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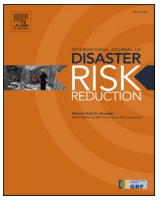

Unraveling myths: Assessing beliefs in disaster management misconceptions among first responders and the general public

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ABSTRACT

Though studies of various global disasters highlighted predictable human behavior, a gap is noted between common perceptions, including those of professionals, and actual responses. Misconceptions are widespread and negatively impact disaster response. First responders play a crucial role in disaster management, and their decisions are influenced by their assessment of public behavior during disasters. Therefore, understanding prevalent beliefs among first responders is of great importance.

The aim of the study was to examine the extent of misconceptions among first responders and the public regarding behavior during disasters. The cross-sectional study was conducted using a structured quantitative questionnaire that included 25 statements, of which 19 were misconceptions. Respondents included >500 first responders (police officers, emergency medical services' providers, and firefighters) and individuals from the public.

The findings showed that first responders believe in some misconceptions to a greater extent than the general public, such as their belief that panic, mass evacuation, and public disorder are characteristic behaviors during disasters.

As first responders are required to demonstrate expertise in predicting human behavior during disasters, the findings demonstrate a substantial gap in their knowledge and beliefs. The research underscores the need for developing mechanisms to reduce misconceptions and enhance skills in disaster management.

1. Introduction

Studies on human behavior indicate that in emergency and disaster situations, there is a tendency for predictable behavior among the public. Research conducted on various adversities, such as earthquakes, hurricanes, and terror attacks, presented that most people act rationally, cooperate, and help each other [1–4]. A consistent tendency to donate food, water, and financial aid to victims has been documented [5]. Organized efforts by bystanders and lay people to rescue victims from destruction areas were observed following diverse adversities [6]. Maintaining personal hygiene and preventing the accumulation of waste were common behaviors observed following disasters [7]. Conversely, substantial prevalent gaps were identified between the perceived and actual behavior of the public during disasters, reflecting diverse geographical and cultural characteristics [8–12]. Many believe that, contrary to what was actually

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observed, lack of order, chaotic behavior, or other negative behaviors characterize emergency settings, but these have been recognized as misconceptions [8,13]. Misconceptions, in the context of emergency management, are defined as persistent false beliefs, (often referred to as myths), that contradict well-established research evidence [14]. They include common but inaccurate perceptions of human behavior during disasters, which contribute to a wide gap between popular perceptions of disaster behavior and what research has consistently shown. As stated by Quarantelli [15], "there is an interesting question as to why these myths persist," highlighting the ongoing presence and influence of such erroneous beliefs. Reality represents the actual human behavior as was recorded in varied scientific studies.

The Pan American Health Organization (PAHO) classified four categories of misconceptions [16]: general topics, morbidity and mortality, social behavior, and assistance. For example, in the social behavior category, misconceptions include beliefs such as panic being a common reaction and looting being widespread during disasters.

Alexander [17] mapped over seventy misconceptions about human behavior during disasters. Both PAHO and Alexander's work emphasized the importance of bridging the gap between expected and actual human behavior during disasters, to enhance the effectiveness of disaster response strategies.

A common misconception is that the public will display mass panic and behave selfishly during a disaster when reality shows that in most cases, the public reacts rationally and demonstrates social solidarity (Heide, 2004 [18]). Panic and selfish behavior among the public following emergencies were observed only in areas characterized by deep social conflicts, lack of trust in authorities, and weak infrastructure [19–22]. However, such negative actions are rare and uncharacteristic in most disaster situations [14,23].

Another misconception is that people will abandon the disaster areas en masse, while studies showed that most people stay in place and seek to protect their loved ones and their property [21].

Research has revealed that not only the public but also professionals in the field of disaster management have misconceptions about how people behave during disasters. To date, only a few studies have examined the gaps between professional perceptions and actual disaster behavior, including the variance between professionals and the public [8,10,13,14,24]. Nonetheless, a notable difference was reported in the extent of beliefs in misconceptions when comparing professionals with the general public, with professionals generally exhibiting fewer misconceptions [13].

Varied researchers have attempted to explain why misconceptions about disasters are widespread, investigating factors such as cognitive biases, media and social media influence, and personal and cultural factors [13,25–27]. While these factors were found to influence misconceptions, they provided a very limited explanation of the variance of belief in misconceptions. Nogami [25] also examined the relationship between communication, social media, anxiety, and misconceptions, but did not find significant results that supported such associations. Attempts to assess whether experience in disaster situations or specific demographic and occupational aspects influence these beliefs have not yielded statistically significant associations [9,13].

Studies examining belief in misconceptions have been conducted in various countries and cultures, such as Japan among the public and professionals [9], USA and Italy [17], UK [14], and Hungary [10]. While all these studies identified misconceptions, differences were seen in the degree and level of dominance of misconceptions. This indicates that while belief in misconceptions concerning disaster behavior may be universal, there is variability in the degree of beliefs and their level of prevalence across different cultures and professions.

