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The impact of the search and rescue training in nursing on disaster perception and disaster response self-efficacy: a mixed-methods study

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Abstract

Background In times of disaster, it is crucial for nurses, who play significant roles in healthcare services, to possess the necessary knowledge and skills to ensure effective emergency interventions and sustain health amidst crises. This study was conducted to determine the disaster perceptions of final-year nursing students and to assess the impact of education provided through theoretical, practical, and simulated application environments regarding disasters on their disaster response self-efficacy levels.

Methods Mixed-methods design. The study involved 30 senior nursing students. The study utilized a quasi-experimental design with a single-group pretest-posttest arrangement. Additionally, a mixed-methods approach was employed, incorporating a qualitative descriptive design to capture pre-training opinions. The data collection instruments included a Demographic Characteristics Form, a Metaphorical Perceptions Data Collection Form, and a Disaster Response Self-Efficacy Scale.

Results Before the search and rescue training in nursing, students obtained a total score of 65.17 ± 11.844 points on the Disaster Response Self-Efficacy Scale. After the search and rescue training, students scored a total of 83.87 ± 9.372 points on the same scale. Statistically significant differences were observed in the total score and all sub-dimensions of the scale before and after the training ($p < 0.05$). Upon examining qualitative data, it was observed that students' metaphorical perceptions of disasters were categorized into three themes: "Uncertainty and Fear," "Emotional Burden and Loss," and "Reality and Change." We found that the disaster self-efficacy of nursing students increased after the search and rescue training in nursing.

Conclusion We would like to thank the Editor for the constructive comments and helpful suggestions. In response, we have carefully revised the manuscript and implemented all recommended changes.

Keywords Disaster, Healthcare equity, Nursing, Public health

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Background

Disasters represent a significant public health concern, characterized by sudden occurrences that lead to serious health issues, loss of life and property, and disruptions in healthcare services [1]. The damage caused by disasters is immeasurable and affects the mental, socioeconomic, political and cultural situation of the affected area. Disasters are events that cause great damage, destruction and human suffering. Their origins can be natural, such as earthquakes, floods and hurricanes, or man-made, such as accidents and acts of terrorism [2, 3]. Therefore, search and rescue efforts become an urgent priority. Search and rescue involve locating and extracting individuals trapped, either informally by neighbors and relatives or formally by professional teams. In some countries where professional teams or sufficient capacity are lacking, international search and rescue teams often intervene [4]. Search and rescue operations vary based on the location of the disaster, adapting to urban, water, mountainous, or other environments. With the increasing urbanization in contemporary times, a significant portion of the population resides in cities, leading to a rise in the number of multi-story structures, industrial facilities, and storage areas for hazardous materials. Consequently, urban search and rescue operations become more complex and challenging [5]. The first 72 h in search and rescue operations are crucial, as this period is considered the most critical. Therefore, these operations must be carried out as effectively and rapidly as possible. The more efficiently the process is executed, the higher the number of survivors [6].

Disaster management comprises five integrated phases: mitigation, prevention, preparedness, response, and recovery [7]. Particularly, the response phase holds critical importance when a disaster occurs. The magnitude of the disaster, insufficient resources and equipment, adverse environmental conditions, infrastructure deficiencies, political imbalances, and a lack of technical personnel can lead to increased loss of both lives and property. It is essential to emphasize the significance of search and rescue operations after a disaster event to minimize both human and material losses [5, 8, 9].

In addition to the significant loss of life in large-scale disasters, serious health problems arise, such as crush injuries, limb loss, injuries, fractures, burns, and frostbite. Thus, there is an increased need for emergency healthcare services [10]. Health care providers, with nurses at the forefront, play a crucial role in responding to disasters [11, 12]. Disaster nursing is a specialized nursing field in which nurses provide care to disaster victims. Since Florence Nightingale, nurses have been involved in all stages of mitigation, preparedness, response and recovery and have taken an active role in every step of disaster management [13]. Nursing students need to graduate with

the necessary knowledge, skills, and attitudes to provide services to individuals, families, groups, and communities in disaster situations. To enable students to intervene quickly and effectively in disasters, it is important for them to acquire the required theoretical knowledge before graduation and gain practical experience in a simulated environment. In the literature, there has been no study specifically addressing nursing students' involvement in search and rescue. In this context, elucidating the disaster response self-efficacy of student nurses may contribute to guiding nursing practices, developing educational programs, and conducting research on search and rescue in disasters. This study was conducted to determine the disaster perceptions of senior nursing students before graduation and to assess the impact of the education provided on their disaster response self-efficacy levels.

Methods

Research type

This study employed a single-group pretest–posttest quasi-experimental design supported by a sequential explanatory mixed-methods approach. Quantitative data were collected before and after the educational intervention to examine changes in disaster response self-efficacy, and qualitative data were used to deepen the interpretation of these changes by exploring students' metaphorical perceptions of disasters.

