

Psychopathological Reactions among Citizen Rescue Volunteers One and Six Months after a Shipwreck Tragedy

Leonidas J. Mantonakis¹, Christos Theleritis², Consantine Psarros¹, Maria Vasileiadou², Sofia Martinaki¹ and Joanna-Despoina Bergiannaki^{1,2*}

¹1st Psychiatric Department, National and Kapodistrian University of Athens, Eginition Hospital, Athens, Greece

²University Mental Health Research Institute (UMHRI), 11527 Athens, Greece

Abstract

Aim: This study aims to investigate sub-acute (one month after) and persistent (six months after) stress reactions and psychopathological symptoms experienced by citizen rescue volunteers involved in a shipwreck tragedy that occurred in the Aegean Sea near Paros Island, Greece.

Materials and methods: One month (study period 1) and six months following the event (study period 2), a joint task force group of mental health clinicians was organized in order to investigate the psychological consequences of the post-shipwreck rescue operation to the volunteer rescuers. 51 male rescuers (study period 1) and 57 male rescuers (study period 2) who participated as rescue volunteers on the night of the shipwreck were interviewed and assessed with the use of several questionnaires and inventories (State-Trait Anxiety Inventory-STAI; Athens Insomnia Scale-AIS; Eysenck Personality Inventory-EPI; Symptom Checklist-90-R-SCL-90-R; Mini-International Neuropsychiatric Interview-MINI).

Results: During study period 1, Post-Traumatic Stress Disorder (PTSD) according to ICD-10 criteria and insomnia were detected in 35.3% and 31.4% of participants respectively. While during study period 2, Post-Traumatic Stress Disorder (PTSD) and insomnia were detected in 25.5% and 17.6% of rescue volunteers respectively. Participants experiencing PTSD and those who felt sadness during the rescue operation had a significantly higher likelihood of suffering from insomnia.

Conclusion: Psychopathological symptoms observed within one month after a rescue operation remained almost unchanged after six months. Thus, early detection of some personal characteristics, such signs as insomnia and PTSD among rescue volunteers is crucial for immediate treatment and the prevention of long-lasting psychopathology.

Keywords: Rescue volunteers • Shipwreck • Psychopathological reactions • PTSD • Insomnia

Introduction

Limited literature exists on the psychological, emotional, behavioural and cognitive impact experienced by civilian rescue volunteers following shipwrecks in the open sea [1]. However, the recent surge in maritime disasters in the Aegean and Mediterranean Seas, owing to refugees attempting to reach Europe, has made these incidents more common, necessitating a novel scientific approach.

All rescue workers involved in emergency situations, immediately following any disaster, play a pivotal role in saving lives and providing necessary support. However, their tasks make them highly susceptible to adverse emotional effects [2,3]. The responsibilities of rescuers expose them to physically demanding, exhausting, perilous and life-threatening situations [4-6]. They often witness physical harm or the suffering of victims [6], leading to 'vicarious traumatization' [7,8], gruesome deaths, severe injuries, or intense emotional demands, such as searching for survivors, exposure to harsh weather conditions, prolonged danger, loss and emotional or physical strain during or after the disaster [4]. These factors significantly elevate the risk of severe distressing emotional

reactions and various types of psychopathological symptoms among rescue workers [9-13].

The psychological and psychophysiological symptoms experienced by rescue workers after disaster experiences persist for several days, weeks, or even months [7,13,14]. These include a) emotional reactions: feelings of shock, fear, grief, anger, resentment, guilt, shame, helplessness, hopelessness, or emotional numbness. b) Cognitive reactions: confusion, disorientation, indecisiveness, worry, shortened attention span, difficulty concentrating, memory loss, unwanted memories and self-blame. c) Physical reactions: tension, fatigue, edginess, difficulty sleeping, bodily aches or pain, startling easily, racing heartbeat, nausea, change in appetite and change in sex drive. d) Interpersonal reactions: distrust, irritability, withdrawal, isolation, feeling rejected or abandoned, being distant, judgmental, or over-controlling [2,5,15,16]. These psychopathological reactions and symptoms pose enduring readjustment challenges and may lead to acute stress reactions, long-lasting stress disorders, anxiety disorders, depression, PTSD [17-23], phobias, obsessive-compulsive symptoms, interpersonal sensitivity, psychoticism, somatization [13,24-26], chronic symptomatic distress [27] and burnout [28-30]. For instance, in the review by Aker AT [31] of an air crash incident, over eighty percent of the rescue workers handling victims' bodies exhibited post-traumatic symptoms, with more than half experiencing moderately severe symptoms. Nearly two years post-crash, a fifth of the rescue workers continued to display symptomatic behaviour. Additionally, rescue workers often encounter various role stresses, feeling inadequate even when facing constraints beyond their control, such as challenging weather conditions, blaming themselves for unsuccessful rescue efforts and experiencing guilt when prioritizing their efforts [4].

