with a long-term follow-up of individuals exposed to various types of disasters is needed.

The findings of this study suggest that subjective distress following a natural disaster is higher in individuals with suicide risk. Various psychological factors, particularly PTSD symptoms, may affect suicide risk via depressive symptoms. This emphasizes the need to include an assessment of depressive and PTSD symptoms and suicide risk in assessing and treating individuals who have experienced a disaster.

**Ethics Committee Approval:** Ethics committee approval was received from the Institutional Review Board of Hallym University (HIRB-2015-040).

**Informed Consent:** Written informed consent was obtained from all participants who participated in this study.

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