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RESEARCH ARTICLE

The Psychological Impact on Rescue Workers of the 2023 Kahramanmaraş (Turkey) Earthquakes: A Six-Month Follow-Up Study

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ABSTRACT

Background: Rescue workers responding to major disasters are at increased risk of adverse psychological outcomes, including depression, anxiety, stress, and posttraumatic stress symptoms. However, limited longitudinal data exist regarding their mental health, resilience, and posttraumatic growth following the February 6, 2023 Kahramanmaraş Earthquakes.

Methods: This study examines the changes in depression, anxiety, stress, and posttraumatic stress levels of search and rescue workers 1 and 6 months after the Kahramanmaraş Earthquakes on February 6, 2023. Additionally, the study explores the levels of psychological resilience and posttraumatic growth. This longitudinal follow-up study was conducted using a self-administered questionnaire which included the Impact of Events Scale (IES-R) and Depression, Anxiety and Stress Scale – 21 Items (DASS-21). The Brief Resilience Scale (BRS) and Post Traumatic Growth Inventory (PTGI) were added to the six-month review.

Results: A total of 34 rescue workers were enrolled in the final analysis. There were no differences in post-traumatic stress disorder symptoms, depression, anxiety, and stress levels among rescue workers after 1 and 6 months. A significant and moderate correlation was found between Depression, Anxiety, IES-R, PTGI and BRS scores, between the IES-R scale and PTGI.

Conclusion: The findings highlight the ongoing psychological burden experienced by rescue workers following disaster response operations and underscore the need for interventions aimed at improving their psychological well-being.

Keywords: Earthquake, Rescue Workers, Post-Traumatic Stress, Resilience, Post-Traumatic Growth.

Introduction

On February 6, 2023, two consecutive earthquakes occurred, affecting 11 provinces of Türkiye. While the first earthquake had a magnitude of 7.8 and occurred in the early morning hours, another earthquake with a magnitude of 7.6 occurred just nine hours later. About 50,000 individuals lost their lives because of the earthquakes, and another 107,000 were injured. The disaster destroyed 18,200 buildings and left 1.5 million people homeless. Thus, the Kahramanmaraş earthquakes were recorded as the deadliest earthquake in modern Turkish history.[1,2] The post-disaster response process was carried out with the intensive efforts of both local and international aid teams, with thousands of rescue personnel playing an active role in the field.[3,4]

Rescue workers face not only physical challenges but also serious psychological burdens in such disasters.[5,6] Factors such as contact with dead bodies, feelings of helplessness, extreme fatigue, the pressure of racing against time, and concerns about personal safety can negatively affect their psychological well-being.[7] Symptoms such as post-traumatic stress disorder (PTSD), anxiety, depression, and burnout are frequently reported in this group.[8,9,10]

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Rescue workers frequently encounter psychologically distressing situations, yet in some cases, trauma exposure can foster greater resilience and post-traumatic growth. One definition of resilience is the ability to cope with stressful and unpredictable demanding situations, to adapt, to employ flexibility, and to go forward, to recover and heal oneself in the face of a challenging stress factor such as an earthquake.[11,12] Research has indicated that rescue workers reported positive changes after this experience.[13,14] These changes can include improved relationships, new life opportunities, a heightened sense of personal strength, a deeper appreciation for life, and spiritual growth. [15,16] Positive psychological changes brought about by overcoming trauma or difficult circumstances are also referred to as post-traumatic growth.[17] In a systematic review, it was found that these professionals felt stronger and were more capable of handling challenges after exposure to traumatic events.[18]

Post-traumatic responses should not be conceptualized solely in terms of psychopathology. Following a traumatic event, individuals may experience psychological distress while simultaneously developing adaptive responses such as resilience and post-traumatic growth (PTG). Within Tedeschi and Calhoun's cognitive processing model of PTG, highly challenging traumatic experiences may disrupt previously held beliefs and assumptions, initiating cognitive processing and meaning reconstruction that can contribute to positive psychological changes. From this perspective, PTG does not represent the absence of psychological distress or PTSD; rather, positive psychological change and post-traumatic symptoms may coexist. Resilience, in contrast, refers to the capacity to maintain or regain adaptive functioning in the face of adversity and may represent a related but conceptually distinct dimension of post-traumatic adaptation. Examining PTSD, resilience, and PTG together may therefore provide a more comprehensive understanding of psychological adaptation following disaster exposure.