Civilian rescue volunteers engaged in relief efforts in disaster zones often endure significant psychological distress and can be profoundly impacted by Critical Incident Stress (CIS) [32-37], leading to symptoms such

***Address for Correspondence:** Joanna-Despoina Bergiannaki, 1st Psychiatric Department, National and Kapodistrian University of Athens, Eginition Hospital, Athens, Greece, E-mail: bergiannaki@gmail.com

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as hyperarousal, flashbacks, emotional numbness, insomnia [14,38-40], profound feelings of helplessness and self-condemnation [41]. They frequently report more Post-Traumatic Stress Symptoms (PTSS) and PTSD compared to the general population [11,42], professional rescuers and trained rescue volunteers after various incidents [43-46]. In a review by Thormar SB, et al. [1], PTSD prevalence was indicated between 24% and 46% in volunteers, like in disaster victims. Moreover, volunteers lacking adequate training, minimal emergency work experience and lacking psychological and social support are at an increased risk for post-traumatic stress and psychological impairment [1,25,46-48]. The study by Hagh-Shenas H, et al. [45] showed that college students exhibited significantly higher PTSD scores than professional rescue workers after an earthquake. Similar results were found in rescue volunteers compared to professional rescue workers after a bus crash in Norway [43] and among unaffiliated volunteers after the World Trade Center (WTC) attacks [1,6,46].

During a disastrous event, both victims and rescuers confront various fears. Among these, the specific fear of death is particularly debilitating for rescuers [49]. Additionally, the actual potential of facing imminent death is an intensely felt fear constituting a primal form of death anxiety, not present in every threatening situation [50,51]. This specific fear positively correlates with the persistence of acute stress reaction [20], sleep disturbances [38], PTSD and when combined with personality traits like neuroticism, predisposes individuals to various psychopathological reactions and consistently contributes to post-traumatic stress responses and long-lasting PTSD [9,13,25,49,52].

Multiple risk factors contribute to the development of PTSD in disaster victims, professionals, volunteers and unaffiliated civilian rescuers [53]. These factors include past psychiatric history [17,19], degree of exposure to the disaster [54,55], physical injury [56], perceived personal threat [21], event-related fears regarding death [54,57], near-death experiences [58], insomnia [13,40], perception of fear of imminent death in a rescue operation [2,9,20,52], early manifestation of post-traumatic symptoms such as re-experiencing of the event, avoidance, emotional numbing, increased arousal [59,60], exposure to corpses [31,61-63], certain coping mechanisms [64,65] and certain personality characteristics like introversion and neuroticism [13,19,66-70]. Neuroticism, characterized by emotional instability and anxiousness [71], heightens susceptibility to psychological trauma [72]; it significantly contributes to PTSD development in all individuals involved in a disastrous event [64,73,74]. Particularly, the combination of neuroticism, high state anxiety levels during the rescue operation, fear of imminent death and experience of personal loss, increases the likelihood of developing PTSD [40,49,52,75].

Given the diverse reactions, symptoms and disorders exhibited by rescue workers involved in various disastrous events, researching and exploring residual stress disorders among these individuals is crucial. Thus, the present study aims to identify psychopathological symptoms occurring either during the early post-disaster phase and/or during the late post-rescue phase of volunteer rescuers, especially those involved in maritime disasters, an area in which scientific literature is extremely sparse.

Materials and Methods

Description of the event

The information derives from interviews conducted with citizen rescue volunteers, who spontaneously participated to the rescue operation, following a major shipwreck in the Aegean Sea near the Island of Paros, Greece, on the night of September 26, 2000.

The ferry, named "Samina Express," was situated one and a half miles outside the port of Paros when it accidentally collided with a rock, resulting in its hull tearing apart like the Titanic and subsequently sinking within a span of 20 minutes. Observers on the shore witnessed the ship's lights approaching but suddenly lost sight of the vessel. Many experienced fishermen and sailors quickly recognized the significance of the ship's sudden disappearance. Without awaiting further information or guidance, they hastily prepared their small fishing boats, rallying young individuals from the shore to join them and immediately initiated rescue operations for the shipwrecked. However,

the night was exceptionally overcast and dark. To worsen matters, a wind measuring 9 to 10 Beaufort wind force scale blew for the next two hours, severely hindering any airplane or helicopter intervention, rendering rescue operation extremely difficult, if not impossible. Under normal conditions, small fishing boats do not venture into the sea with winds exceeding 4 to 5 on the Beaufort wind force scale.