Several theories attempt to explain human behavior during disasters, including processes of behavioral change and expected actions. One prominent theory is the Self-Categorization Theory [28], which posits that individuals behave according to their group identity, especially during emergency situations [27]. According to this theory, people classify themselves as part of either the affected or the responding group and act according to the norms and values of that group. Mileti's [29] theory highlights the importance of social and community connections in coping with disasters. Studies have shown that during a disaster, social connections strengthen, and communities organize efficiently to handle the situation. These behaviors reflect the human capacity to overcome emergencies through cooperation and mutual aid, countering misconceptions of chaotic and selfish behavior [30].

The Naturalistic Decision Making (NDM) theory is used in various studies to explain how expertise develops, particularly among emergency organizations and in emergency situations. The theory emphasizes that expertise, which is contrary to belief in misconceptions, requires more than just experience; it highlights the necessary conditions, including immediate professional feedback on actions taken, to foster the process of specialization and expertise development [31]. When such actions are effectively implemented, emergency responders are expected to be aware of and base their actions on evidence-based acquaintance with human behavior during disasters, rather than on misconceptions.

Beliefs in misconceptions may have a drastic impact on the effectiveness of disaster management. Several studies have shown that misconceptions concerning public behavior can negatively affect disaster response, including command and control processes, cooperation among emergency responders, and collaboration with civilian entities [1,14,24,32]. For example, findings from Hurricane Katrina indicated that misconceptions influenced the aid provided to survivors, worsening their situation and enhancing the need for assistance [33]. A study in Germany presented that misconceptions among emergency professionals affected the effectiveness of the cooperation between formal emergency responders and volunteer organizations [24]. Given the significant impact of misconceptions, it is vital to align disaster management strategies with the realities of public behavior. The aim of the study was to identify the levels of beliefs among first responders (police, fire brigade, and EMS personnel) and the public regarding misconceptions in disaster management. Understanding these perceptions is essential for improving preparedness, ensuring effective disaster response, and bridging the gap between expected and actual human behavior in emergencies.

2. Methods

The study was cross-sectional, conducted from January 29 to February 2, 2024. The data was collected using two methodologies: first responders were approached using the Qualtrics platform, based on the "snowball" (chain) sampling. At the same time, the public was reached through an internet panel company (https://www.sekernet.co.il/).

2.1. Study tool

A structured questionnaire aimed at identifying common misconceptions in disaster management was developed following an extensive review of the literature and existing study tools. The respondents were requested to consider emergency situations, defined as "all events that pose a risk to injury or death of many people, when there is only limited time to flee from the risk zone, such as earthquake, flood, fire, terror event, etc." The instructions stated that: "Following are several sentences that describe the behaviors of the population in emergencies. To what extent do you agree/disagree with each sentence?" The questionnaire is based on a list of perceptions concerning behavior during disasters, as outlined in Appendix A.

Specifically, 5 questions were adopted from the work of Drury et al. [14], 11 questions from the study of Alexander [8], supplemented with 9 additional questions based on insights from the literature review on misconceptions.

The questionnaire consisted of 25 items, of which 19 represented misconceptions, while the remaining 6 presented statements that were found to accurately represent the behavior of the public during disasters. Responses were based on a Likert scale with five options, ranging from 1 (strongly disagree) to 5 (strongly agree). Additionally, the questionnaire included 9 demographic questions, 5 items concerning experience and training in emergency situations, and 5 occupational data, with a particular focus on roles within first-response organizations.

The questionnaire was validated by 18 content experts, including 10 senior officials from emergency organizations (police, fire department, EMS, Home Front Command, military, and local authorities) and 8 academic experts in disaster management, psychology, and public health. Following the incorporation of their feedback, the revised questionnaire was pilot tested among 30 heterogeneous participants, including both the general public and first responders. The final version of the questionnaire was modified based on the results of the pilot study.

2.2. Sample size calculation and sampling

The sample size was calculated using the OpenEpi scientific calculator, separately for the first responders and the general population, while maintaining a confidence level of 95 %. The current size of the first responders was identified through the Ministry of Public Security and management systems of the first response organizations (N = 41,433), and by the National Bureau of Statistics for

Table 1
Demographic characteristics, experience, and training in disaster situations of the general public vs. First Responders.

