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Evaluation of the Knowledge and Awareness of Firefighters in Turkey in Disaster Risk Management

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Abstract: Firefighters stand as one of the most effective task forces, striving to minimize losses incurred during disasters. Clarifying the present status of disaster risk management for firefighters can offer insights into the factors influencing response during disasters and how preparedness for such events can be enhanced. The aim of this study is to assess the current status of fire and rescue services, actively engage in crisis management during disaster risk management, to identify areas for improvement that enhance their involvement in preparatory stages, and to bolster their effectiveness in crisis management. This descriptive, cross-sectional study involved 772 firefighters who had prior experience in disaster response. The findings of this study revealed that firefighters who had undergone first aid training demonstrated the ability to anticipate hazardous situations and behaviors, regularly inspected their equipment, showed awareness of work-related accidents and occupational diseases, and scored statistically higher on the scales. These findings are expected to assist fire departments in establishing a sustainable and comprehensive disaster management cycle.

Keywords: risk management; integrated disaster management; sustainable disaster cycle; OHS; firefighter; effectiveness

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1. Introduction

Disasters pose significant threats to societal health, security, and well-being on a global scale, resulting in loss of life, injuries, displacement, and adverse impacts on the economy [1]. Given its geological, meteorological, and topographic characteristics, Turkey is situated in a region prone to frequent natural disasters, including earthquakes, landslides, floods, rockfalls, and avalanches [2].

In 2022, Turkey recorded over 20 thousand earthquakes [3], marking the highest number of earthquakes documented in 2023, with over 49 thousand occurring in the first half of the year [4]. On 6 February 2023, two earthquakes of magnitudes Mw 7.7 and Mw 7.6 struck the Pazarcık and Elbistan districts of Kahramanmaraş, approximately 9 h apart (at 04:17 and 13:24 Turkey time). This disaster resulted in the loss of more than 48 thousand lives and severe damage or destruction to over half a million buildings across 11 provinces along the Eastern Anatolian fault line [5].

It is suggested that Turkey's average annual Gross Domestic Product (GDP), susceptible to earthquakes, could potentially increase fivefold between 2010 and 2080, contingent upon socioeconomic development [6]. Given these projections, establishing an effective disaster management system in Turkey has become imperative.

Disaster management endeavors to mitigate the potential impact on human life and property [7]. Emergency response teams have been organized in many parts of the world with the aim of minimizing the potential and subsequent effects of disasters. These teams serve a range of pre-disaster preparedness functions such as planning, training, and exercises [8]. Therefore, the readiness of these teams is of paramount importance.

Readiness is directly related to the challenges teams face in understanding hazards, interpreting risks, and determining the extent to which they wish to prepare for disasters [9]. Their readiness for disasters not only helps mitigate the impact of disasters, respond to the needs of the community post-disaster, and expedite effective recovery but also strengthens the community, local governments, and professional emergency response teams [10]. Therefore, understanding the effectiveness of institutions and organizations in preparing for disasters is of utmost importance.

In the event of a potential disaster, it is important to assess the current readiness of firefighters who play a significant role in the early stages of intervention and carry out a large and important portion of search and rescue operations in disaster risk management. Identifying their preparedness levels, identifying areas for improvement, and determining corrective actions are crucial for them to effectively combat disasters [11].

Building upon these premises, the aim of this study is to identify the current status of firefighters who actively engage in the intervention phase of disasters within the risk management process. By doing so, the study seeks to provide areas for improvement that not only enhance their participation in intervention efforts but also contribute to preparedness activities for risk management. To achieve this aim, a "Disaster Risk Management Scale" has been developed specifically for firefighting personnel and applied to firefighters who have previously participated in disaster interventions.

Another factor that positively influences the effectiveness of firefighters in emergencies and disasters is a healthy and safe working environment. Occupational Health and Safety (OHS) refers to systematic efforts aimed at protecting employees from various hazards that may arise during the course of work, as well as improving working conditions both inside and outside the workplace to enhance their well-being [12]. It is an important concept for the physical and mental health of employees [13].

This study aimed to investigate the impact of OHS knowledge and awareness among firefighters on the Disaster Risk Management Scale, pinpointing areas for improvement. The lack of previous research exploring the correlation between OHS and disaster management knowledge of firefighters underscores the significance of this study in addressing a notable gap in the literature. Moreover, given the global imperative of robust disaster preparedness and response, this research offers valuable insights into the readiness of the studied firefighters for disaster scenarios.

2. Conceptual Framework

A typical disaster management cycle comprises four phases: preparation, response, recovery, and mitigation. The effectiveness of the response and recovery phases, initiated when a disaster strikes, is closely tied to the preparatory activities conducted beforehand [14]. There is increasing agreement that preparedness at various levels represents one of the most influential and cost-effective methods for reducing disaster risk [14]. Consequently, the international approach to emergencies and disasters has primarily shifted from post-impact activities (such as temporary relief and reconstruction) towards a more systematic and comprehensive risk management process [15].