Amidst these challenging weather conditions, communication with the ship was entirely severed, leaving everyone unaware of the exact location of the accident. The accounts of the rescue volunteers are distressing. Within ten minutes of the blackout, they were confronted with a startling sight-the sea was illuminated by the lights of life vests, resembling a "Christmas tree." Approximately eight hundred people were aboard the ship and tragically, 82 lives were lost. Nevertheless, despite the highly adverse weather conditions, all other individuals were successfully rescued. Seasoned captains, leading the small boats, faced the formidable and perilous task of navigating against waves reaching two meters high while ensuring the safety of those in the water. Halting the boat motors was unfeasible due to the ferocious waves, necessitating continuous movement throughout the rescue operation. The emotional impact on the rescuers was profound and even a month later, they couldn't shake off the haunting voices of those shipwrecked individuals pleading, "Save me, Captain, don't let me die."

Participants

One month following the event (study period 1), a joint task force comprising an experienced and trained team of mental health clinicians in disaster research and support [13,20,25,40] involving 6 psychiatrists, 2 social workers and 1 psychologist from the University Mental Health Research Institute (UMHRI) and the 1st Department of Psychiatry of the National and Kapodistrian University of Athens, visited and interviewed 78% of the individuals (n=51) who participated as rescue volunteers on that night. This investigation spanned approximately four days.

Six months later (study period 2), the same individuals plus an additional 6 new participants (88%, n=57) were re-evaluated by the same team. All interviewees provided written informed consent and the study received approval from the Ethics Committee of the University Research Institute for Mental Health (U.R.I.M.H), in accordance with the Declaration of Helsinki.

Outcome measures

During both study periods, sociodemographic variables including sex, age, socioeconomic status, education, family status and ownership status were recorded. Additionally, data on any personal or family material or physical damage resulting from the incident was collected.

Anxiety levels were assessed using the Trait and State subscales of the State-Trait Anxiety Inventory (STAI) [76], standardized in the Greek population by Liakos A and Giannitsi S [77]. Physical, emotional and psychopathological reactions as well as other nonspecific symptoms and their changes during the first 48 hours after the event were assessed through a structured questionnaire based on the diagnostic and research criteria of the 10th classification of mental and behavioural disorders (ICD-10) [78]. The questionnaire was made up of 8 main symptom categories, a total of 38 items and 4 choices for each item (1=not at all, 2=a little, 3=quiet, 4=a lot). The main categories referred to: 1) autonomic arousal symptoms; tachycardia-palpitations-pounding heart-sweating-trembling or shaking-dry mouth, 2) symptoms involving the chest and the abdomen; difficulty in breathing-chest pain or discomfort-nausea or abdominal distress, 3) symptoms involving mental state; feeling dizzy-unsteady-faint or light-headed-derealization and depersonalization-fear of losing control-fear of dying, 4) general symptoms; hot flushes or cold chills- numbness or tingling sensations, 5) symptoms of tension; muscle tension or aches and pains- restlessness and inability to relax-feeling keyed up or mentally tense-difficulty in swallowing, 6) other psychic symptoms; withdrawal from expected social interaction-narrowing of attention-apparent disorientation-anger or verbal aggression-despair or hopelessness-inappropriate over activity-uncontrolled and excessive grief, 7) dissociative symptoms; dissociative anaesthesia-dissociative motor disorders-dissociative sensory impairment-dramatic behaviour, 8) nonspecific symptoms; startle-

difficulty in concentrating-persistent irritability-difficulty in getting to sleep. The total score averages per subscale divided by the number of items were used for the purposes of each separate analysis. The Athens Insomnia Scale (AIS), a self-assessment psychometric instrument, was utilized to quantify sleep difficulty based on the latest classification systems (ICD-10, DSM-IV-TR, ICSD). The diagnosis of insomnia was made based on the patient's subjective perception of unsatisfactory sleep quantity and/or quality. The AIS consists of eight items: the first five pertain to sleep induction, awakenings during the night, final awakening, total sleep duration and sleep quality; the last three refer to well-being, functioning capacity and sleepiness during the day [79,80]. The scale is validated for the Greek population [81].

Personality characteristics such as extraversion and neuroticism (introversion) were evaluated using a modified short, standardized version of the Eysenck Personality Inventory (EPI) [82] and tailored for the Greek population [83]. Symptoms of psychopathology within the previous week were assessed through the Greek version [84] of the Symptom Checklist-90-R (SCL-90-R) [85], which is a self-administered psychometric instrument and measures nine primary symptom dimensions (somatization, obsessiveness-compulsivity, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism) and changes in appetite, sleep problems, suicidal ideation and feelings of guilt. The instrument yields four global indices: 1. PST (total of positive items), 2. Global Severity Index (GSI) calculated from the total SCL-90 divided by the total of positive items, 3. Positive Symptom Index (PSI) calculated from the PST divided by 90 and 4. The Positive Symptom Distress Index (PSDI) calculated by dividing the total SCL-90 by PST.