There are some studies examining the psychological problems experienced by rescue workers, [19,20] as well as studies examining their resilience [21, 22] and post-traumatic growth. [23, 24] However, longitudinal studies examining the simultaneous trajectories of psychological distress, resilience, and post-traumatic growth among rescue workers following a major earthquake remain limited.

Our previous study examined the immediate psychological impact of the 2023 Kahramanmaraş earthquakes on Turkish rescue workers using a cross-sectional design. In that study, 103 professional and volunteer rescue workers were assessed approximately three weeks after the earthquake using the Impact of Event Scale-Revised (IES-R) and the Depression, Anxiety and Stress Scale-21 (DASS-21). The findings indicated that 23% of participants had probable PTSD symptoms, while depression was generally in the mild range and anxiety and stress were within the normal range. Furthermore, PTSD symptoms were significantly associated with depression, anxiety, and stress, and higher PTSD symptoms were observed among participants reporting greater trauma exposure, fear of earthquakes or aftershocks, longer daily rescue work, and a need for psychological support.[25] Although these findings provided important evidence regarding the early psychological impact of the disaster on rescue workers, the cross-sectional design of the previous study did not allow conclusions to be drawn about the course of these psychological responses over time. Indeed, the previous study identified the need for repeated assessments of

the same individuals to better understand how psychological responses change following a disaster.[25] The present study was designed to address this limitation by conducting a six-month follow-up assessment of participants from the original study. Rather than replicating the previously reported cross-sectional findings, the current study focuses on the longitudinal course of psychological responses following the earthquake. Specifically, it examines changes in post-traumatic stress, depression, anxiety, and stress over the six-month period and additionally evaluates psychological resilience and post-traumatic growth as potential indicators of adaptive psychological responses. Thus, the present study extends our previous findings by addressing the temporal dimension of psychological distress and positive psychological adaptation among rescue workers following a major disaster.

H1. Post-traumatic stress, depression, anxiety, and stress symptoms will significantly change between the initial and six-month follow-up assessments.

H2. Higher post-traumatic stress symptoms will be associated with greater psychological distress at follow-up.

H3. Psychological resilience and post-traumatic growth will show significant associations with post-traumatic stress symptoms and psychological distress.

Methods

Participants

Participants from our earlier study—rescue workers involved in the Kahramanmaraş earthquakes—agreed to take part in our longitudinal follow-up study. The inclusion requirements were the same as for our earlier study: (1) participants had to be at least eighteen years old, (2) able to comprehend and give consent for participation, and (3) involved in rescue operations during the acute phase following the Kahramanmaraş Earthquakes.

For the current follow-up, participants from the original cohort were contacted approximately six months after the initial assessment and invited to complete a second assessment. Of the 103 participants in the original study, 57 had indicated willingness to participate in a follow-up assessment and were subsequently contacted. Of these, 34 completed the follow-up questionnaire and were included in the present analysis. The present study therefore uses the repeated assessment of this subgroup to examine changes in psychological outcomes over time.. Demographic information about participants was summarized in Table 1.

Procedure

As an extension of our previous study (conducted in March 2023), the current observational study examines the long-term psychological effects of the rescue workers. In July 2023, six months after the catastrophe, we reached out to past participants using the email list for the initial study and asked them to complete an online survey using Google Forms. The emails were taken to prevent participants from completing the questionnaire more than once and to check whether they had completed more than one questionnaire using the same email.