Disaster preparedness encompasses proactive measures taken before an emergency to enhance operational capabilities, enable an efficient response in the event of an emergency, and minimize losses. It involves activities such as planning, identifying resources, training, communicating risks, raising public awareness, and conducting drills to ensure the safety and security of a community's response. Predictive activities are also included to enhance effectiveness [16–19].

The world relies on efficient task forces to minimize the impact of emergencies and reduce losses resulting from both human-made and natural disasters [20]. Firefighters, police officers, and healthcare workers are among the active-duty forces in most countries. With their specialized training and superior equipment, they play a crucial role, particularly in the crisis management phase of disaster response [21–24]. However, when examining the literature on disaster management, studies focusing on society and house-

holds (e.g., [25–28]), healthcare workers (e.g., [29–38]), and police officers (e.g., [39–42]) are abundant, while research specifically addressing firefighters within this subject area is notably limited (see [43,44]).

King et al. (2019) conducted a study with military health personnel, indicating a moderate level of preparedness for disasters. Similar results were found in a study conducted among health personnel in the Asia–Pacific region [45–48]. In a study evaluating the preparedness of rescue workers following an emergency, firefighters' preparedness levels were assessed, and it was reported that their preparedness levels were adequate [49]. The common conclusion drawn from all these studies is the need to enhance preparedness.

Furthermore, upon reviewing the literature, it is evident that there is a limited number of studies focusing on the disaster preparedness of search and rescue personnel who have previously participated in disaster interventions [49]. This deficiency is considered significant within the field of disaster management. While some communities utilize voluntary accreditation programs to evaluate their emergency response capabilities, others depend on internal resources, leading to a lack of consistency and standardized self-assessments that may not accurately reflect actual preparedness [50].

3. Methods

3.1. Study Group

The research was conducted in Turkey, and firefighters who voluntarily agreed to participate and had prior experience in disaster response were included in the study. During the scale development phase, a pilot test was administered to 30 randomly selected firefighters. The aim of this pilot test was to assess the applicability of the scale, address any issues based on feedback received, and measure the time required to complete the scale. In the main study, 772 firefighters were reached. Data collection in both phases was conducted face-to-face using a survey form. Descriptive statistics for the study group are presented in Table 1.

Table 1. Descriptive Statistics for Participants (n = 772).

	n	**%**
Gender		
Male	745	96.5
Female	27	3.5
Age		
20–27	73	9.5
28–35	186	24.1
36–43	235	30.4
44–51	216	28
52 and over	62	8
Educational Status		
Primary and secondary school	169	21.9
High school	344	44.6
University	259	33.5
Years of experience		
0–5	133	17.2
6–10	305	39.5
11–15	115	14.9
16–20	107	13.9
20+	112	14.5
Mission		
Fireman	464	60.1
Fire Sergeant	84	10.9
Fire Chief	39	5.1
Other	185	24

The vast majority of respondents were male firefighters (96.5%), with most participants falling between the ages of 28 and 51 (82.5%). Additionally, 78.1% of participants held a high school diploma or higher education qualification. In terms of tenure within the fire department, the majority of respondents (39.5%) had been on duty for 6–10 years. Regarding the roles undertaken by firefighters, the distribution is as follows: firefighters constitute 60.1%, fire sergeants 10.9%, fire chiefs 5.1%, and other roles account for 24%.

Table 2 presents the distribution of OHS and disaster-related knowledge within the main study group (n = 772).

Table 2. Distribution of firefighters' knowledge about OHS and disaster (n = 772).

	Yes	No	No Idea
Received training on OHS	733 (94.9%)	27 (3.5%)	12 (1.6%)
Received basic first-aid training	716 (92.7%)	48 (6.2%)	8 (1%)
Experienced a work accident	141 (18.3%)	598 (77.5%)	33 (4.3%)
Experienced an incident at the work site	245 (31.7%)	487 (63.1%)	40 (5.2%)
Knows about what needs to be done after a work accident	687 (89%)	57 (7.4%)	28 (3.6%)
Is provided with the necessary PPE by the employer	713 (92.4%)	43 (5.6%)	16 (2.1%)
Has the ability to predict dangerous situations and dangerous behaviors	696 (90.2%)	54 (7%)	22 (2.8%)
Checks equipment regularly	688 (89.1%)	64 (8.3%)	20 (2.6%)
Knows what to do in case of a work accident	717 (92.9%)	38 (4.9%)	17 (2.2%)
Is aware of the competent authorities to contact in case of an illness after work.	619 (80.2%)	114 (14.8%)	39 (5.1%)
Received disaster psychology training	314 (40.7%)	422 (54.7%)	36 (4.7%)
Participated in a disaster drill before	478 (61.9%)	277 (35.9%)	17 (2.2%)
Received disaster-related training in in-service training	575 (74.5%)	173 (22.4%)	24 (3.1%)
Reviewed the Turkey Disaster Response Plan (TAMP)	330 (42.7%)	382 (49.5%)	60 (7.8%)
Participated in a disaster drill within TAMP	231 (29.9%)	495 (64.1%)	46 (6%)
Is aware of the disaster and emergency risks prevalent in one's residing region	521 (67.5%)	190 (24.6%)	61 (7.9%)

Summary statistics are given as Number (Percentage) values.