Psychiatric diagnoses were confirmed using the Mini-International Neuropsychiatric Interview (MINI) [86], while the diagnosis of Post-Traumatic Stress Disorder (PTSD) was established during the clinical psychiatric interview based on the ICD-10 research diagnostic criteria [78].

Statistical analysis

Normal distributed variables are expressed as mean \pm standard deviation, while variables with skewed distribution are expressed as median (interquartile range). Quantitative variables were expressed as mean values (SD), while qualitative variables were expressed as absolute and relative frequencies. Comparisons of proportions of participants experiencing psychological problems pre and post were made using the McNemar test.

Logistic regression analysis was employed in a stepwise method to identify independent factors associated with insomnia. Adjusted Odds Ratios (OR) with 95% confidence intervals (95% CI) was computed from the results of the logistic regression analyses.

Multiple linear regression analysis was conducted in a stepwise method to ascertain associations between dependent trait and state anxiety scores. Adjusted regression coefficients (β) with Standard Errors (SE) were computed from the results of the linear regression analyses.

All reported p values are two-tailed, with statistical significance set at $p < 0.05$. The analyses were performed using SPSS statistical software (version 19.0).

Results

The sample comprised of male volunteer rescuers who were evaluated at one month (study period 1, N=51) and at six months (study period 2, N=57) after the shipwreck. The mean age of participants was 38.2 years (SD=11.7 years). Sample characteristics during study period 1 are presented in Table 1. 58.8% of participants were married individuals and 52.9% had more than six years of education. Among them, the majority (52.9%) changed habits (e.g., smoking, alcohol consumption, eating) after the incident. 37.3% of the participants had at least one acquaintance among the shipwreck survivors and 17.6% knew someone among the victims. 70.6% of participants rescued at least one person (24.8% rescued 1-3 persons, 2.4% rescued 5-10 and 29.5% rescued more than 10); the median number of people rescued was 2 (IQR: 0-14). 35.1% of

participants collected corpses (26.3% collected 1-2 and 8.8% collected 3-5). During the rescue operation, 19.6% of the rescuers were injured, 68.6% have put themselves in danger and there were failed attempts in 39.2% of cases. 29.8% of the rescuers had specialized training in nautical disasters, 7.5% had experience in minor shipwrecks and 22.8% had experience in personal disasters. 77.2% of the rescuers had no guidance during the rescue operation. Finally, 17.5% suffered minor health damage following the rescue action.

The most frequent emotions experienced by rescue volunteers were anxiety (47.1%), followed by sadness (29.4%) and fear (17.6%).

The sample characteristics of the rescue volunteers during study period 2 are presented in Table 2. The sample consisted of 57 males with a mean age of 38.2 years (SD=11.7 years). 56.1% of the participants were married. Among them, 52.6% changed habits (e.g., smoking, alcohol consumption, eating) after the incident. Additionally, 40.4% of the participants had an acquaintance among the shipwreck survivors and 21.1% knew someone among the victims. 66.7% of the participants rescued at least one shipwreck victim and 64.9% put themselves in danger during the rescue. The median number of people rescued was 2 (IQR: 0-14). 35.1% of the participants collected corpses. The most frequent emotions experienced during the rescue were anxiety followed

Table 1. Sample characteristics (1 month).

	N (%)
Age, mean (SD)	38.2 (11.7)
Years of education	-
≤ 6	24 (47.1)
> 6	27 (52.9)
Married	30 (58.8)
Any habit change	27 (52.9)
Acquaintances among the ship wreckers	19 (37.3)
Acquaintances among the victims	9 (17.6)
Get in danger during rescue	35 (68.6)
Rescued people	36 (70.6)
Number of people rescued, median (IQR)	2 (0 - 14)
Collect corpses	15 (29.4)
Fear during rescue	9 (17.6)
Guilt during rescue	2 (3.9)
Anxiety during rescue	24 (47.1)
Sadness during rescue	15 (29.4)
Any saving attempt that failed?	20 (39.2)
Were you injured during the rescue?	10 (19.6)

Table 2. Sample characteristics (6 months).

	N (%)
Age, mean (SD)	38.1 (11.7)
Years of education	-
≤ 6	26 (45.6)
> 6	31 (54.4)
Married	32 (56.1)
Habit changed (i.e., smoking, alcohol consumption)	30 (52.6)
Acquaintance among ship wreckers	23 (40.4)
Acquaintance among victims	12 (21.1)
Get in danger during rescue	37 (64.9)
Rescued people	38 (66.7)
Number of people rescued, median (IQR)	2 (0 - 14)
Collect corpses	20 (35.1)
Fear during rescue	11 (19.3)
Guilt during rescue	3 (5.3)
Anxiety during rescue	27 (47.4)
Sadness during rescue	17 (29.8)
Any saving attempt that failed?	22 (38.6)
Were you injured during the rescue?	10 (17.5)

by sadness. There were failed attempts in 38.6% of the cases and 17.5% of the rescuers were injured during the rescue. Only 2 participants (3.5%) had minor psychological problems prior to the incident, while after the shipwreck, the number increased significantly to 9 (15.8%; $p=0.039$).