Metaphor analysis was chosen as the qualitative method because metaphors provide access to the underlying emotional and cognitive structures that shape how individuals interpret disaster contexts. Metaphors enable participants to express complex psychological states—such as fear, uncertainty, emotional burden, or transformation—in a concise yet meaningful way. By revealing these deeper perceptual layers, metaphor analysis added interpretive depth to the quantitative self-efficacy findings and contributed to a more comprehensive understanding of students' disaster-related training needs [14].

Research population and sample

The research population consisted of fourth-year nursing students enrolled in state universities in Türkiye during the 2023–2024 academic year. A total of **76 students applied** to participate in the “*Search and Rescue Training in Nursing*” project, supported by the TÜBİTAK 2237-A Scientific Education Activities Support Program.

Applicants were evaluated based on predefined **eligibility criteria**, which included:

1. Being a fourth-year nursing student,
2. Not having participated in any previous phase of the project,

3. Meeting the minimum academic achievement requirement (GPA ranking),
4. Completing the application form during the announced dates (13 November–December 2023),
5. Expressing willingness to participate in all stages of the training and providing informed consent, and having no physical or medical condition that would prevent safe participation in skills stations or field-based search and rescue activities.

After reviewing all applications, students were **ranked according to GPA**, and the **top 30 eligible and voluntary applicants** from **11 different universities** were selected. The training was conducted between 11 and 14 December 2023.

Inclusion and exclusion criteria

The inclusion criterion for participants was being eligible to participate in the project titled “Search and Rescue Training in Nursing”, while the criterion for exclusion was expressing a desire to withdraw from the research.

Data collection instruments

Demographic characteristics form

The form was developed by the researchers based on the literature and consisted of six questions. It included items on age, year of study, income status, and previous exposure to disasters. In this study, *exposure to disasters* was defined according to international disaster classifications and included both direct disaster experiences (e.g., personally being affected by an earthquake) and indirect or societal disaster experiences (e.g., living through the COVID-19 pandemic as a biological disaster). The form also asked whether students had previously received any education or coursework related to disaster management.

Disaster response self-efficacy scale

This scale was developed by Li et al. in 2017 [15]. The Turkish validity and reliability of the scale were established by Koca et al. in 2018 [16]. The scale is a 5-point Likert-type, consisting of 19 items and three subscales: on-site rescue competency, disaster psychological nursing competency, and disaster role quality and adaptation competency. Responses are rated on a scale of no confidence at all (1 point), basically no confidence (2 points), little confidence (3 points), basically confident (4 points), and complete confidence (5 points). The scale score is calculated by summing the responses to the questions. A high score on the scale indicates a high level of disaster response self-efficacy.

Metaphorical perceptions data collection form

The form was prepared by the researchers based on the literature [17–19]. The participants were asked to

complete the statement: “Disaster perception is like. because.”. In the first part, nursing students were asked to write a metaphor, and in the second part following the “Because” question, the perceptions of the students were actually tried to be determined. As Yıldırım and Şimşek (2011), stated, the metaphor itself cannot reflect the underlying visual and descriptive power alone [20]. For this reason, the real meaning and justification for the selection of that metaphor should be determined by asking the question “why/why” immediately afterwards. In this way, the underlying basis of the person’s use of that metaphor is revealed.

Data collection

Research data were collected in three stages:

Data collection

Intervention design overview

The “Search and Rescue Training in Nursing” program was designed as a structured three-stage educational intervention integrating theoretical instruction, skills-based practice, and full-scale simulation. The overarching aims of the program were to enhance disaster perception, strengthen disaster response self-efficacy, and equip nursing students with foundational search and rescue competencies applicable in disaster settings. The training spanned three consecutive days (December 11–14, 2023) and was developed collaboratively by experts in emergency aid and disaster management, nursing, and medicine. The curricular structure followed a progressive logic model in which cognitive knowledge acquisition (Stage 1) was followed by psychomotor skills development (Stage 2) and applied situational performance in a realistic scenario (Stage 3). (Fig. 1).

Stage 1: Theoretical instruction On December 11–12, 2023, theoretical courses on search and rescue in nursing were conducted between 08:30 and 17:30. The lectures addressed disasters and emergencies, incident management, stages of field assessment, approaches to victims under rubble, fundamental principles of search and rescue, planning and organization, disaster triage, and ethical considerations in disaster settings. The lecture content was structured in line with the recommendations of 10 faculty members who are experts in the field, and the theoretical training was conducted by faculty members specializing in emergency aid and disaster management, nursing, and medicine. Before the training, the Demographic Characteristics Form, the Metaphorical Perceptions Data Collection Form, and the Disaster Response Self-Efficacy Scale were administered to assess the participants’ initial disaster perceptions.