This study was carried out per the Helsinki Declaration, updated in 2004. The University's Ethics Committee approved the study on April 10, 2023. Participants were informed of the study's aim, procedure, and anonymity. Data was collected anonymously and analysed at the group level, with no link to participants' names.

Measures

In the socio-demographic questionnaire, there were questions such as age, gender, marital status, and educational background. Additionally, questions about their involvement in rescue work, including how they participated, how long they were on duty, whether they were volunteers, whether they suffered trauma or loss while on rescue, and whether they needed psychological help, were also asked.

The Impact of Event Scale-Revised (IES-R) [25] was employed to evaluate symptoms of posttraumatic stress disorder. It is a self-report questionnaire with confirmed psychometric properties. It is made up of 22 questions, each with a Likert-type response format ranging from 0 ("not at all") to 4 ("extremely"). In addition to subscale scores for the intrusion, avoidance, and hyperarousal subscales, the IES-R generates a total score (ranging from 0 to 88). A high score implies that the incident had a significant impact on the individual. [26] It has been shown that a cutoff score of ≥23 is suggestive of PTSD. Cronbach's alpha was previously used to evaluate the scale's internal consistency, and the results showed coefficients of 0.94. The Cronbach's alpha for the overall score of our study is 0.92.

To assess depression, anxiety and stress levels, we used the Depression, Anxiety and Stress Scale (DASS-21).[27] It consists of three self-report tests intended to assess depression, anxiety, and stress. Seven items make up each of the three DASS-21 scales, and these items are further broken down into subscales with associated content. The depression scale is used to measure symptoms such as lethargy, anhedonia, self-deprecation, hopelessness, dysphoria, and a devaluation of life. Autonomic arousal, situational anxiety, skeletal muscle reactions, and subjective anxious affect experience are all measured by the anxiety scale. The chronic nonspecific arousal levels can be measured by the stress scale. It assesses issues with relaxation, anxiety, arousal, impatience, irritability, and over reactivity. The values for the relevant items are added to ascertain the stress, anxiety, and depression scores.[28] Sum scores of 10 or higher on all subscales are suggestive of likely anxiety, depression, or stress.[27] The Cronbach's alpha was 0.91 for the current study.

The Brief Resilience Scale (BRS),[29] was used to determine resilience. The BRS was developed to evaluate a person's capacity to rebound or bounce back from stress. The BRS has six items, each of which is evaluated using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Items 1, 3 and 5 are positively phrased, and items 2, 4 and 6 are negatively phrased. The mean of the six items is determined by reversing the scoring of the negatively phrased items to assess the questionnaire. Higher scores indicate greater resilience; the ratings range from 6 to 30 points. [29] In the current study, the BRS had an acceptable Cronbach's alpha (0.75).

The Posttraumatic Growth Inventory (PTGI) [30] was used to evaluate an individual's self-improvement and post-traumatic growth. The instrument includes a 21-item rate on a 6-point Likert scale based on Tedeschi's five-factor model[17], which is one of the most valid and dependable resources for assessing personal progress following a stressful experience. The three subscales in the Turkish version of the PTGI—changes in relationship, changes in philosophy of life, and changes in self-perception—are distinct from those in the original edition. The sum of the scores indicates the degree of post-traumatic growth. Positive psychological changes resulting from adverse life events are indicated by higher scores. Cronbach's alpha values for the overall score in the original study were 0.92. In this study, the

Cronbach's Alpha coefficient determined is 0.94.

Data Analysis

For data analysis, IBM Corp., Armonk, NY, USA's Statistical Package for the Social Sciences (SPSS) version 25.0 was utilised. The Shapiro-Wilk test and the Levene test were used to assess the homogeneity of variances and the normality of the distribution. The mean and standard deviation values for quantitative data, as well as numbers and percentages, were used to summarize descriptive statistics. According to the answers received from the demographic form, the difference between the scale scores applied to individuals at 6-month intervals was evaluated with the Wilcoxon signed rank test. In Table 2 we used only three variables (marital status, becoming a professional rescue team worker and rescue working time for the day) because the other variables were not distributed homogeneously (see Table 1). Using a Pearson correlation coefficient analysis, the scales' relationship was examined. The IES-R scale cut-off point was utilized to compare groups using the independent sample t-test and the Mann-Whitney U test. A threshold of $p<0.05$ was established for statistical significance.