Upon examination of Table 2, it is apparent that a significant portion of participants have received comprehensive training and possess essential knowledge and skills related to OHS and disaster preparedness. Specifically, 94.9% have undergone OHS training, 92.7% have received basic first aid training, and 92.4% have been equipped with necessary Personal Protective Equipment (PPE) by their employers. Additionally, a notable 90.2% reported being aware of hazardous situations and behaviors. Furthermore, 89.1% diligently conduct regular equipment checks, while 92.9% are knowledgeable about the appropriate actions to take in the event of a work-related accident. Moreover, 80.2% are familiar with the relevant authorities to contact in case of work-related illnesses. However, participation rates in disaster drills (61.9%) and training programs on disasters (74.5%) during in-service training indicate areas where further engagement may be warranted. Moreover, it is noteworthy that 42.7% have examined the Turkey Disaster Response Plan (TAMP), with 29.9% participating in drills within its scope. Lastly, the fact that 67.5% of participants reside in disaster-prone areas underscores their awareness of emergency risks and dangers.

3.2. Procedure

Administration: The data for this study was collected between 1 May and 30 May, 2023. The inclusion criterion for participation in the research was voluntary agreement. All participants received training and information regarding data collection methods, ethical considerations, and communication protocols in the field. The survey form comprised 5 questions pertaining to participants' sociodemographic characteristics, 16 knowledge-related questions about OHS and disasters, and 35 awareness-related questions about emergencies and disasters. The "Fire Department Personnel's Disaster Risk Management Scale" was developed using the 'Awareness Questions on Emergencies and Disasters' included in this survey form.

In both the initial trial and the primary study, participants were requested to select from five options for each item on the scale: 'Strongly agree', 'Agree', 'Undecided', 'Disagree', and 'Strongly disagree'.

Initial Item Pool Generation/Criteria for selection of items: Initially, an exhaustive literature review was conducted to compile the scale items, supplemented by an examination of the 'Municipal Fire Brigade Regulation'. Subsequently, a comprehensive item pool consisting of 35 statements across four dimensions (11 items on security perception, 11 on attitude, 6 on knowledge, and 7 on self-efficacy) was developed.

To assess the content validity of the scale, interviews were conducted with individuals and academics possessing expertise in disaster risk management and firefighting. Based on the informal feedback received from these experts, certain items were revised, an item pertaining to the attitude factor was eliminated, and the scopes of the factors were refined.

3.3. Ethics

To conduct the study, approval was obtained from the Yıldız Technical University Social and Human Sciences Research Ethics Committee, dated 3 May 2023, with meeting number 2023.05. Prior to commencing the survey, all participants were provided with information regarding the study's objectives through a written consent form. Those who agreed to participate in the survey proceeded by accepting this written consent form and were assured that they could withdraw from the study at any point.

3.4. Data Analysis

The results of this study were analyzed in two stages. The first stage involved the analysis of scale development. In the second stage, the relationship between the valid and reliable scale and the independent variables was explored. The study data were assessed using the IBM SPSS Statistics Standard Concurrent User V26 statistical package program.

Scale development. Prior to conducting scale development and testing for construct validity, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) for fit were employed.

In EFA, factors formed by observed variables were identified. These factors represent hypothetical variables [51]. The correlation matrix was scrutinized to assess the data's suitability for factor analysis. Hwang and Henry (1990) excluded items with factor loading values below 0.40 from their scale [52]. Bartlett's test of sphericity was utilized to statistically assess the correlation between variables in the data matrix [53]. This test determined whether the matrix formed between the questions resembled an identity matrix. Additionally, the Kaiser-Meyer-Olkin (KMO) criterion, derived from correlation and partial correlation coefficients, was evaluated to gauge the data's suitability for factor analysis. The KMO, a sampling adequacy criterion, ranges from 0 to 1, with a value above 0.5 deemed adequate [54]. The principal component method was employed to derive the factors, considering as many factors as eigenvalues greater than one. Factor rotation was conducted using the Varimax Method to elucidate the variables contributing to each common factor. An item-total correlation coefficient value of 0.20 or higher indicated compatibility with the overall scale [55].