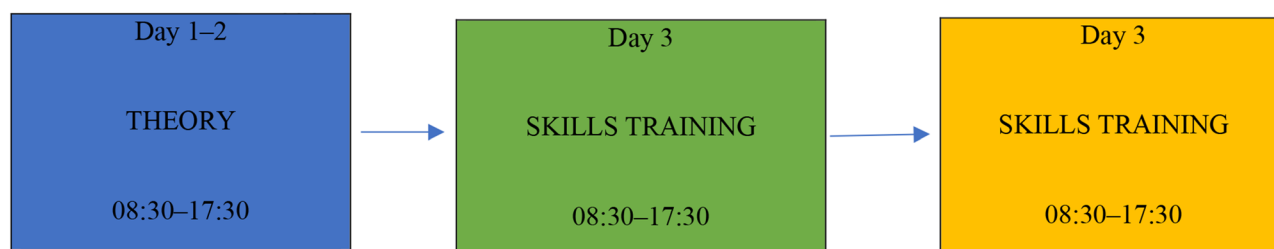


Fig. 1 Timeline and logic model of the search and rescue training in nursing program. * The intervention followed a single left-to-right chronological structure, progressing from theoretical instruction on Days 1–2 to skills-based training on Day 3 and culminating in a full-scale simulation drill on Day 4

Stage 2: Skills stations After the theoretical training on December 13, 2023, students were divided into three groups of ten. Three stations were set up. In the first station, activities included putting on a neck brace, transferring the patient to a stretcher, and fastening the patient using a spider belt. The second station involved practicing proper carrying techniques, while the third station focused on the application of the Kendrick Extrication Device (KED) vest. After a demonstration by the instructors, each student performed the application once; the execution time for each skill was approximately 10 min.

Stage 3: Full-scale simulation This stage took place at the Search and Rescue Training Facility within the building and campus of the Kastamonu Provincial Disaster and Emergency Management Directorate (AFAD) on December 14, 2023. The training was conducted through practical and simulated scenarios. The students were briefed on a scenario involving the search and rescue of patients and injured individuals trapped under debris after an explosion in a factory. Students assigned to play the role of injured victims received moultage makeup applied by personnel from the National Medical Rescue Team (UMKE). All students in the field wore personal protective equipment. In an area arranged to resemble a post-explosion collapse environment, the students performed search and rescue operations and provided necessary interventions to patient/injured models and standardized mock injuries. This stage lasted approximately 8 h (08:30–17:30). After completing the practical session, the Disaster Response Self-Efficacy Scale was administered again to assess changes in disaster intervention knowledge and self-evaluations.

Research rigor

This study followed the rigor criteria proposed by Patton [21] to ensure credibility, dependability, and transferability in the qualitative component of the mixed-methods design. A systematic and transparent process was used during both data collection and analysis, following Patton's content analysis framework.

Credibility was strengthened by employing a rigorous

coding process. All metaphorical expressions related to disaster perception provided by the nursing students were independently coded by two researchers. The researchers carefully reviewed, compared, and discussed all codes and emerging categories. Any disagreements were resolved through in-depth discussions until full consensus was reached. Regular team meetings were held throughout the analysis process to maintain consistency in coding decisions and interpretations. Peer debriefing with an external qualitative expert further enhanced the credibility of the findings.

Dependability was supported through a detailed documentation process. Each step of the data analysis—from raw extraction to category formation—was recorded to ensure procedural transparency. The iterative nature of coding and category refinement allowed for consistent interpretation across researchers.

Transferability was enhanced by providing rich and detailed descriptions of participant characteristics and offering clear, comprehensive presentations of the qualitative findings. Illustrative examples of students' metaphorical expressions were included to support the interpretation of the categories and allow readers to assess the relevance of the findings to other educational or disaster-preparedness contexts.

Students used a variety of metaphors to describe their disaster perceptions, reflecting emotional, cognitive, and experiential dimensions. For example, metaphors such as “like being trapped in darkness,” “like an unpredictable storm,” or “like a sudden collapse” reveal the uncertainty, fear, and emotional burden associated with disaster situations. Conversely, metaphors such as “a moment of awakening” or “a turning point” reflect the shifts in perception that occurred after participating in the search and rescue training. These metaphors provided meaningful insight into the students' inner experiences and supported the thematic analysis.

Ethical considerations were carefully observed during metaphor interpretation. Each metaphor's meaning, context, and intended message were respected to avoid misrepresentation of participants' perceptions. As

emphasized in the literature, metaphors can be powerful but may be misleading if decontextualized. For this reason, every metaphor was interpreted alongside the student's written justification ("because...") to preserve the authenticity and integrity of their expression.