Information regarding participants' psychological condition during study period 1 is presented in Table 3. 33.3% of participants developed acute stress reaction and 26.3% protracted stress reaction, only 8.0% showed no reaction at all. Almost one out of three participants (33.3%) experienced PTSD or suffered from insomnia (31.4%). The mean trait anxiety score was 41.4 (SD=10.0) (max=84) and the mean state anxiety score was 42.3 (SD=13.4) (max=84). The mean neuroticism score was 4.07 (SD=2.22) and the mean extroversion score was 4.21 (SD=1.38). Psychophysiological symptoms such as neurovegetative symptoms were present in 59.6% of the participants, psychological symptoms in 29.8%, general symptoms in 31.6%, dissociative symptoms in 33.3% and non-specific symptoms in 82.5%. Flashbacks and intrusive thoughts were reported by over 60%. Intense startled reactions were reported by 21.6%, persistent irritability by 25.3%, concentration impairments by 9.6% and avoidance was observed in 53.0% of the rescue volunteers. None of the participants were taking medication before sleep.

Descriptive statistics of SCL-90 dimensions at Study Period 2 are shown in Table 4. Evaluation of psychological parameters in study period 1 and 2 is displayed in Table 5. The same proportion of subjects feared for their own death at both study periods. 62.7% of the participants had at least one physical symptom in study period 1 and the corresponding proportion in study period 2 (45.1%) had a slight, but not significant, decrease. State levels remained unchanged in study period 2. 35.3% of participants had PTSD in study period 1 after the shipwreck while in study period 2, 25.5% had PTSD ($p=0.383$). The proportion experiencing insomnia was 31.4% in study period 1 and 25.5% in study period 2, with no significant difference. Specifically, regarding PTSD, 30 subjects (58.8%) remained unchanged in both study periods, 8 subjects (15.7%) experienced PTSD in study period 2 without having it in study period 1 and 13 subjects (25.5%) had no longer PTSD that they demonstrated during study period 1 clinical interview. Concerning insomnia, 36 subjects (70.6%) remained unchanged in both study periods, 4 subjects (7.8%) had insomnia in study period 2 without having it in study period 1 and 11 subjects (21.6%) no longer had insomnia that they had in study period 1. Regarding PTSD, state anxiety and insomnia changes at follow-up were associated with factors referred to in Table 5, no significant differences were found.

PTSD and feeling sadness during rescue operation were found to be significantly and independently associated with insomnia (Table 6). Specifically, participants experiencing PTSD and those who felt sadness during rescue operation had a significantly greater likelihood of suffering from insomnia.

In Table 7, the SCL-90 dimensions associated with PTSD and insomnia

Table 3. Information regarding participants' psychological condition (first period).

	N (%)
Acute stress reaction according to icd-10	19 (33.3)
Protracted acute stress reaction	15 (26.3)
Acute and protracted stress reaction	34 (59.6)
PTSD	19 (33.3)
Trait anxiety, mean (SD)	41.4 (10.0)
State anxiety, mean (SD)	42.3 (13.4)
Neuroticism, mean (SD)	4.07 (2.22)
Extraversion, mean (SD)	4.21 (1.38)
Total neurovegetative symptoms	34 (59.6)
Total abdomen thorax symptoms	18 (31.6)
Total psychological symptoms	17 (29.8)
Total general symptoms	18 (31.6)
Total tension symptoms	40 (70.2)
Total other symptoms	53 (93.0)
Total dissociative symptoms	19 (33.3)
Total not specific symptoms	47 (82.5)
Insomnia	16 (31.4)

Table 4. SCL-90 dimensions at six months of follow up (six months).

	Mean (SD)
Somatization	3.63 (4.88)
Obsessive-compulsive	7.04 (6.98)
Interpersonal sensitivity	7.76 (5.63)
Depression	8.43 (7.92)
Anxiety	4.55 (5.07)
Hostility	4.04 (4.46)
Phobic anxiety	1.41 (2.29)
Paranoid ideation	8.04 (5.41)
Psychoticism	2.25 (3.00)
Total scl-90	50.8 (39.14)
SCI positive symptoms index	25.37 (16.22)
General symptom index (bscl/bpsi)	1.84 (0.49)

Table 5. Evaluation of psychological parameters at one and six months (six months).