Demography		Total	General public	First responders	*p-value*
		N = 1120	N = 504	N = 516	
Age	Mean ± Sd	40.27 ± 13.5	41.58 ± 15.1	38.97 ± 11.6	.002[b]
Gender	Male	66.9 %	48.9 %	84.8 %	<.001[a]
	Female	33.1 %	51.1 %	15.2 %	
Religion	Jewish	85.2 %	80.0 %	90.3 %	<.001[a]
	Other	14.8 %	20.0 %	9.7 %	
Degree of religiosity	Secular	40.5 %	44.0 %	36.9 %	.073[a]
	Traditional	36.8 %	33.6 %	40.0 %	
	Religious	15.5 %	14.7 %	16.4 %	
	Orthodox	7.2 %	7.7 %	6.7 %	
Level of Education	High school and below	24.3 %	28.6 %	20.1 %	<.001[a]
	Post-secondary	26.5 %	29.0 %	24.1 %	
	Academic degree	49.2 %	42.4 %	55.8 %	
Level of Income	Below mean	39.2 %	48.0 %	30.4 %	<.001[a]
	Mean	31.9 %	30.4 %	33.5 %	
	Above mean	28.9 %	21.6 %	36.1 %	
Family Status	Bachelor	24.1 %	26.4 %	21.9 %	.001[a]
	Married	64.1 %	58.9 %	69.2 %	
	Widow/divorced	11.8 %	14.7 %	8.9 %	
Experience and training in disaster situations					
Training in the last five years in disaster situations	Yes	41.3 %	19.2 %	63.7 %	<.001[a]
Direct experience in disasters	Yes	42.8 %	16.5 %	69.1 %	<.001[a]
# of times involved or present at the scene of a disaster		N = 432	N = 83	N = 349	<.001[a]
	1–2	37.7 %	71.1 %	29.8 %	
	3–5	21.1 %	16.9 %	22.1 %	
	>5	41.2 %	12.0 %	48.1 %	

[a] Based on chi-square analysis.
[b] Based on independent sample *t*-test.

calculating the sample of the general population (6.2 million individuals aged 18 and over). The calculation resulted in a required sample of 385 civilians and 381 first responders to ensure statistical significance.

2.3. Ethical approval

The study was approved by the Ethics Committee of Tel Aviv University, # 0007726-1, on December 18, 2023.

2.4. Statistical analysis

The analysis included descriptive statistics to present demographic characteristics, experience, and training in disaster situations of FR and the general public. Chi-square test and independent-sample *t*-test were used to compare the differences in misconceptions and reality statements between FR and the general public. A misconceptions index was calculated as the number of times that participants indicated 'High - 4′ and 'Very high-5′ for each of the 19 misconceptions, ranging from 0 (the participant did not choose 4 or 5 concerning any misconceptions) to 19 (the participant chose 4 or 5 regarding all of the misconceptions). The internal reliability of the index was examined by Cronbach's alpha. Differences between the higher level of the misconceptions index (17–19 statements ranked in the 'Very High' category) and the other levels of the index were analyzed by chi-square test. Logistic regression was conducted to identify factors that predict the level of beliefs in the misconceptions index. SPSS version 29.0.01 was used for the statistical analysis and a p-value less than .05 was considered statistically significant.

3. Results

The study included 1120 participants, among them 516 FR and 504 representatives of the general public. The demographic characteristics, experience, and training in disaster situations of the FR versus the public are presented in Table 1. A significant difference was observed between the two groups in all demographic characteristics except for the level of religiosity. FR vs. the general public were significantly younger ($p = .002$), had a higher frequency of males ($p < .001$), a higher percent of Jews ($p < .001$), more educated ($p < .001$), a higher level of income ($p < .001$), and a higher percent of married respondents ($p = .001$). Regarding experience and training in disaster situations, as expected, FR, compared to the general public, had more training in the last five years in disaster situations (63.7 % vs. 19.2 % respectively, $p < .001$). Similarly, FR had more direct experience in disasters versus the public (69.1 % vs. 16.5 % respectively, $p < .001$) and were more involved or present at the scene of a disaster compared to the general public.

3.1. Levels of belief in misconceptions

As presented in Fig. 1, a diverse response concerning the different misconceptions was observed. Some of the misconceptions are perceived as true among most respondents, such as 'Heavy load on evacuation centers' (90.2 %), 'A bomb alert causes panic' (88.2 %),