By grounding the analysis in Patton's [20] framework and applying a rigorous, consensus-based coding process, the study ensured a structured and trustworthy interpretation of nursing students' disaster perceptions.

Data analysis

Data analysis was conducted using the SPSS (Statistical Package for Social Sciences for Windows 23.0) statistical program (IBM Corp. Armonk, NY, USA). The normal distribution of the data was assessed using the Shapiro-Wilk test, and it was found that the data showed a normal distribution. Descriptive statistical methods (number, percentage distribution, median) were used to analyze demographic characteristics, and independent samples t-test and ANOVA test were employed for comparing variables. The normal distribution of the total scores of the scale was checked using the Shapiro-Wilk test. Paired t-test was used to examine the differences between the mean total scores of the scale before and after the training. In the Turkish validity and reliability study of the scale, the Cronbach's alpha coefficient was found to be 0.96 [16]. In this study, the Cronbach's alpha was found to be 0.831. Results obtained from statistical analyses were considered statistically significant at a 95% confidence interval and $p < 0.05$.

Content analysis was utilized in the analysis of qualitative data. Content analysis involves bringing together similar data within identified themes/concepts and interpreting them in a highly understandable manner [20]. The data underwent a preliminary extraction process. Each of the 30 complete data collected was numbered and assigned a code (e.g., PN1, PN2). The "PN" code was the code for the metaphor produced for disaster perception. A metaphor image chart was created based on the participants' responses. After reviewing all forms and completing the coding and extraction processes, the metaphors were categorized by bringing together similar data into certain concepts and themes. When determining the categories, the section explaining the metaphors was additionally examined, and efforts were made to place the metaphor in the category that best represented its meaning. In this context, a total of three categories were created.

Ethical considerations

Ethics committee approval was received from the Kastamonu University Science and Engineering Sciences Scientific Research and Publication Ethics Board with decision number 12–39, dated 08.11.2023. In addition,

permission was obtained via e-mail from the person who developed the scale to use the scale. Necessary explanations were made to the participants about the purpose of the study and the confidentiality of the answers, students were allowed to withdraw from the study at any time and their informed consent was obtained. The voluntary participants were included in the study. The study was carried out in accordance with ethical research principles and the Declaration of Helsinki.

Results

A total of 30 students participated in the study. The average age of these students was 21.90 ± 0.712 years, with 86.7% ($n = 26$) being female. When examining the regions where the participants live, 36.7% ($n = 11$) stated they are from Central Anatolia, and 30% ($n = 9$) from the Black Sea region. Regarding their income status, 76.7% of the students reported it as "equal to expenses." The majority of the students (76.7%) claimed to have been exposed to disasters before, citing incidents such as the COVID-19 pandemic and earthquakes. A significant portion of the students (76.7%) had not received any training related to nursing in disasters or emergencies. Furthermore, 76.7% of the students ($n = 23$) had not participated in any disaster drills before, and 90% ($n = 27$) had not volunteered for any tasks related to disasters (Table 1).

Table 2 presents a comparison of the participants' scores on the Disaster Response Self-Efficacy Scale and its sub-dimensions. Before receiving the nursing search and rescue training, students scored an average of 65.17 ± 11.844 on the scale. When the average scores of the sub-dimensions of the scale were examined, it was seen that the on-site rescue competency received 35.83 ± 7.98 points, the disaster psychological nursing competency received 13.10 ± 2.808 points, and the disaster role quality and adaptation competency received 16.33 ± 2.998 points. After the search and rescue training, students scored a total of 83.87 ± 9.372 on the Disaster Response Self-Efficacy Scale. A statistically significant difference was found in the total pre-training and post-training scores of the scale and all sub-dimensions ($p < 0.05$).

The findings regarding the comparison of the participants' Disaster Response Self-Efficacy Scale pre-test total scores and sub-dimension scores with descriptive characteristics are presented in Table 3. A statistically significant difference was observed between volunteering in disasters and the sub-dimension scores of the scale, including on-site rescue competency, disaster role quality and adaptation competency, and the pre-test total scores ($p < 0.05$). This study revealed that the mean "on-site rescue competency" subdimension score of the self-efficacy scale was higher in male students, and the mean "disaster psychological nursing competency" score was higher in

Table 1 Descriptive characteristics of the participants

Variables		
Age	21.90 ± 0.712 (min.=21, max.=24)	
Gender	n	%
Female	26	86.7
Male	4	13.3
Region of Residence		
Marmara	5	16.7
Central Anatolia	11	36.7
Black Sea	9	30.0
Mediterranean	2	6.7
Aegean	2	6.7
Southeastern Anatolia	1	3.3
Perceived Income Level		
Income less than expenses	3	10.0
Income equals expenses	23	76.7
Income higher than expenses	4	13.3
Previous Exposure to a Disaster		
Yes	23	76.7
No	7	23.3
Receiving Education Related to Nursing in Disasters/Emergency Situations in the Undergraduate Nursing Program		
Yes	5	16.7
No	25	83.3
Participation in Disaster Drills		
Yes	7	23.3
No	23	76.7
Volunteering in Disasters		
Yes	3	10.0
No	27	90.0
Participation or Membership in NGOs or Institutions Related to Disasters		
Yes	8	26.7
No	22	73.3
Total	30	100.0

students with lower income. Furthermore, students who volunteered in disasters had higher scores in the sub-dimensions of on-site rescue competency and disaster role quality and adaptation competency ($p < 0.05$).