		1 Month	6 Months	P
Fear of death, N(%)	No	44 (86.3)	44 (86.3)	-*
	Yes	7 (13.7)	7 (13.7)	-
At least one physical symptom, N (%)	No	19 (37.3)	28 (54.9)	-
	Yes	32 (62.7)	23 (45.1)	0.124**
PTSD, N (%)	No	33 (64.7)	38 (74.5)	-
	Yes	18 (35.3)	13 (25.5)	0.383**
Insomnia, N (%)	No	35 (68.6)	42 (82.4)	0.118**
	Yes	16 (31.4)	9 (17.6)	-
State Anxiety, mean (SD)		41.8 (12.9)	41.0 (12.6)	0.678+

*Not computed due to no distribution; **McNemar test; +Paired t-test

Table 6. Multiple logistic regression analysis using stepwise method for insomnia (first period).

		OR (95% CI)*	P
PTSD	No	1.00**	-
	Yes	4.49 (1.25 - 16.09)	0.021
Sadness during rescue operation	No	1	-
	Yes	4.31 (1.17 - 15.90)	0.028

*Odds Ratio (95% Confidence Interval); **indicates reference category

status during study period 2 are presented. After Bonferroni correction in ANOVA, it was found that participants who no longer had PTSD in study period 2 had significantly greater values in 'Hostility' compared to those whose PTSD condition remained unchanged ($p=0.048$). The symptoms of 'Anxiety' did not differ according to PTSD status after Bonferroni correction. Also, participants who did not have insomnia in study period 1, but developed it in study period 2, had significantly greater values in 'Interpersonal sensitivity', indicating more symptoms of interpersonal sensitivity, compared to those whose insomnia status was unchanged ($p=0.022$). Additionally, participants who did not have insomnia in study period 1 but developed it in study period 2 had significantly more symptoms of anxiety, hostility, paranoid ideation and psychoticism, compared to those whose insomnia status was unchanged ($p=0.025$, $p=0.016$, $p=0.042$ and $p=0.019$ respectively). The symptoms of phobic anxiety did not significantly differ according to insomnia symptoms after Bonferroni correction.

The multiple linear regression analysis revealed positive correlations between trait anxiety score and neuroticism as well as age (Table 8). Conversely, the extraversion subscale exhibited a negative correlation with the trait anxiety score. Participants experiencing PTSD demonstrated a significantly higher trait anxiety score. Regarding the state anxiety score, the neuroticism subscale showed a positive correlation with it. Furthermore, significantly higher state anxiety scores were observed in participants experiencing PTSD, those who changed their habits, individuals with less than 7 years of education and those who felt guilty during the rescue operation.

Table 7. SCL-90 dimensions in association with PTSD and insomnia status (six months).

	PTSD				Insomnia			
	Unchanged	PTSD at 6 Months and not at 1 Month	Lost PTSD at 6 Months	P ANOVA	Unchanged	Insomnia at 6 Months and not at 1 Month	Lost Insomnia at 6 Months	P ANOVA
	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	
Somatization	3.33 (4)	4.5 (8.18)	3.77 (4.57)	0.835	3.58 (5.42)	3.75 (4.99)	3.73 (3)	0.995
Obsessive-compulsive	6.6 (7.13)	6.25 (5.75)	8.54 (7.6)	0.672	6.75 (6.89)	13 (9.38)	5.82 (5.93)	0.193
Interpersonal sensitivity	6.7 (5.25)	9.75 (5.8)	9 (6.23)	0.265	6.33 (4.61)	14 (5.72)	10.18 (6.71)	0.007
Depression	6.8 (7.11)	11.63 (11.19)	10.23 (6.99)	0.199	7.19 (7.11)	12.75 (8.77)	10.91 (9.68)	0.21
Anxiety	3.07 (3.2)	6 (5.61)	7.08 (7.09)	0.046	3.78 (4.56)	10.75 (6.99)	4.82 (4.87)	0.029
Hostility	2.73 (2.9)	5.5 (6)	6.15 (5.57)	0.034	3.11 (3.27)	9.5 (8.7)	5.09 (4.81)	0.014
Phobic anxiety	1.07 (1.98)	0.88 (1.36)	2.54 (3.07)	0.118	0.89 (1.94)	3 (4.08)	2.55 (2.16)	0.035
Paranoid ideation	7.2 (5.03)	7.88 (5.06)	10.08 (6.28)	0.281	6.72 (4.75)	13.5 (7.55)	10.36 (5.1)	0.013
Psychoticism	2 (3.11)	2.25 (2.05)	2.85 (3.34)	0.705	1.75 (2.55)	6 (4.55)	2.55 (3.08)	0.022
Total scl-90	42.37 (33.47)	59.38 (44.48)	65 (45.57)	0.176	43.06 (34.65)	94.5 (58.42)	60.27 (36.84)	0.26
Scl positive symptoms index	22.37 (14.48)	28.25 (19.29)	30.54 (17.77)	0.278	22.97 (15.79)	39.75 (19.24)	28 (14.89)	0.121
General symptom index (bscl/bpsi)	1.76 (0.43)	1.97 (0.55)	1.93 (0.56)	0.412	1.74 (0.42)	2.15 (0.73)	2.05 (0.54)	0.067

Table 8. Multiple linear regression analysis using stepwise method for trait and state subscales (first period).