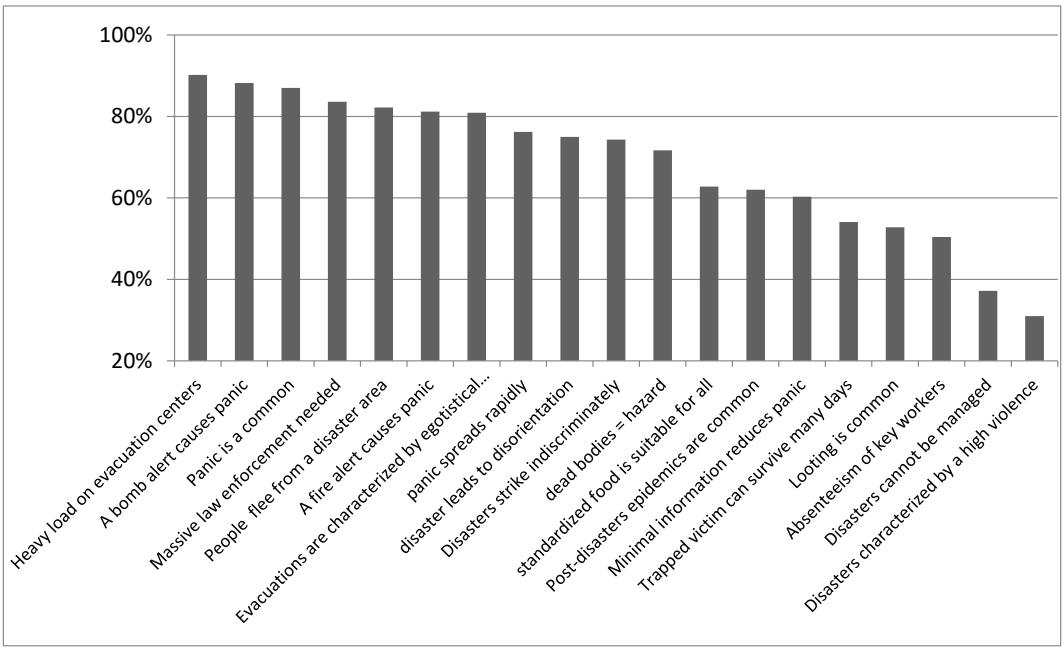

Fig. 1. Percent of answers 'highly agree'/'very highly agree' to the 19 misconceptions among the total respondents of both FR and the public (n = 1020).

'Panic is 'common during disasters' (87.0 %), 'Massive law enforcement is needed' (83.6 %), 'People flee from a disaster area' (82.2 %) and 'A fire alert causes panic' (81.2 %). In contrast, some other misconceptions are perceived as realistic by a lower percentage of respondents, such as 'Disasters are characterized by a high level of violence' (31.0 %) and 'Disasters cannot be managed' (37.2 %).

3.2. A comparison concerning levels of beliefs in misconceptions between first responders and the public

Commonalities and diversities between FR and the public are presented according to the percentage of respondents that perceive the misconceptions as truly representing realistic behavior during disasters (those that reported high or very high levels of agreement) and by mean ± standard deviation (see Table 2). Beliefs in 11 misconceptions were significantly different between FR and the public.

FR versus the general public had a higher level of belief in five misconceptions; 'Heavy load on evacuation centers' ($p < .001$), 'A bomb alert causes panic' ($p < .001$), 'Panic is common during disasters' ($p = .002$), 'Massive law enforcement needed' ($p < .001$), and 'Dead bodies constitute a public health hazard' ($p = .037$). In contrast, the public versus FR had a higher level of belief concerning six misconceptions; 'Panic spreads rapidly' ($p = .007$), 'Disaster leads to disorientation' ($p = .003$), 'Standardized food is suitable for all' ($p = .006$), 'Looting is common after a disaster' ($p = .008$), 'Absenteeism of key workers is common in a disaster' ($p < .001$), and 'Disasters cannot be managed' ($p < .001$) (Table 2).

3.3. A comparison concerning levels of beliefs in true statements between first responders and the public

Table 3 presents the distribution of perceptions concerning statements that are true in real disaster scenarios, comparing the perceptions of FR and the public. Five true statements were found to be perceived significantly differently between FR and the public. FR versus the public had a higher level of beliefs concerning four true statements; 'Disasters amplify solidarity' ($p < .001$), 'FRs are more organized than the public during disasters' ($p < .001$), 'Logistic challenges are common during disasters due to excessive

Table 2
Comparison between first responders (FR) (n = 516) and the public (n = 504) concerning misconceptions.

		Response (%) 'High' & 'Very high'	*P-value*[a]	Mean ± SD	*P-value*[b]
Q4 - Heavy load on evacuation centers	FR	93.8 %	.000	4.35 ± .661	.008
	Public	86.5 %		4.23 ± .783	
Q22 – A bomb alert causes panic	FR	92.4 %	.000	4.32 ± .703	.044
	Public	83.9 %		4.22 ± .836	
Q2 - Panic is common during disasters	FR	90.1 %	.002	4.18 ± .787	.482
	Public	83.7 %		4.15 ± .819	
Q13- Massive law enforcement needed	FR	89.0 %	.000	4.20 ± .793	.000
	Public	78.2 %		4.01 ± .854	
Q3 - People flee from a disaster area	FR	82.9 %	.506	4.08 ± .892	.884
	Public	81.3 %		4.09 ± .839	
Q23 – A fire alert causes panic	FR	81.6 %	.733	3.97 ± .847	.061
	Public	80.8 %		4.07 ± .861	
Q6 – Evacuations are characterized by egotistical behavior	FR	81.0 %	.918	4.06 ± .924	.596
	Public	80.8 %		4.09 ± .836	
Q11 - panic spreads rapidly during disasters	FR	75.4 %	.550	3.79 ± .807	.007
	Public	77.0 %		3.93 ± .819	
Q7 - disaster leads to disorientation	FR	73.8 %	.386	3.80 ± .863	.003
	Public	76.2 %		3.95 ± 770.	
Q19 - Disasters strike indiscriminately	FR	74.6 %	.825	3.89 ± 1.09	.120
	Public	74.0 %		4.00 ± 1.01	
Q14 – dead bodies = hazard	FR	73.4 %	.201	3.97 ± .906	.037
	Public	69.8 %		3.85 ± 1.01	
Q25 - standardized food is suitable for all	FR	62.4 %	.769	3.61 ± .860	.006
	Public	63.3 %		3.76 ± .814	
Q15- Post-disaster epidemics are common	FR	63.2 %	.418	3.72 ± .875	.221
	Public	60.7 %		3.65 ± .906	
Q21 - Minimal information reduces panic	FR	62.4 %	.164	3.45 ± 1.095	.783
	Public	58.1 %		3.47 ± 1.077	
Q20- Trapped victim can survive many days	FR	54.8 %	.637	3.37 ± .992	.225
	Public	53.4 %		3.45 ± .965	
Q10 -Looting is common	FR	53.1 %	.868	3.36 ± .904	008.
	Public	52.6 %		3.51 ± .922	
Q12 – Absenteeism of key workers	FR	46.5 %	.012	3.16 ± 1.107	.000
	Public	54.4 %		3.46 ± 1.049	
Q1 – Disasters cannot be managed	FR	35.1 %	.164	2.74 ± .571	.000
	Public	39.3 %		3.00 ± .630	
Q9 – Disasters characterized by a high violence	FR	32.4 %	.333	2.89 ± 1.01	160.
	Public	29.6 %		2.98 ± 1.01	