Table 4 presents the conceptual categories formed by nursing students. The analysis of the qualitative findings showed that the metaphorical perceptions of nursing students about disasters are grouped into three different

categories. These categories are “Uncertainty and Fear,” “Emotional Burden and Loss,” and “Reality and Change.”

Discussion

Disasters are a significant public health issue that negatively impacts community life, increases mortality and morbidity rates, and leads to material and spiritual losses [15]. The recent earthquake disaster in Türkiye, which has adversely affected numerous people, has once again highlighted the importance of being prepared for disasters. This study was designed to determine nursing undergraduate students’ metaphorical perceptions of disasters and to assess the impact of the search and rescue training given to nursing students on their level of disaster response self-efficacy. The findings showed that the disaster response self-efficacy levels of nursing students increased after the search and rescue training related to disasters. The results of this study are discussed below in the context of the literature.

The mean age of the students in this study was 21.90 ± 0.712, 86.7% of them were female, and 76.7% had been exposed to disasters before, including the COVID-19 pandemic and earthquakes (Table 1). In a similar study, Sarıkahya and Yorulmaz (2023), aimed to determine the disaster response self-efficacy of nursing students [22]. In their study, 65.5% of the students were female, and 53.7% had not experienced any disaster. Koca and Arkan (2020), investigated the impact of a disaster management training program on nursing students’ perceptions of disaster preparedness and response self-efficacy [23]. They reported that the mean age of the students was 21.16 ± 1.23, 74% were female, and 70.1% had no experience of a disaster. Similarly, Bülbül (2021), [24] assessed the disaster response self-efficacy of nursing students. In the study, the mean age of the students was 21.42 ± 2.33, 82.3% were female, and 8.2% had been exposed to disasters throughout their lives, including earthquakes and floods [24]. Our findings are parallel to the literature.

Nurses take frontline positions during emergencies, pandemics, and disasters, striving to save lives, meet needs, and mitigate the long-term impact of disasters on health. Nurses’ ability to intervene in any disaster event is significantly determined by their disaster response self-efficacy, which is their belief in carrying out the required practices related to disaster intervention [25]. In this

Table 2 Comparison of the mean scores of disaster response self-efficacy scale and its sub-dimensions

Scale and sub-dimensions	Pre-test	Post-test	Statistical results ^a	
Disaster response self-efficacy scale	X ± SD	X ± SD	t	p
On-site rescue competency	35.83 ± 7.98	47.70 ± 6.16	-8.531	< 0.001*
Disaster psychological nursing competency	13.10 ± 2.808	17.93 ± 2.363	-9.238	< 0.001*
Disaster role quality and adaptation competency	16.33 ± 2.998	18.23 ± 1.547	-3.825	< 0.05**
Disaster Response Self-Efficacy Scale Total Score	65.17 ± 11.844	83.87 ± 9.372	-8.889	< 0.001*

a: t test in dependent groups, X: Mean, SS: Standard Deviation, t: paired t test statistics * $p < 0.001$, ** $p < 0.005$

Table 3 Comparison of disaster response self-efficacy scale pretest mean scores according to the descriptive characteristics of nursing students