CFA was employed to confirm the factor structure obtained from EFA [56]. While EFA determines the appropriate number of factors based on the data matrix, in CFA, the number of factors is predetermined. IBM SPSS Statistics for Windows (Version 25.0) and Amos (Version 24.0) package programs were utilized for CFA.

Various indices, including χ^2/df, RMSEA, SRMR, IFI, TLI, CFI, and GFI, were used to evaluate the factor validity of the models in CFA. RMSEA, being least affected by sample size, typically considers cutoff values near 0.06 or 0.08 acceptable. IFI, TLI, CFI, and GFI fit indices exceeding 0.90 indicate adequate model fit [57,58].

Analysis of the scale within dependent variables. The analysis was conducted using a rating scale ranging from 1 to 5 (1 = Strongly agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly disagree). As the scale score increases, firefighters' proficiency in disaster risk management is expected to improve.

Independent Samples *t*-tests were employed to compare two groups and determine whether there were variations in scores on the 'Firefighters' Disaster Risk Management

Scale' based on gender, age, education level, length of service, and duty. Analysis of Variance was utilized for variables with more than two categories. In cases where the Analysis of Variance yielded significant results, multiple comparisons were conducted using the Bonferroni test. Relationships between numerical variables were assessed using the Pearson correlation coefficient.

4. Results

4.1. Scale Development

Following the analyses, three items with factor loadings below 0.40 and inadequate distribution in the dimensions were eliminated from the scale. Consequently, the scale was reconstructed with 31 items encompassing four factors. Items that fell outside the scope were removed, and question numbers were revised accordingly. The final iteration of the original scale is depicted in Table 3.

Table 3. Items in the Disaster Risk Management Scale for Firefighters.

Factor	Elements
Perception of Security	1. Firefighter health and safety is supported in my organization.
	2. Safety training is built into all our training.
	3. Vehicle inspection schedules and equipment checks are strictly adhered to.
	4. We have a post-incident critique process for firefighting operations.
	5. All firefighters have the authority to stop unsafe practices.
	6. We understand risk analysis and apply risk assessment analysis in every fire incident.
	7. I do not hesitate to tell my supervisor when I need urgent and long-term medical help.
	8. In my institution, records of near-miss incidents, work accidents, and occupational diseases are taken regularly.
	9. Technological developments are followed for a safer and healthier working environment.
	10. Corrective action plans are developed to eliminate deficiencies.
	11. Standards and policies are developed for emergency responses.
	24. Our institution has sufficient tools and equipment to respond to emergencies or disasters.
Attitude	27. I would be willing to take part in a possible disaster.
	28. Improving my working conditions will make me more efficient when responding to emergencies or disasters.
	29. The training I received is essential in responding efficiently to emergencies and disasters.
	30. Personal protective equipment is required when responding to emergencies and disasters and is provided by my institution.
	32. Teamwork is essential when responding to emergencies and disasters.
	33. I trust my teammates when responding to emergencies and disasters.
	34. To mitigate disasters, fire brigades can engage in proactive activities both before and during interventions.
Self-Efficacy	12. I reviewed the current disaster and emergency action plans.
	13. I know what to do in any disaster.
	14. I have the knowledge and competence to intervene in an emergency or disaster.
	15. In the event of a disaster, I can collaborate with other institutions and organizations in a coordinated manner.
	16. The fire department is one of the most competent institutions to respond to a disaster.
	17. I received the necessary information about emergencies and disasters during the fire department in-service training.
	31. I have the strength to respond to an emergency or disaster.
Knowledge	19. One of the most critical factors in disaster response is the sufficient number of vehicles, equipment, and workforce.
	20. Fast and effective coordination is one of the most critical factors in disaster response.
	21. One of the most critical factors in disaster response is the experienced workforce.
	22. One of the most critical factors in disaster response is proper pre-disaster risk management.
	23. A linear relationship exists between faster recovery after a disaster and disaster awareness.

The scale comprises security perception (12 items), attitude (7 items), knowledge (5 items), and self-efficacy (7 items). Total score calculation involves summing the responses to all questions, and there are no reverse-scored items in the scale. The scale ranges from a minimum score of 31 points to a maximum of 155 points.

The KMO value, utilized to assess the suitability of the newly formulated scale distribution for factor analysis, yielded an excellent level. The Bartlett test result was obtained as 19,699.651 ($p < 0.05$), suggesting that the applied measurement indicates multivariate distribution within the universal parameter. Heteroscedasticity ratios exceeding 60% typically denote a perfect explanatory value in factor analysis. In this study, the variance accounted for was 67.88%, which is deemed excellent (Appendix A).