		β^*	SE**	P
Trait Anxiety	Neuroticism	2.49	0.5	<0.001
	Extroversion	-2.31	0.76	0.004
	Age	0.26	0.1	0.008
	PTSD			
	No	0.00+	-	-
Yes	6.6	2.81	0.022	
State Anxiety	Neuroticism	2.77	0.69	<0.001
	PTSD			
	No	0	-	-
	Yes	13.47	3.46	<0.001
	Habit Changed (i.e smoking, alcohol consumption)			
	No	0	-	-
	Yes	8.42	3.45	0.018
	Years of Education			
	≤6	0	-	-
	>6	-9.6	3.03	0.003
Guilt during Rescue				
No	-	-	-	
Yes	19.14	6.55	0.005	

*Regression coefficient; **Standard Error of regression coefficient; +indicates reference category

Discussion

Our sample initially comprised of 51 men during the 1-month post-shipwreck clinical interview while it was further increased to 57 men in the 6-month post-shipwreck clinical interview. These were citizen volunteers, relatively young, with an average age of 38.2 years, actively engaging in the rescue effort. Despite the inclusion of six individuals who were initially untraceable during the research's initial phase, there were no discernible differences in the overall demographic characteristics between the two study periods. Approximately 60% of participants in both study periods were married, with an average education level equivalent to primary education.

Twenty-five percent of the participants encountered minor injuries during the rescue operation, while approximately 68.6% voluntarily placed themselves at risk during the mission. While these factors were identified as potential contributors to post-rescue reactions [9-13], our findings suggest they did not singularly play a significant role in the development of PTSD or insomnia. The relatively minor and transient nature of the injuries, coupled with the participants'

familiarity with the rescue environment—specifically, being fishermen or sailors accustomed to the sea—may support the notion that familiarity with specialized rescue settings and environmental factors might influence rescuers' reactions. This holds true even for non-professionals volunteering in such situations, potentially contributing to the absence of distinct post-rescue reactions.

Contrarily, our results indicate that other factors, such as pre-rescue anxiety levels and neurotic personality traits like introversion, appeared to impact both the early onset and long-term persistence of psychopathological reactions such as PTSD and insomnia. Previous studies have also cited pre-rescue anxiety levels [40,49,52,64,75] and neurotic personality traits [13,40,64,66,67,69], as predisposing factors for post-rescue psychopathology."

The primary emotions reported during the rescue operation were anxiety (47.1%), sadness (29.4%) and fear (17.6%). These findings align with similar observations made by other researchers studying firefighters and volunteers across various disaster scenarios, corroborating our results [15].

Before the rescue operation, only 2 participants (3.5%) reported minor psychological issues, but this percentage significantly increased to 15.8%

after the operation ($p=0.039$). This noteworthy shift suggests that, in addition to recognizable and major posttraumatic disorders, a substantial proportion of previously mentally sound rescuers develop diverse psychological impairments and isolated symptoms. These symptoms may endure for a period [7,13,14] and often go unnoticed, due to the absence of specific assessments.

Approximately half of the volunteers had acquaintance with at least one of the shipwreck survivors, while a quarter of them were acquainted with someone among the deceased. These findings have been consistently noted to influence post-rescue psychological responses in recent studies involving various disaster scenarios [31,61-63]. However, our findings indicate that these factors alone did not significantly contribute to the development of specific psychopathologies such as PTSD or insomnia, as emphasized in our study.

Around thirty percent had received some form of training in maritime rescue, primarily because most were professional fishermen. However, only 7.5% reported any prior experience with shipwrecks related to small-scale fishing. This fact accentuates the vulnerability of opportunistic volunteer rescuers to a heightened risk of developing post-rescue reactions, as highlighted in pertinent literature [1,25,46-48], but it is not seen in our findings.

Even though one-third of the rescuers (35.1%) recovered corpses, our analyses did not indicate a significant impact on the development of psychopathological events, which aligns with observations from previous studies [4,31]. This could be attributed to the relatively high success rate-reaching 70%-in rescuing survivors despite the highly adverse and prohibitive weather conditions during the operation. This substantial success rate appears to have mitigated potential reactions stemming from injuries, perceived danger during the rescue, failed attempts (which reached 39.2%) and the recovery of corpses.