	On-site rescue competency	Disaster psychological nursing competency	Disaster role quality and adaptation competency	Disaster Response Self-Efficacy Scale Total Score
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Gender				
Female	34.62 ± 7.505	13.08 ± 2.756	15.96 ± 2.932	63.54 ± 11.035
Male	43.75 ± 7.136	13.25 ± 3.594	18.75 ± 2.500	75.75 ± 12.997
T	-2.278	-0.113	-1.797	-2.017
P	0.031*	0.911	0.083	0.053
Region of Residence				
Marmara	35.60 ± 6.877	13.80 ± 3.271	17.60 ± 3.32	67.00 ± 10.124
Central Anatolia	36.82 ± 8.232	13.82 ± 2.228	17.45 ± 2.39	67.82 ± 12.106
Black Sea	35.89 ± 7.557	12.00 ± 2.739	14.33 ± 3.000	62.22 ± 10.791
Mediterranean	30.50 ± 4.950	11.50 ± 6.364	16.50 ± 3.536	58.50 ± 14.849
Aegean	44.50 ± 0.707	15.00 ± 0.00	17.50 ± 2.121	77.00 ± 2.828
Southeastern Anatolia	19.00	11.00	13.00	43.00
F	1.785	0.890	1.823	1.633
p	0.154	0.503	0.146	0.190
Perceived Income Level				
Income less than expenses	42.67 ± 9.713	16.67 ± 2.082	19.67 ± 0.577	79.00 ± 8.000
Income equals expenses	35.17 ± 8.172	12.52 ± 2.591	16.22 ± 2.860	63.91 ± 11.816
Income higher than expenses	34.50 ± 3.416	13.75 ± 2.872	14.50 ± 3.317	62.00 ± 8.524
F	1.254	3.54	2.936	2.569
p	0.302	0.043*	0.068	0.095
Previous Exposure to a Disaster				
Yes	35.52 ± 8.118	13.04 ± 2.549	16.09 ± 3.088	64.52 ± 11.889
No	36.86 ± 8.071	13.29 ± 3.773	17.14 ± 2.734	67.29 ± 12.365
t	-0.382	-0.196	-0.811	-0.534
p	0.706	0.846	0.424	0.598
Receiving Education Related to Nursing in Disasters/Emergency Situations in the Undergraduate Nursing Program				
Yes	34.60 ± 8.849	13.60 ± 2.408	16.60 ± 3.435	64.80 ± 11.862
No	36.08 ± 7.979	13.0 ± 2.915	16.28 ± 2.979	65.24 ± 12.084
T	-0.373	0.430	0.214	-0.075
P	0.712	0.671	0.832	0.941
Participation in Disaster Drills				
Yes	31.0 ± 2.309	13.29 ± 3.352	14.71 ± 3.904	59.0 ± 8.622
No	37.30 ± 8.541	13.04 ± 2.705	16.83 ± 2.570	67.04 ± 12.201
T	-1.910	0.196	0.113	0.297
P	0.066	0.846	0.104	0.117
Volunteering in Disasters				
Yes	44.67 ± 6.028	16.00 ± 1.000	20.00 ± 0.000	80.67 ± 5.686
No	34.85 ± 7.639	12.78 ± 2.764	15.93 ± 2.811	63.44 ± 11.099
T	2.140	1.978	2.411	2.620
P	0.041*	0.058	0.023*	0.014*
Participation or Membership in NGOs or Institutions Related to Disasters				
Yes	36.50 ± 6.803	14.50 ± 1.773	17.38 ± 2.387	68.00 ± 8.685
No	35.59 ± 8.511	12.59 ± 2.971	15.95 ± 3.14	64.14 ± 12.822
T	0.271	1.699	1.154	0.785
P	0.788	0.100	0.258	0.439

t test in independent groups * $p < 0.05$

F: One-way ANOVA

Table 4 Conceptual categories

Categories	Metaphors	Statements related to the metaphors
Uncertainty and Fear	Being Trapped Under	"Disaster perception is like a balloon because when it bursts, everyone is afraid" (PN1).
	Debris	"Disaster perception is like being under debris because despite all the despair, it is the desire to live again" (PN9).
	Tunnel and Uncertainty	"Disaster perception is like a tunnel where you don't know where the end is because it is uncertain when and how we will escape from that psychology and the severity of the current situation" (PN17).
	Death and Uncertainty	"Disaster is like darkness because in the dark, people think they won't find their way, they believe they will stay there, and they lose hope" (PN23).
	Bridge of Sirat and Recovery	
	Ocean and Direction Loss	
Emotional Burden and Loss	Lost Child and Uncertainty	
	Tears and Loss	"Disaster perception is like a beloved item because when the word 'disaster' comes to my mind, I experience or think about the fear of losing someone" (PN5).
	Heart Attack and Damage	"Disaster is like a smeared page because no matter how much you erase it, the trace always remains" (PN18).
	Waking Up from a Beautiful Dream and Facing Reality	"Disaster is like teardrops because it is the pain of deaths, accidents, losses, and shattered families" (PN21).
	Breath out and Approaching Danger	"Disaster perception is like a heart attack because it either passes, leaves damage, or kills." (PN25).
Reality and Change	Bomb and Global Impact	"Disaster perception is like a rotten fruit because a rotten fruit is inedible and should be discarded. A fresh one should be eaten. Similarly, a damaged building won't continue to be used; it needs to be demolished, and a new one must be built." (PN3).
		"Disaster perception is like a withered flower because some damages can flourish again after much effort, while others wither away" (PN7).
		"Disaster perception is like the sunrise and sunset of the sun because it feels like there will never be a morning, but hope is reborn with the first rays of the sun" (PN11).
		"Disaster perception is like a broken vase because even though it may look beautiful from the outside when you put the vase back together and place the flower, nothing is the same as before" (PN29).

study, the disaster response self-efficacy scores of nursing students were assessed before (65.17 ± 11.844) and after (83.87 ± 9.372) search and rescue training. A significant change was observed in the total scores and all sub-dimensions of the self-efficacy scale, indicating an increase in self-efficacy scores among nursing students after the training (Table 2). Similarly, in the literature, Erkin et al. (2023), reported a significant increase in the disaster response self-efficacy scores of nursing students from pre-training (63.11 ± 11.73) to post-training (75.88 ± 11.77) [26].