[a] Based on chi-square analysis.
[b] Based on independent sample *t*-test.

Table 3
Comparison between first responders (FR) (n = 516) and the public (n = 504) concerning belief in true statements.

		Response (%) 'High' & 'Very high'	*P-value*[a]	Mean ± SD	*P-value*[b]
Q8- Disasters amplify solidarity	FR	84.5 %	.000	4.12 ± .78	.001
	Public	74.8 %		3.96 ± .84	
Q24- FRs more organized than the public	FR	81.4 %	.000	4.02 ± .859	.002
	Public	70.2 %		3.85 ± .877	
Q18 – Logistic challenges common due to donations	FR	58.9 %	003.	3.53 ± .89	.145
	Public	49.6 %		3.45 ± .92	
Q5- Most survivors rescued by public	FR	57.9 %	.006	3.53 ± 1.07	.204
	Public	49.4 %		3.45 ± .90	
Q16 - Displaced people vulnerable to food insecurity	FR	51.2 %	.993	3.30 ± .97	.032
	Public	51.2 %		3.44 ± 1.03	
Q17- Provision of expired medications	FR	32.8 %	.168	3.10 ± .89	.585
	Public	28.8 %		3.07 ± .93	

[a] Based on chi-square analysis.
[b] Based on independent sample *t*-test.

donations' (p = .003), and 'Most survivors are rescued by the public than by FR' (p = .006). Conversely, the public versus FR had a higher level of belief in 'Displaced people are vulnerable to food insecurity' (p = .032.). See Table 3.

3.4. Misconceptions index

In order to build a misconceptions index, we counted the number of times that the respondents (both FR and the public) indicated 'High - 4′ and 'Very high-5′ agreement with each of the 19 misconceptions. The index ranged between 0 (respondents who did not rank any misconceptions as highly [4] or very highly [5] agreed) to 19 (respondents who ranked all of the misconceptions as highly [4] or very highly [5] agreed). Five groups were created to accurately represent the variation in agreement with misconceptions. These groups ranged from agreement with 4 answers (approximately 20 % of the questions), increasing in similar increments, up to the final group, which represented over 10 % agreement, indicating widespread acceptance of the misconceptions.

The distribution of the index is presented in Fig. 2. Approximately 15 % of the respondents very highly perceived the misconceptions as true (ranked 17 to 19 misconceptions as highly [4] or very highly [5] agreed). About 47 % had a high level of agreement (ranked 13 to 16 misconceptions as either highly [4] or very highly [5] agreed), and only approximately 4 % had a very low level of