The findings reveal that the factor loadings of questions within the security perception dimension range from 0.537 to 0.778, for attitude dimension from 0.599 to 0.806, for self-efficacy dimension from 0.529 to 0.704, and for knowledge dimension from 0.601 to 0.758. With Cronbach's Alpha (α) exceeding 0.70, the reliability of the scale was considered sufficient. Therefore, it effectively measures the four-dimensional sub-features of the 'Disaster Risk Management Scale for Firefighters.' Based on these outcomes, the scale created is regarded as a reliable measurement tool.

A Total Correlation exceeding 0.20 signifies the item's significance for the question. The total correlation values obtained range from 0.704 to 0.823. Based on these results, the scale was deemed a valid measurement tool.

Statistical values concerning the fit of the scale model are provided in Table 4.

Table 4. Statistical values pertaining to the fit of the Disaster Risk Management Scale for Firefighters.

Scale	(χ^2/sd)	RMSEA	SRMR	IFI	CFI	GFI	TLI
Model	3.643	0.059	0.049	0.945	0.944	0.881	0.937

This study established acceptable fit indices as RMSEA ≤ 0.05, IFI, TLI, CFI ≥ 0.90, and GFI ≥ 0.85. The model developed for the disaster risk management scale for firefighters ($\chi^2 = 1497.149$, dF = 411) comprises four dimensions. The fit indices for this model indicate that it is compatible at an acceptable level.

The model generated through the applied CFA is visually presented in Figure 1. Each path coefficient of the dimensions on the 31 questions is statistically significant ($p < 0.05$). All subscales significantly influence the questions, with each path coefficient of security perception, attitude, self-efficacy, and knowledge above the scale being statistically significant ($p < 0.05$).

Introductory statistical data of the scale are presented in Table 5. The average of the security perception dimension of the scale is calculated as 47.84 ± 9.26 points, while the total score average of the scale falls between 127.68 ± 20.49 points. A positive and statistically significant relationship between the 'Disaster Risk Management Scale for Firefighters' and its dimensions was determined ($p < 0.05$).

Table 5. Introductory Statistics for the Disaster Risk Management Scale for Firefighters.

	Mean $\pm$ *SD*	*M* (*Min-Max*)	Dimension 1	Dimension 2	Dimension 3	Dimension 4
Perception of security	47.84 $\pm$ 9.26	48 (12–60)	1			
Attitude	30.29 $\pm$ 4.80	31 (7–35)	$r = 0.605$ $p < 0.001$	1		
Self-sufficiency	28.56 $\pm$ 5.54	28 (7–35)	$r = 0.740$ $p < 0.001$	$r = 0.682$ $p < 0.001$	1	
Knowledge	20.99 $\pm$ 3.80	21 (5–25)	$r = 0.624$ $p < 0.001$	$r = 0.709$ $p < 0.001$	$r = 0.714$ $p < 0.001$	1
Disaster Risk Management Scale for Firefighters	127.68 $\pm$ 20.49	127 (31–155)	$r = 0.910$ $p < 0.001$	$r = 0.824$ $p < 0.001$	$r = 0.897$ $p < 0.001$	$r = 0.837$ $p < 0.001$