Only 20% of rescuers received basic guidance during the operation. The absence of professional guidance, combined with the rescue conducted under extremely adverse and challenging weather conditions, created a situation that, according to recent literature [2,4], increased the risk of developing psychopathological reactions. Surprisingly, our results do not suggest a significant impact on the development of post-rescue psychological reactions despite these challenging circumstances.

During the initial month following the rescue operation, 26.3% of participants met the criteria for protracted stress reaction, while 33.3% were diagnosed with PTSD, mirroring findings from victims as well as from other rescue operations across diverse scenarios [17,19-22]. Interestingly, a similar percentage (31.4%) met the criteria for diagnosed insomnia based on the AIS scale, rather than experiencing general or opportunistic sleep disorders reported subjectively."

Approximately 59.6% of rescue volunteers reported neurovegetative symptoms, while 29.8% experienced psychological symptoms. Additionally, a significant majority (82.5%) displayed nonspecific symptoms similar with previous reports [20,68] signifying considerable strain on both their physical well-being and psychological state.

The consistent percentage (13.7%) of participants fearing for their own death remained unchanged across both study periods. It's important to note that further evaluation of this very important feeling predisposing for the development of post traumatic psychopathology, as seen in previous reports [9,13,20,49,54,57,58], was limited, possibly due to the relatively small number of subjects in our study.

An increase in anxiety levels observed one month after the operation persisted at the six-month period, indicating the enduring impact of the rescue operation on the volunteer rescuers as reported in previous studies [7,20].

Initially, 35.3% of individuals were diagnosed with PTSD one month after the shipwreck, a rate consistent with findings among victims in other kind of disaster and higher than in professional rescuers in other disaster scenarios [1,13]. However, this rate decreased after six months, aligning with observations from previous studies [87,88]. Notably, 15.7% experienced delayed-onset PTSD despite not initially presenting symptoms, while 25.5% no longer had PTSD after six months despite initially exhibiting the disorder. This

has been observed also in previous reports [88,89]. Those who did not sustain PTSD in the long term displayed significantly higher hostility scores in the SCL-90. This suggests that coping mechanisms developed after a rescue operation creates a potential emotional shift toward anger and aggression, aiding in the avoidance of the disorder.

Individuals who developed and sustained PTSD exhibited higher levels of pre-operation anxiety, lower educational attainment, altered habits following the operation and harbored numerous guilt feelings as reported also in previous studies [90], suggesting a potential predisposition toward depression. The proportion experiencing insomnia was 31.4% at one month and 25.5% at six months, with no significant difference in line with previous studies. Individuals who didn't experience insomnia initially but developed it later exhibited high scores in interpersonal sensitivity suggesting broader challenges in interpersonal relationships and social withdrawal. Additionally, participants who did not have insomnia at 1 month but developed it by six months had significantly more symptoms of anxiety, hostility, paranoid ideation and psychoticism, compared to those whose insomnia status was unchanged ($p=0.025$, $p=0.016$, $p=0.042$ and $p=0.019$ respectively), reinforcing the notion that coping mechanisms developed after a rescue action possibly play a crucial role for the development of various psychopathological entities as shown by previous reports [65].

A crucial finding of our study is that individuals who were initially diagnosed with insomnia showed high levels of neuroticism, experienced sadness during the rescue, endured elevated distress during the operation and exhibited a stronger correlation with the onset of PTSD. This finding was partly referred to previous studies [13,40,91,92]. Both psychopathological conditions, PTSD and insomnia, seem intricately linked from their early stages, contributing to the development and persistence of post-rescue psychopathology.

Certainly, identifying early signs of psychological distress among rescuers, especially volunteers and civilians, is paramount for timely intervention. Employing concise scales like the AIS to assess insomnia development and evaluating specific personality traits and early psychopathological signs derived from SCL-90 could serve as valuable tools in identifying individuals at heightened risk of psychiatric reactions following a rescue operation.

Early detection [40,93] can facilitate targeted interventions and support, potentially mitigating the risk of long-term psychiatric disorders. Conducting assessments within a reasonable timeframe, ideally within a month post-rescue, may significantly contribute to the well-being and mental health of those involved in rescue operations.

Conclusion

Psychopathological symptoms observed within one month after a rescue operation remained almost unchanged after six months. Thus, early detection of some personal characteristics, such signs as insomnia and PTSD among rescue volunteers is crucial for immediate treatment and the prevention of long-lasting psychopathology.

Limitations

The number of individuals who participated in the voluntary rescue operation (65 people on 18 fishing boats were relatively small). Although 88% of participants were located and surveyed and had repeated measurements on most scales in two time periods (early, i.e., 1 month and late, i.e., six months), causal analyses could not be conducted on the investigated parameters. Additionally, the absence of SCL-90 administration during the early post-rescue period hindered the exploration of the progression of current psychopathology.

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Conflict of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the manuscript.

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