Furthermore, the study by Jung et al. (2018), confirmed that nursing students' competency for disaster nursing increased through the disaster education program, and a number of previous studies also reported that the ability and knowledge to perform disaster nursing improved after education [27]. The lack of disaster-related education, poor disaster knowledge, and insufficient disaster skills have been identified as important determinants of nurses' lack of confidence in disaster preparedness and response to disaster or emergency situations. Nurses with knowledge in disaster management have reported higher confidence or self-efficacy in responding to disasters [1, 28–30]. In their study examining the disaster response self-efficacy levels of final-year nursing students, Korkmaz et al. (2023), reported that students who received prior disaster training had higher levels of disaster response self-efficacy [31]. Our results support the notion that disaster-related education in nursing increases the level of disaster response self-efficacy. Considering the difference between pre-test and post-test

results, it is suggested that nursing students may have insufficient knowledge about disasters, emphasizing the need to address this knowledge gap.

This study revealed that the mean "on-site rescue competency" subdimension score of the self-efficacy scale was higher in male students, and the mean "disaster psychological nursing competency" score was higher in students with lower income. Furthermore, students who volunteered in disasters had higher scores in the sub-dimensions of on-site rescue competency and disaster role quality and adaptation competency (Table 3). Erkin et al. (2023), reported that nurses with previous disaster experience had higher levels of disaster response self-efficacy [26]. Sarikahya and Yorulmaz (2023), indicated that male gender and exposure to disasters were determinants of disaster response competence [22]. Similarly, Toraman and Korkmaz (2023), reported in their studies on the disaster response self-efficacy of nursing students that male students had higher self-efficacy levels [32]. The higher self-efficacy in male students can be explained by the fact that in tasks such as search and rescue, extracting from debris, and tasks requiring physical strength in disaster sites, men may take more risks and have greater confidence. Previous experiences of students in this regard, knowing what they will encounter in the next instance, and understanding how and where to intervene are believed to increase their self-confidence and, consequently, enhance their levels of self-efficacy.

In this study, students' metaphorical perceptions of disasters were categorized into three distinct themes: "Uncertainty and Fear," "Emotional Burden and Loss,"

and “Reality and Change.” The theme of Uncertainty and Fear is a metaphorical representation used to understand the impact of disaster situations on individuals (Table 4). Disasters disrupt the routine of life as unexpected and sudden events, shake the sense of security, and create uncertainty about the future. The expressions within this theme emphasize the feelings of uncertainty that individuals experience in the chaotic situations caused by disasters, along with the associated emotions of fear, anxiety, and psychological stress. Fear also encompasses risk and uncertainty. In the study by Cankardaş and Sofuoğlu (2019), it was reported that individuals who experienced earthquakes and fires had a moderate level of stress, and those who had previously experienced earthquakes and fires had higher stress levels [33].

The theme of Emotional Burden and Loss represents the impact of disaster perception on individuals and their emotional experiences. It depicts the physical manifestations of stress and anxiety during the process, emotional losses stemming from personal attachments, emotional reactions to the changing and vulnerable nature of the environment, and the emotional burdens brought about by facing reality and awakening. It emphasizes that disaster is an experience that touches on various dimensions of individuals’ emotional worlds. There are studies in the literature examining the emotional effects of disasters on individuals. In a study by Ari et al. (2016), it was found that anxiety, depression levels, and stress disorders were significantly higher in individuals directly exposed to the Hatay-Reyhanlı bombing attack compared to those indirectly exposed [34]. In another study by Bulut (2009), it was reported that 90.2% of children who experienced an earthquake in Bingöl were in the at-risk group for a diagnosis of post-traumatic stress disorder [35].

The theme of Reality and Change signifies the impact of the disaster, the real changes individuals experience, and the process of achievement and adaptation. This theme focuses on the new conditions, challenges, and comprehensive living conditions that emerge with the disaster. It represents the changes in people’s daily routines and their efforts to adapt to these changes. Due to the limited number of studies examining students’ perceptions of disasters in the literature, we discussed our findings with a limited amount of literature. It is expected that our study will contribute to the literature in this regard.