Results

Scale evaluations of the rescue workers were taken 1 month later and 6 months later, according to their marital status, whether they were a professional rescue team and the duration of rescue work during the day. Baseline psychological and demographic characteristics did not significantly differ between participants who completed the six-month follow-up and those who did not. As seen in Table 2, no statistical differences were found for the IES-R scale and its sub-factors (Intrusion, Avoidance, and Hyperarousal), as well as for the DASS scale and its sub-factors Depression, Anxiety, and Stress ($p>0.05$). (Insert Table 2 below).

Table 1. Characteristics of Participants (Time 2)

	n (%)
Gender	
Female	2 (6)
Male	32 (94)
Marital status	
Single	20 (59)
Married	14 (41)
Education	
High school and below	9 (26)
University and above	25 (74)
Professional search and rescue team worker	
Yes	13 (38)
No	21 (62)
Institution	
Voluntarily	5 (15)
Civil Society Organization	2 (6)
Civil servant	27 (79)
Search and rescue working time for the day	
8 hours and less	7 (21)
9 – 17 hours	18 (53)
18 hours and more	9 (26)
Witnessing the deceased or seriously injured during rescue efforts	
Yes	31 (91)
No	3 (9)
Suffering of the near-death experience, serious injury or serious mental trauma during rescue efforts	
Yes	2 (6)
No	32 (94)
Receiving professional psychological support after the earthquake	
Yes	3 (9)
No	31 (91)
Brief Resilience Scale (BRS) level	
Low resilience	6 (18)
Normal resilience	22 (64)
High resilience	6 (18)
Depression Anxiety Stress Scales (DASS) level	
Depression (normal, mild, moderate, severe, very severe)	19 (56), 1 (3), 7 (20), 2 (6), 5 (15)
Anxiety (normal, mild, moderate, very severe)	21 (62), 5 (15), 5 (15), 3 (8)
Stress (normal, mild, moderate, severe)	26 (76), 1 (3), 3 (9), 4 (12)