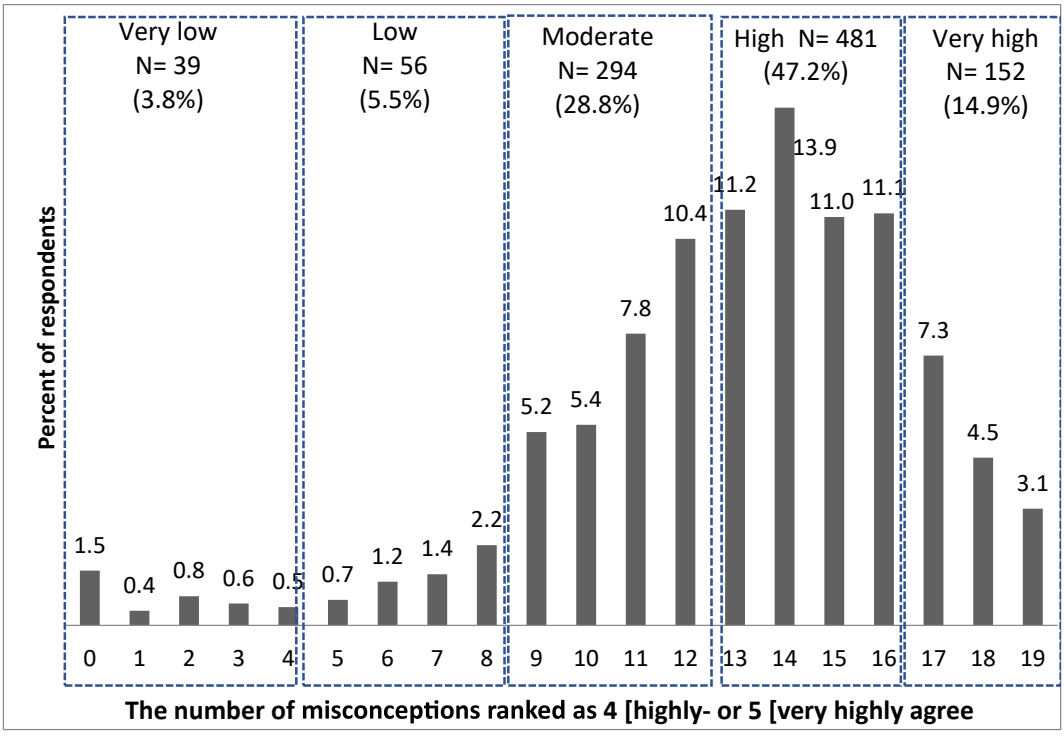

Fig. 2. Percent of respondents that answered 'highly' [4] or 'very highly' [5] agree with one of the 19 misconceptions among all respondents (n = 1020).

agreement with the misconceptions (ranked 0–4 misconceptions as highly [4] or very highly [5] agreed).

In the overall sample, the average number of positive responses per respondent was 13. Over 90 % of the respondents believe in nine or more misconceptions, with more than 60 % highly or very highly believing in misconceptions. Nearly 50 % of the respondents fall into the high belief category, meaning they believe in 13–16 misconceptions out of 19. Though there are differences between the varied groups concerning the levels of believing in misconceptions, there is substantial similarity in the distribution of demographic characteristics between the various groups. No particular demographic trait led to a major change compared to others, aside from a few notable exceptions. Older individuals are more likely to believe in misconceptions; the higher the average age of the respondents, the more misconceptions they believe in. Concerning family status, single individuals tend to believe in fewer misconceptions compared to married individuals. Among religious groups, Orthodox respondents show an exceptionally high belief level, with approximately 70 % highly or very highly believing in misconceptions (over 13). Religious respondents tend to believe in fewer misconceptions compared to other groups, with 53.5 % holding high or very high levels of belief, compared to over 60 % in the other groups.

Data analysis further reveals that individuals from other religions display different patterns compared to Jews. They tend to have a higher percentage of low-level belief in misconceptions, but simultaneously, around 18 % of them hold very high levels of belief (17–19 misconceptions). Experience and training in disaster response were not found to be substantial factors in influencing the level of belief in misconceptions. See Table 4.

The percentage of positive responses for first responders and the public was 69.3 % and 67.5 % respectively, with a mean of 13.1 (SD = 3.14) per first responder and 12.8 (SD = 4.2) per the public, but the differences between the two groups were not significant ($p = .138$). The distribution of the index into reference groups indicated a significant difference ($p < .001$) between first responders and the general public in the relative frequency across categories—very low, medium, high, and very high. In the extreme categories of the medium and high agreement, first responders had a significantly higher relative frequency compared to the general public. Conversely, in the extreme categories of very low and very high agreement, as demonstrated by the chi-square test, the general public's relative

Table 4
Levels of beliefs in misconceptions according to demographic characteristics.