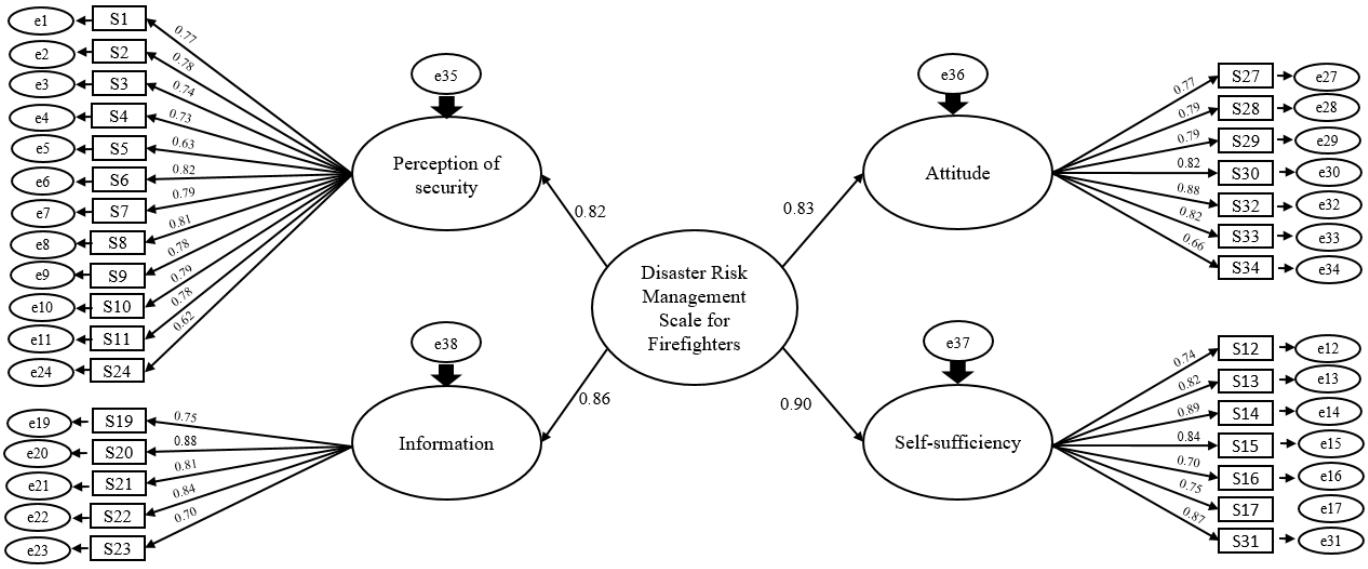

Figure 1. Confirmatory factor analysis for the Disaster Risk Management Scale for Firefighters.

4.2. Results of Independent Sample t-Tests

When comparing the created scale across demographic characteristics, the average scores of firefighters on the disaster risk management scale do not exhibit a statistically significant difference based on demographic traits ($p > 0.05$). These findings suggest that the disaster risk management scale scores of firefighters are independent of demographic characteristics, indicating that these factors do not influence the scale results (Appendix B).

Upon examining significant outcomes from the scale comparison concerning knowledge about OHS and disaster, it was found that scale score averages were notably higher among individuals who had received basic first aid training ($F = 3.683$, $p = 0.026$), had access to necessary personal protective equipment provided by their employer ($F = 4.867$, $p = 0.008$), and demonstrated an ability to anticipate dangerous situations and behaviors ($F = 4.939$, $p = 0.007$). Additionally, those who routinely inspected their equipment ($F = 17.191$, $p < 0.001$), remained vigilant regarding work accidents and occupational diseases ($F = 3.803$, $p = 0.023$; $F = 11.920$, $p < 0.001$), engaged in disaster drills previously ($F = 4.896$, $p = 0.008$), received disaster training ($F = 9.516$, $p < 0.001$), were familiar with the TAMP ($F = 5.932$, $p = 0.003$), and were knowledgeable about the disaster/emergency risks in their residential area ($F = 8.357$, $p < 0.001$) exhibited statistically higher scores among firefighters.

5. Discussion

The primary objective of intervening in disasters such as major earthquakes is to save as many lives as possible. A crucial component of such emergency response is the search and rescue operations to locate and extricate individuals trapped under debris. Over the past decade, large-scale natural and man-made disasters have underscored the importance of disaster response efforts.

This study aimed to assess the current status of firefighters, who often serve as the primary responders in disaster scenarios, within the risk management framework. It sought to identify areas for enhancement to enable their involvement in pre-disaster preparedness efforts.

One common obstacle to effective response, both in learning and executing first aid during emergencies, is the apprehension of making mistakes and the associated fear of shouldering responsibility [59]. This psychological barrier can hinder swift and confident action when facing critical situations. Additionally, firefighters often experience heightened stress when they are the first or sole responders at the scene, particularly if they feel ill-

equipped compared to other emergency personnel [60]. Such circumstances can diminish the efficacy of disaster interventions, underscoring the importance of adequate preparation.

According to the findings of this study, 92.7% of the participants had received first-aid training. Similarly, previous research on firefighters by Kanat (2019) reported a percentage of 98.9% [44], Ergün (2012) found 86.8% [61], Yıldırım (2019) noted 89.9% [62], and Adıgüzel (2010) reported a figure of 98.9% [63], indicating a consistent trend across studies in the literature.

Drills that define emergency response functions or roles are crucial for first responders to ensure their competency during emergencies or disasters [64]. Full-scale participation exercises involve the operational mobilization of all or most elements of the emergency management program and incorporate realistic scenarios to test response capabilities under stress [65]. Disaster drills, specifically, assess the adequacy of existing disaster plans, personnel training, hands-on checks of communication systems, equipment, and other materials, as well as the effectiveness of the emergency response network in relation to the applied threat [66].

Fung et al. (2008) highlighted in their study that disaster drills are instrumental in helping nurses prepare for disasters [67]. According to the data from this study, 61.9% of the participants reported participating in disaster drills. In contrast, other studies examining the situation of firefighters in this regard revealed that 80% of participants [68] in the study by El and Avşar (2022) and 38.9% of participants [43] in the research conducted by Karatutlu (2021) and Adıgüzel (2010) reported 24.2% participation in disaster drills [63].