Table 2. Statistical differences between one and six months

	Marital status				Professional rescue team worker				Rescue working time for the day					
	Single		Married		Yes		No		8 hours and less		9 – 17 hours		18 hours and more	
	Mean±SD	*p*	Mean±SD	*p*	Mean±SD	*p*	Mean±SD	*p*	Mean±SD	*p*	Mean±SD	*p*	Mean±SD	*p*
(IES-R) (after 1 month)	19.75±13.93	0.484[W]	32.29±16.03	0.551[W]	23.31±14.61	0.278[W]	25.90±16.89	0.904[W]	27.86±19.56	0.310[W]	24.17±13.73	0.897[W]	24.11±18.52	0.678[W]
(IES-R) (after 6 months)	20.35±14.20		30.93±20.78		20.62±14.20		27.24±19.49		20.14±24.05		26.83±16.52		24.00±15.91	
IES-R –INT (after 1 month)	7.60±5.91	0.887[W]	13.79±7.32	0.244[W]	9.85±6.49	0.248[W]	10.33±7.64	0.862[W]	11.00±7.39	0.310[W]	9.78±6.57	0.932[W]	10.22±8.70	0.767[W]
IES-R –INT (after 6 months)	7.95±5.72		11.00±7.96		7.62±5.80		10.19±7.30		6.57±8.66		10.06±6.37		9.56±6.33	
IES-R –AVD (after 1 month)	8.55±8.61	0.641[W]	12.14±6.72	0.916[W]	10.00±7.62	0.721[W]	10.05±5.94	0.952[W]	12.00±8.56	0.463[W]	9.28±5.44	0.442[W]	10.00±7.25	0.726[W]
IES-R –AVD (after 6 months)	8.45±5.28		13.21±7.33		9.46±5.40		11.00±7.23		9.43±8.44		11.11±6.45		9.78±5.70	
IES-R –HYP (after 1 month)	3.60±3.86	0.932[W]	6.36±5.17	0.805[W]	3.46±2.96	0.504[W]	5.52±5.26	0.932[W]	4.86±5.55	0.345[W]	5.11±4.52	0.487[W]	3.89±3.34	0.944[W]
IES-R –HYP (after 6 months)	3.95±3.93		6.71±6.62		3.54±3.76		6.05±5.94		4.14±7.73		5.67±4.84		4.67±4.77	
(DASS) (after 1 month)	11.55±9.89	0.468[W]	15.36±9.09	0.861[W]	10.62±8.52	0.625[W]	14.67±10.11	0.276[W]	11.14±11.77	0.446[W]	15.72±8.64	0.330[W]	9.44±9.21	0.263[W]
(DASS) (after 6 months)	11.45±11.89		16.29±13.95		12.77±11.92		13.86±13.59		7.57±15.69		14.72±11.45		15.44±13.20	
DASS – Depression (after 1 month)	4.95±4.20	0.962[W]	7.93±5.68	0.096[W]	5.38±5.58	0.861[W]	6.67±4.69	0.105[W]	4.71±5.71	0.398[W]	7.11±4.26	0.132[W]	5.44±6.00	0.833[W]
DASS – Depression (after 6 months)	4.75±5.12		5.64±6.44		5.31±5.82		5.00±5.64		2.71±5.62		5.44±5.10		6.33±6.67	
DASS – Anxiety (after 1 month)	3.05±3.32	0.721[W]	2.36±2.76	0.455[W]	1.62±2.10	0.635[W]	3.48±3.40	0.875[W]	3.14±3.81	0.713[W]	3.39±2.87	0.789[W]	1.22±2.64	0.106[W]
DASS – Anxiety (after 6 months)	2.90±3.19		3.50±4.17		2.08±2.18		3.81±4.13		2.43±5.16		3.56±3.38		2.89±2.76	
DASS – Stress (after 1 month)	3.55±3.45	0.622[W]	5.07±3.29	0.327[W]	3.62±2.60	0.479[W]	4.52±3.78	0.962[W]	3.29±3.09	0.344[W]	5.22±3.47	0.775[W]	2.78±2.91	0.176[W]
DASS – Stress (after 6 months)	3.80±4.36		7.14±5.16		5.38±5.42		5.05±4.72		2.43±5.16		5.72±4.38		6.22±5.54	

IES-R: Impact of Events Scale, DASS: Depression, Anxiety and Stress Scale, W: Wilcoxon signed rank test, *p<0.05,

Table 3. Correlation between scales and sub-scales (Time 2)

n=34	**Post Traumatic Growth Inventory (PTGI)**	**PTGI – Changes in Self-Perception**	**PTGI – Changes in Philosophy of Life**	**PTGI – Changes in Relationship**	**Brief Resilience Scale (BRS)**
Brief Resilience Scale (BRS)	-.027	-.016	-.065	-.050	**-**
Depression Anxiety Stress Scales (DASS)	.057	.040	.101	.018	**-0.391***
DASS - Depression	-.024	-.029	.018	-.072	**-0.397***
DASS - Anxiety	.003	-.041	.052	.018	**-0.512****
DASS - Stress	.107	.084	.141	.068	-0.305
Impact of Events Scale-Revised (IES-R)	.309	.285	**.353***	.261	**-0.398***
IES-R – Intrusion	**.376***	**.345***	**.408***	**.350***	**-0.377***
IES-R – Avoidance	.282	.265	**.350***	.190	**-0.388***
IES-R – Hyperarousal	.238	.202	.274	.221	**-0.482****