Integration of quantitative and qualitative findings

The integration of the quantitative and qualitative findings provides a more comprehensive understanding of how the search and rescue training influenced students’ disaster-related perceptions and disaster response self-efficacy.

Quantitative improvements and their meaning

Following the three-stage intervention, students’ total DRSES scores increased significantly from 65.17 ± 11.84 to 83.87 ± 9.37 , demonstrating a marked improvement in their perceived competencies across on-site rescue, psychological nursing in disasters, and disaster role adaptation. All sub-dimensions also showed statistically significant gains ($p < 0.05$). These increases align with the fact that most participants had no prior disaster training (76.7%), no drill experience (76.7%), and no volunteer experience (90%). Thus, the training served as their first structured exposure to disaster response, contributing to substantial cognitive and behavioral shifts.

Connection with qualitative themes

Qualitative metaphors provide insight into *how* and *why* these changes occurred.

“Uncertainty and fear”

This category reflects students’ pre-training perceptions. Their metaphors emphasized unpredictability, anxiety, and insufficient knowledge about disasters—consistent with their lower pre-test DRSES scores and limited disaster experience. The dominance of this category prior to training illustrates the students’ lack of confidence and preparedness, matching quantitatively observed baseline self-efficacy levels.

“Emotional burden and loss”

After exposure to the training—especially the skills stations and the simulation day—students began to conceptualize disasters as emotionally intense but manageable situations. This perceptual shift corresponds with increases in the sub-dimension disaster psychological nursing competency, suggesting that experiential learning helped them develop emotional readiness in addition to technical competence.

“Reality and change”

This category reflects a post-training sense of realism, increased situational awareness, and professional responsibility. Students’ metaphors highlighted recognition of the real demands of disaster environments and the need for rapid, coordinated action. These expressions align with the significant improvements in on-site rescue and disaster role adaptation competencies. The shift toward this category mirrors the overall rise in DRSES scores and indicates that the training fostered not only technical skills but also transformative changes in perception and self-efficacy.

Synthesis of results

Taken together, the integration demonstrates that:

- Quantitative gains in DRSES reflect measurable improvements in knowledge, skills, and perceived competence.
- Qualitative themes reveal *underlying emotional and perceptual transformations* that explain these gains.
- The shift from “uncertainty and fear” toward “reality and change” parallels the significant increase in self-efficacy scores.
- Students’ lack of prior disaster exposure made the training particularly impactful, amplifying both cognitive and affective learning outcomes.

Thus, the mixed-methods integration shows that the educational intervention not only enhanced students’ disaster response skills numerically but also reshaped their internal frameworks for understanding and approaching disaster scenarios.

Conclusion

Nurses play a crucial role as healthcare professionals in disaster response. Providing nursing students with training in search and rescue during disasters, determining their self-efficacy, and identifying their perceptions towards disasters are essential steps in understanding their responses during such incidents and preparing them to provide care to many individuals affected by disasters. This study found that disaster education increased the disaster response self-efficacy of nursing students. It provides valuable information to understand nursing students’ disaster perceptions. The findings of in this study support the literature indicating that the search and rescue training provided to nursing students enhances their self-efficacy in responding to disasters.

Limitations

This study has several limitations. First, the sample size was small ($n=30$) and consisted of voluntary, self-selected participants, which introduces the possibility of selection bias and limits generalisability to all nursing students or other educational settings. Second, although students were recruited from 11 universities, the sample may not be representative of the wider nursing student population. Third, the single-group pretest–posttest design without a comparison group prevents causal inference. Fourth, students’ disaster response self-efficacy was evaluated through a scale measuring students’ self-efficacy and based on students’ written opinions and student declaration. Finally, the post-test was administered immediately after the intervention, and therefore long-term retention and sustained self-efficacy could not be assessed. Future studies should include larger and more diverse samples, controlled designs, and longer follow-up periods.

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Author contributions

Mahinur DURMUŞ: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Supervision; Validation; Writing-original draft; Writing-review & editing. Ayşenur DURMUŞ: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Supervision; Validation; Writing-original draft; Writing-review & editing. Nuray DEMİRALP: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Sila GÜL: Data curation; Formal analysis; Supervision; Validation; Writing-original draft. Kemal DEMİRALP: Data curation; Formal analysis.

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Data availability

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethics committee approval was received from the Kastamonu University Science and Engineering Sciences Scientific Research and Publication Ethics Board with decision number 12–39, dated 08.11.2023. In addition, permission was obtained via e-mail from the person who developed the scale to use the scale. Necessary explanations were made to the participants about the purpose of the study and the confidentiality of the answers, students were allowed to withdraw from the study at any time and their informed consent was obtained. The voluntary participants were included in the study. The study was carried out in accordance with ethical research principles and the Declaration of Helsinki.

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Competing interests

The authors declare no competing interests.

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