In many disaster response operations, first responders have encountered difficulties due to limited access to necessary and appropriate equipment [69]. The 11 September 2001 terrorist attacks resulted in the loss of 2819 lives and injured over 6290 people. It was reported that during disaster response operations, first responders faced inadequate equipment supply [70]. In China, during the earthquake measuring 7.9 on the Richter scale, search and rescue operations were hampered due to limited equipment, and intervention teams were reported to have dug out survivors with their bare hands [71]. In Haiti, during the earthquake measuring 7.0 in 2010, the lack of appropriate vehicles and equipment hindered search and rescue operations [72]. In our study, 83.3% of firefighters identified having an adequate number of vehicles, equipment, and manpower as one of the most crucial factors in disaster response, while 86% emphasized the importance of experienced manpower as another critical factor. In conclusion, access to vehicles and equipment is of critical importance to support life-saving operations and facilitate effective disaster response operations.

Furthermore, one of the most important factors influencing the readiness and performance of an emergency response team is coordination among teams [73]. Coordinating first response teams who are not familiar with appropriate training, technical skills, and disaster management organizational structures can be extremely challenging. To overcome these challenges, there is a need to enhance the technical skills of teams and establish policies, operational agreements, and standardized procedures and protocols for effective inter-agency disaster response [74].

According to research, the lack of coordination among response teams has been identified as one of the most significant challenges that can impair teamwork during situations such as major California wildfires [22]. Therefore, the efficiency and performance of an emergency response team are significantly influenced by effective coordination among its members, which is crucial for enhancing readiness [73]. In our study, 88.4% of firefighters identified rapid and effective coordination as one of the most important factors in disaster response.

Training plays a crucial role in equipping first responders and critical workers with the necessary skills to effectively respond to the unique challenges posed by disasters. Additionally, it instills accepted norms and best practices for executing specific tasks or skills [75]. In Turkey, the basic firefighting training for firefighters is regulated in the "Municipal Fire Brigade Regulation" in its 8th Annex [76]. In this annex, it is stipulated

that firefighters should receive annual training of 8 h on "Basic Disaster and Emergency Management" and "Turkey Disaster Response Plan (TAMP)".

According to the findings of this study, 74.5% of the participants reported receiving training on disaster management. In comparison, another study examining the preparedness of firefighters in a similar context, conducted by Karatutlu (2021), indicated that only 41.3% of participants received disaster-related training [43]. Among studies focusing on healthcare workers, Goniewicz and Goniewicz (2020) reported a lower percentage, with 46.3% of participants receiving disaster training [33], whereas Susila et al. (2019) found that 70.9% of participants had received such training [35]. These results suggest that participants in this study exhibited higher levels of disaster education compared to those in other studies.

TAMP encompasses a network of working groups and coordination units involving various governmental bodies, institutions, private sector entities, NGOs, and individuals. This comprehensive plan was established in 2014 to delineate the roles and obligations of stakeholders in disaster response activities across Turkey [77]. It outlines fundamental response principles to be adhered to before, during, and after disasters of any scale or nature. By delving into this plan, firefighters gain invaluable insights that aid in their preparedness and response efforts during emergencies.

The findings from this study reveal that 42.7% of the participants reported examining TAMP. In comparison, previous studies investigating firefighters' engagement with TAMP yielded consistent results. For instance, El and Avşar (2022) found that 28% of participants reviewed TAMP [68], while Kanat (2019) reported a slightly higher percentage of 47.9% who examined TAMP [44]. These results align with the trends observed in related literature, indicating a notable portion of firefighters engaging with TAMP.

Fire departments play a crucial role in safeguarding public safety and managing risks effectively [78,79]. Adequate allocation of emergency resources tailored to the known risk profiles of local communities is vital for mitigating the impact of emergencies and disasters [80]. According to the findings of this study, 67.5% of participants demonstrated awareness of the disaster and emergency risks in their living area. Similarly, previous research examining firefighters' awareness of local risks reported consistent findings. For instance, one study found that 72% of participants were knowledgeable about the hazards in their region, while another study indicated that 52.1% were aware of disaster and emergency risks. These results are in line with those reported in existing literature, underscoring the importance of firefighters' awareness of local risks.

Moreover, firefighters who exhibited high scores in areas such as employer-provided PPE, ability to anticipate potential hazards, regular equipment inspections, and knowledge regarding work-related accidents and occupational diseases demonstrated superior performance on the disaster risk management scale.

Many studies have examined the impact of OHS on employee productivity, and as a result, it has been stated that there is a positive and significant relationship between all measures related to OHS and the productivity of employees in this context [81–84]. However, literature exploring the interplay between firefighters' roles in disaster management and OHS remains noticeably absent.

These findings underscore the significance of firefighters' comprehension and awareness of OHS and disaster-related issues in influencing their disaster risk management scale scores. It highlights the crucial role that such knowledge and awareness play in shaping the scale's performance. Consequently, these factors warrant careful consideration for enhancing firefighters' proficiency in managing the disaster risk management process. This study stands as a vital contribution to bridging the existing gap in the literature.