***p<0.05, **p<0.01**

The DASS and BRS scores of rescue professionals showed a substantial and moderate connection (r=-0.391), as seen in Table 3. Significant and moderate correlations were found between Depression (r= -0.397) and Anxiety (r= -0.512), which are the sub-factors of the DASS scale and BRS scores. Significant and moderate correlations were found between the IES-R scale and PTGI – Changes in Philosophy of Life (r= 0.353) and BRS (r= -0.398). Between IES-R – Intrusion and PTGI (r= 0.376), between PTGI – Changes in Self-Perception (r= 0.345), between PTGI – Changes in Philosophy of Life (r= 0.408), between PTGI – Changes in Relationship (r= 0.350) and BRS (r= -0.377), significant and moderate correlations were found. There were significant and moderate correlations between Avoidance (r= -0.388) and Hyperarousal (r= -0.482), which are the sub-factors of the IES-R scale and BRS scores (Insert Table 3, Figure 1 here). Although no statistically significant baseline differences were observed between follow-up completers and non-completers, the substantial attrition means that selective loss cannot be completely excluded.

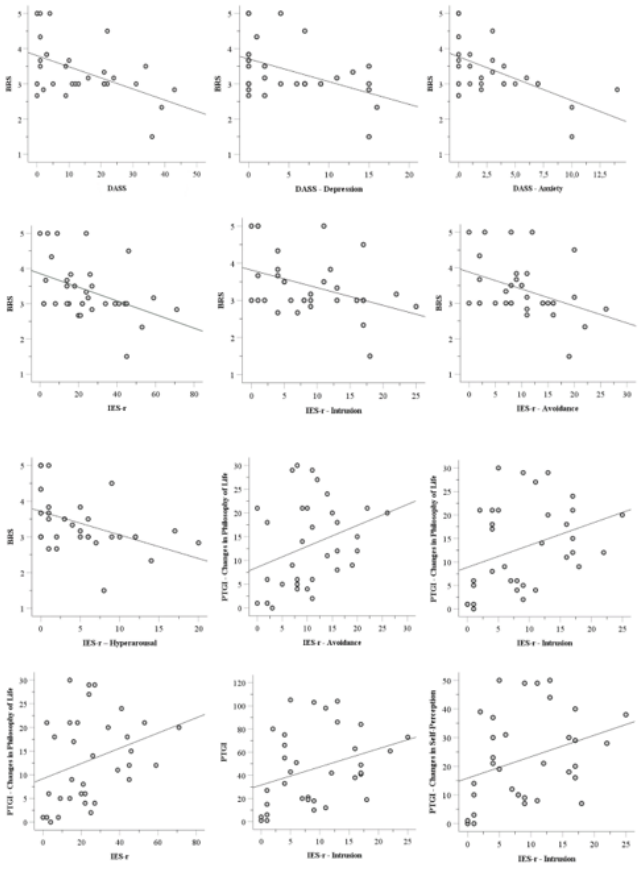

Figure 1. Correlation graphs

Table 4. Comparison between post-traumatic stress and other scales (Time 2)

	IES-R		
	<24 (Healthy) (n=18)	**24 and more (PTSD status) (n=16)**	***p***
Post Traumatic Growth Inventory (PTGI)	35.56±30.44	57.81±31.29	**0.044**[t]
Changes in Self-Perception	17.72±14.67	28.38±15.29	**0.046**[t]
Changes in Philosophy of Life	10.00±8.94	16.69±8.28	**0.035**[U]
Changes in Relationship	7.83±7.84	12.75±8.90	0.087[U]
Brief Resilience Scale (BRS)	3.55±0.79	3.19±0.80	0.281[U]
Depression Anxiety Stress Scales (DASS)	6.00±6.92	21.81±12.85	**<0.001**[U]
Depression	2.11±3.07	8.50±5.99	**0.002**[U]
Anxiety	1.56±2.41	4.94±3.89	**0.004**[U]
Stress	2.33±2.93	8.38±4.79	**0.001**[U]

t: Independent sample t-test, U: Mann-Whitney U test

Fig. 1 shows the correlations between the IES-R's subscales with BRS and also PTGI and PTGI's subscales. At the six-month assessment, higher IES-R scores were associated with higher PTGI scores and lower BRS scores. These cross-sectional associations should not be interpreted as evidence that post-traumatic stress caused changes in post-traumatic growth or resilience.