# of misconceptions believed in		0–4	5–8	9–12	13–16	17–19	Total	p value
Group #		1	2	3	4	5		
%		3.7 %	5.4 %	28.8 %	47.2 %	14.9 %	100 %	
Age (mean)		35.61	38.04	38.33	40.84	44.14	100 %	<0.001
Gender	Male	2.7 %	5.6 %	29.0 %	46.7 %	16.0 %	100 %	0.169
	Female	5.4 %	5.1 %	28.1 %	48.5 %	12.9 %	100 %	
Religion	Jewish	3.3 %	4.8 %	30.0 %	47.5 %	14.5 %	100 %	0.028
	Other	5.3 %	9.3 %	21.3 %	46.0 %	**18.0 %**	100 %	
Degree of religiosity	Secular	3.4 %	3.9 %	29.1 %	47.4 %	16.1 %	100 %	0.219
	Traditional	3.8 %	7.5 %	25.5 %	49.2 %	14.0 %	100 %	
	Religious	4.5 %	5.7 %	36.3 %	40.1 %	13.4 %	100 %	
	Orthodox	1.4 %	2.7 %	26.0 %	52.1 %	17.8 %	100 %	
Level of Education	High school and below	7.3 %	6.1 %	25.2 %	47.2 %	14.2 %	100 %	0.008
	Post-secondary	3.0 %	6.3 %	25.4 %	47.4 %	**17.9 %**	100 %	
	Academic degree	2.0 %	4.6 %	32.2 %	47.3 %	13.9 %	100 %	
Level of Income	Below mean	5.1 %	7.3 %	27.0 %	46.2 %	14.4 %	100 %	0.013
	Mean	4.0 %	4.3 %	26.6 %	46.7 %	18.3 %	100 %	
	Above mean	1.0 %	4.1 %	33.2 %	49.3 %	12.3 %	100 %	
Family Status	Bachelor	7.0 %	4.9 %	34.0 %	43.0 %	11.1 %	100 %	0.05
	Married	2.2 %	5.2 %	27.9 %	48.3 %	16.4 %	100 %	
	Widow/divorced	4.2 %	7.6 %	21.8 %	50.4 %	16.0 %	100 %	
Training in the last five years in disaster situations	Yes	1.0 %	5.1 %	28.8 %	51.3 %	13.8 %	100 %	0.02
	No	5.5 %	5.8 %	28.4 %	44.5 %	15.8 %	100 %	
Direct experience in disasters	Yes	1.9 %	4.6 %	30.8 %	49.3 %	13.4 %	100 %	0.034
	No	4.9 %	6.1 %	27.0 %	45.8 %	16.3 %	100 %	
experience in disasters	once -twice	1.8 %	4.3 %	30.7 %	52.1 %	11.0 %	100 %	0.440
	Three to five times	4.4 %	3.3 %	31.9 %	48.4 %	12.1 %	100 %	
	More than five	.6 %	5.6 %	30.3 %	47.2 %	16.3 %	100 %	

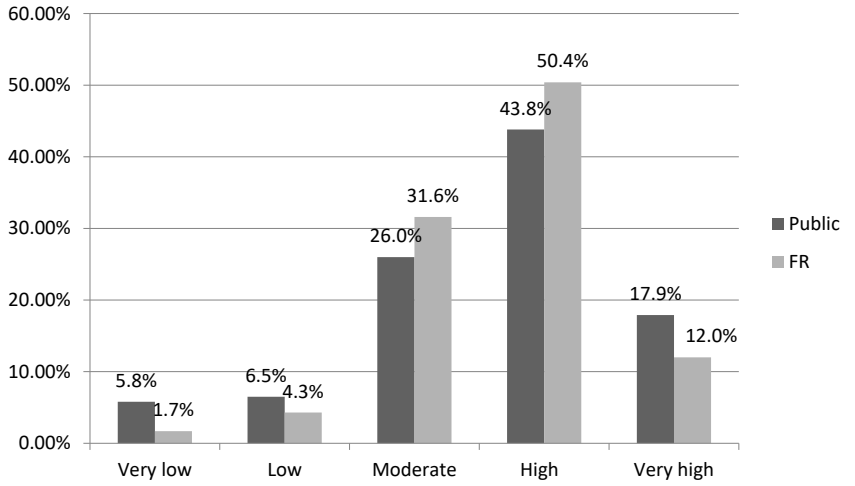

Fig. 3. -Index Distribution Between Two Research Groups: First Responders vs. the General Public.

frequency was significantly higher than that of first responders. See Fig. 3.

An examination of the statistically significant factors predicting very high beliefs presents a clear difference between first responders and the public. Eighteen percent of the public was found to have a 'very high' index level of misconceptions compared to 12 % among the FR (chi square = 24.4, $p < .001$).

A comparison of the demographic characteristics of the overall sample (of both FR and the public) between the 'very high' index category group and those classified with lower levels of belief in misconceptions, revealed that participants who more highly perceived misconceptions as true tended to be older compared to those with a lower level of belief (44.1 ± 12.8 vs. 39.6 ± 13.6 respectively, $p < .001$). However, other demographic characteristics were not found to be significantly different. Among the FR, 8.1 % of the police personnel were found to have a 'very high 'index' level of misconceptions compared to 13.7 % among EMS teams and 15.8 % among firefighters but the differences were not found to be statistically significant ($p = .082$). A logistic regression analysis aimed at finding associations between different demographic and other characteristics to levels of beliefs in misconceptions revealed that the group affiliation (FR vs. the public, OR = .634, $p = .045$), age (OR = 1.025, $p < .001$), and gender (female vs. male, OR = .637, $p = .037$) predicted a high belief in misconceptions (Nagelkerke R Square .043, Chi-square 25.12, $p < .001$). Being affiliated with the public group, older age, and males had a higher tendency to highly believe in misconceptions.