Through this study, the preparedness of firefighters for disasters has been assessed, and their knowledge and awareness within the scope of disaster preparedness have been identified. The results obtained from the study can be shared with municipalities, disaster and emergency management centers, fire departments, and other relevant institutions involved in disaster management with the aim of improving the preparedness of firefighters

for disasters. By sharing the findings, these organizations can reassess existing policies and develop practices aimed at determining training and planning strategies within the scope of disaster preparedness.

Although the job descriptions of firefighters vary in many parts of the world, the general procedures to be followed during a disaster and the practices within the scope of disaster preparedness are similar. Therefore, the scale developed in this study can be used by firefighting organizations in other countries as well.

6. Conclusions

Fire departments play a crucial role in mitigating the impact of emergencies and disasters in Turkey by effectively managing risks and crises. The findings of this study highlight the importance of first aid, OHS training, awareness programs, familiarity with the TAMP, disaster and emergency training as essential areas for improvement among fire department personnel. Moreover, the limited participation in disaster psychology training and drills within TAMP indicates a notable area for improvement.

Furthermore, safeguarding the health and safety of firefighters is paramount for effective disaster management. Enhancing OHS knowledge and awareness can empower firefighters to make informed decisions and intervene more effectively during disasters.

By implementing these recommendations, firefighters can enhance their effectiveness in the disaster risk management process, thereby improving crisis management interventions. Additionally, this study serves as a model for establishing a sustainable and integrated disaster management system within fire departments.

One limitation of the study is that all participants have prior experience working in disasters, which may potentially inflate their scores on the disaster awareness questions of the scale. Moreover, the assessment of firefighters' competencies in disaster risk management relies solely on subjective data, which could introduce biases. However, despite these limitations, the study yields significant findings that address practical and scientific gaps in understanding firefighters' capabilities. The insights gained from this study can serve as a foundation for future research aimed at enhancing the effectiveness of Turkish fire departments across all phases of disaster management. Additionally, this study offers valuable clues for designing more comprehensive research initiatives and provides essential data for researchers in this field.

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Appendix A. Validity and Reliability Results of the Disaster Risk Management Scale for Firefighters

Factor	Item Number	Factor Loading				Total Correlation	Explained Variance %	Cronbach Alpha
		1	2	3	4			
Perception of Security	1	0.729				0.703	23.59	0.942
	2	0.733				0.733		
	3	0.634				0.726		
	4	0.713				0.663		
	5	0.703				0.551		
	6	0.722				0.740		
	7	0.582				0.747		
	8	0.716				0.718		
	9	0.778				0.684		
	10	0.776				0.708		
	11	0.730				0.719		
	24	0.537				0.585		
Attitude	27		0.599			0.669	17.52	0.923
	28		0.774			0.660		
	29		0.763			0.675		
	30		0.784			0.696		
	32		0.806			0.663		
	33		0.766			0.675		
	34		0.617			0.583		
Self-Efficacy	12			0.704		0.688	13.51	0.925
	13			0.704		0.753		
	14			0.752		0.760		
	15			0.651		0.769		
	16			0.529		0.661		
	17			0.550		0.708		
	31			0.665		0.762		
Knowledge	19				0.658	0.652	13.26	0.894
	20				0.735	0.711		
	21				0.732	0.663		
	22				0.758	0.683		
	23				0.601	0.641		
Scale							67.88	0.967
KMO = 0.968 Df = 465 χ^2 = 19,699.651 $p < 0.001$								

Appendix B. Descriptive Statistics Detailing the Demographic Characteristics of the Participants (N = 772) and a Comparison of the Developed Scale across These Characteristics

	Disaster Risk Management Scale for Firefighters	Test (p)
Gender		
Male	127.72 ± 20.45	$t = 0.282$ $p = 0.778$
Female	126.59 ± 21.81	
Age		
20–27	130.14 ± 18.69	
28–35	127.2 ± 19.11	$F = 0.513$ $p = 0.726$
36–43	128.41 ± 18.09	
44–51	126.87 ± 22.05	
52 and over	126.32 ± 28.34	
Educational Status		
Primary and secondary school	128.47 ± 21.28	$F = 0.811$ $p = 0.445$
High school	126.64 ± 22.13	
University	128.56 ± 17.5	
Years of experience		
0–5	129.38 ± 19.61	
6–10	127.21 ± 19.44	$F = 2.383$ $p = 0.055$
11–15	127.41 ± 20.92	
16–20	131.54 ± 18.68	
20+	123.54 ± 24.59	
Mission		
Fireman	128.46 ± 18.36	
Fire Sergeant	127.02 ± 21.54	$F = 2.488$ $p = 0.059$
Fire Chief	133.44 ± 24.19	
Other	124.83 ± 23.75	

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