In the current study, the cut-off point of the IES-R scale was determined as 24, and those who scored 24 and above on the scale were considered to have PTSD. Depending on the cut-off point of the IES-R scale, it was examined whether rescue workers with and without post-traumatic stress disorder (PTSD) differed in terms of other scales in Table 4. Significant differences were observed between individuals with and without PTSD in terms of PTGI (p= 0.044), PTGI - Changes in Self-Perception (p= 0.046), PTGI - Changes in Philosophy of Life (p= 0.035) and the DASS (p< 0.001) and all its sub-factors (Insert Table 4, Figure 2 here).

Fig. 2 shows the participants' posttraumatic levels. Those with high levels of traumatic stress have increased rates of depression, anxiety, and traumatic growth, and their resilience has decreased.

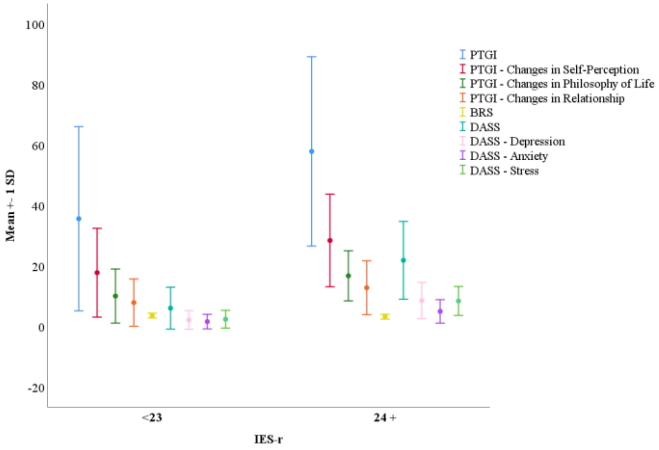

Figure 2. Correlation graph between IES-R and other scales

Discussion

The objective of this study was to assess the correlation and associated factors between depression, anxiety, stress levels, and PTSD symptoms in rescue workers 1 and 6 months after the Kahramanmaraş Earthquakes. The findings of this study reveal that six months after the earthquakes, rescue workers continued to experience significant psychological effects. This situation shows that first responders may need psychological support not only in the short term but also in the medium term after a disaster. In contrast to the literature,[31] there is no significant difference in PTSD symptoms, depression, anxiety, and stress levels among rescue workers after 1 and 6 months. National and cultural factors can explain this situation. The delayed recovery of the regions affected by the earthquake and their failure to return to their former state may prove an effective factor in this regard. The economic conditions of the country and the difficulty in accessing mental health services may have resulted in the participants declining to receive any service.

Additionally, we aimed to evaluate the relationship between psychological resilience and posttraumatic growth, depression, anxiety, stress levels, and PTSD symptoms among rescue workers six months after the earthquake. We found that, at follow-up, higher PTSD symptoms were associated with higher post-traumatic growth scores. Similar to our findings, a study conducted with volunteers in Turkey after the 2023 Kahramanmaraş earthquakes also revealed that volunteers who had participated in earthquake relief efforts experienced trauma symptoms but also reported positive changes in their sense of self and philosophy of life.[32] Similar results have been found in the study of Çorbacı et al. (2025)[7]. In Çorbacı et al. (2025)'s study[7], participants reported undergoing developmental changes following trauma, including changes in self-perception, an enhanced ability to recognise new situations, a greater understanding of the value of life and positive relationships related to personal growth. In Köse's study (2023)[33] with the rescue workers of the Izmir earthquake, the participants experienced symptoms of secondary traumatic stress, but also vicarious post-traumatic growth, such as discovering personal strength, relating to others, appreciating life and striving to do their job better. Post-traumatic growth (PTG) in rescue workers depends on various factors such as optimism, social support, spirituality, and philosophy of life. Coping methods such as acceptance and positive reappraisal also play a very important role in facilitating PTG. However, there are significant cross-cultural differences here. For example, while post-traumatic growth is not very common in Western countries after disasters, it is more prevalent in non-Western countries.[34] This is because encountering difficulties has different meanings in each culture. In Turkey, individuals find it easier to accept the events that happen to them in a spiritual sense and see these difficulties as opportunities.

In our study, higher resilience was associated with lower levels of psychological distress and post-traumatic stress symptoms. The subjects' levels of anxiety, despair, and PTSD symptoms declined as their psychological resilience rose. Previous studies have also shown that resilience may be a significant resource for reducing levels of psychological distress.[22,35,36] Although it was thought that those with low psychological resilience would be more affected by traumatic events,[36] on the contrary, higher post-traumatic stress symptoms were associated with higher PTGI scores and lower resilience scores at the six-month assessment. This finding may reflect individual differences

in post-traumatic adaptation; however, the mechanisms underlying this association cannot be determined from the present data. Similar to our findings, research has shown that rescue workers may experience increased resilience and better coping mechanisms following exposure to traumatic events.[13,14,18] A study conducted with firefighters in Turkey also revealed that Turkish firefighters were able to rely more on individual and spiritual coping resources after exposure to trauma.[37] Based on this, we can say that cultural exposure to trauma increases psychological and spiritual growth, especially in difficult professions such as rescue work and firefighting. This situation, of course, highlights the importance of psychological support in professions where exposure to trauma is common.

Several limitations should be considered. First, the small follow-up sample (n=34) substantially limits statistical power and the generalizability of the findings. Second, substantial attrition occurred between the initial cohort and the follow-up assessment, raising the possibility of selection bias. Although baseline characteristics of follow-up completers and non-completers should be compared where data are available, selective attrition cannot be completely excluded. Third, the study did not include a non-exposed control group, limiting the ability to distinguish disaster-related changes from changes that might occur over time. Fourth, post-traumatic growth and resilience were assessed only at the follow-up assessment, preventing us from examining longitudinal changes in these constructs. Fifth, PTSD symptoms were assessed using a self-report screening instrument rather than a structured clinical interview; therefore, the findings should not be interpreted as clinical diagnoses of PTSD. Sixth, information regarding additional traumatic experiences or subsequent rescue missions during the follow-up period was not systematically collected. Finally, the correlation analyses involved multiple comparisons, increasing the possibility of Type I error; therefore, these associations should be interpreted as exploratory and replicated in larger longitudinal samples.

Conclusion

In this follow-up study, although there was no difference in PTSD symptoms between the first month and six months, high levels of PTSD were still present in half of the participants as in the first study. Despite the negative impact on their mental health, the participants drew positive conclusions from this traumatic experience. Short-term and long-term counselling programs for rescue professionals are required to lower the risk of psychological trauma and improve mental health in subsequent rescue work. To assess the efficacy of psychosocial interventions for these workers, more research is required using semi-experimental designs and longer follow-up periods. Future research should examine routine psychological screening for rescue personnel following major disaster deployments, with repeated assessments extending beyond the immediate post-disaster period. Peer-support programs and resilience-focused interventions could be evaluated as components of occupational mental health services. Future intervention studies should also examine whether brief trauma-focused psychological interventions are effective for rescue workers who screen positive for clinically significant post-traumatic symptoms. Larger prospective cohorts with multiple follow-up assessments could use latent growth or mixed-effects models to examine individual trajectories of psychological distress, resilience, and post-traumatic growth.

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