4. Discussion

This study aimed to identify the levels of beliefs among first responders (police, firefighters, and EMS personnel) and the public regarding misconceptions in disaster management. The expectation was that first responders, being responsible for disaster response, would demonstrate a higher level of expertise in this area and thus would not believe in common misconceptions about disaster behavior. The ability to plan for disaster response depends significantly on first responders' competencies as well as the dialogue with the public, taking into consideration their behavior during adversities [34].

Contrary to the expectation, the study's findings indicate that first responders widely believe in common misconceptions, even when they have been trained and participated in responding to varied adversities. Certain misconceptions are almost unanimously perceived by first responders, such as panic (90 % of participants believe panic is common in disasters), or looting (50 % of first responders believe it occurs during disasters). Conversely, other misconceptions, such as an increase in violence following a disaster, are viewed with more skepticism, though still, approximately 30 % of first responders believe that this is characteristic during adversities. This finding is even more surprising considering that the first responders were highly trained and experienced.

A potential explanation can be derived from the Naturalistic Decision Making (NDM) Theory that posits that to develop effective expertise and skills, professionals require, beyond extensive practice, immediate feedback [35]. A structured and effective method for After Action Review and provision of professional immediate feedback is often lacking in emergency organizations Coles [36,37]. Misconceptions among first responders about disaster behavior and response arise from lack of practice that is combined with feedback, leading to reliance on flawed intuitions [38,39]. The NDM theory emphasizes the need to create training environments that simulate real-world complexities and provide immediate, corrective feedback to build accurate decision-making skills [31,40] Furthermore, NDM recognizes a developmental continuum from novice to expert, which can take years, as it is based on experience and learning processes. It also suggests that this progression can be accelerated through hands-on exercises and immediate feedback [41].

While differences were identified in levels of expertise among first responders, no association was found with the level of experience, nor involvement in disaster response. Thus, the NDM theory that distinguishes between novices and experts along a developmental continuum, does not provide a full explanation for the belief of first responders with varied years of experience in

misconceptions. The study findings highlight that the overall mean beliefs in misconceptions does not differ between the public and the first responders. Even when statistically significant differences were found between the public and the first responders, the general direction of belief remained similar.

The similar beliefs in many misconceptions among the first responders and the public alike, may be partially explained by the Schema theory. A cognitive schema contains structured knowledge and experiences that serve as a reference point for processing new information. Information consistent with the schema is integrated into one's understanding, while conflicting information may be dismissed. When professional development of first responders processes, based on experience and training, fail to influence existing schemas, it is likely that these experiences will actually reinforce those pre-existing schemas (Lipp et al. [42]. This theory suggests that existing beliefs may be reinforced due to the confirmation bias and the tendency to filter information to strengthen existing knowledge, which tends to validate existing beliefs rather than foster new, expert schemas. In every culture, schemas are formed regarding how people behave during disasters and emergencies. These schemas influence the public's perception within that society [43] which tends to validate existing beliefs rather than foster new, expert schemas.

As first responders are also part of the general population, their socialization was formulated before they became professionals, and they most probably share values, beliefs and schemas that are common in their communities [44]. Though during their professional careers they gain experience, directly or through others, which may challenge their original schemas, they may oppose the need to modify their beliefs [45,46]. As posited by Nickerson [45], due to the confirmation bias, individuals tend to seek, interpret, and remember information that confirms their existing schemas while ignoring contradictory information, making schemas difficult to change. The Schemas theory contends that existing schemas influence learning from new events by seeking to confirm themselves and interpret occurrences according to the pre-event beliefs. As a result, first responders who hold inaccurate or limited schemas about disaster behavior, such as beliefs that individuals react in panicked actions or characterized by selfish behavior, might misinterpret the information of altruistic behavior during emergencies, thus reinforcing common misconceptions [46].

The findings reveal similarity between responses describing reality and those related to misconceptions. First responders are more inclined to believe in myths such as panic and mass evacuation, alongside their belief in the reality of high organization and solidarity during a disaster. This combination suggests that first responders, who experience immediate response scenarios more frequently, tend to reinforce biases in their perception of public behavior in emergencies [44]. Post-disaster, however, first responders show lower belief in misconceptions such as looting and violence and display strong confidence in social solidarity and significant public contributions. Thus, they demonstrate a realistic approach similar to that of the public, reinforcing skepticism toward common misconceptions about public behavior and its implications after disasters. Although the general direction is similar between the public and first responders in both true and false perceptions, first responders reinforce their sense of capability and pre-existing beliefs through confirmation bias, especially regarding immediate response, which strengthens existing schemas [46]. The Schema theory emphasizes that schemas are influenced by cultural experiences, and once formulated, are relatively resistant to change. Thus, the Schema theory and related research can serve as tools for understanding misconceptions and differences in beliefs, particularly in their prevalence and breadth across cultures, societies, professions, and individuals [47]. Different cultures develop unique schemas that influence how individuals interpret and recall events, shaping the way they remember stories and experiences, including concerning expected behavior schemas during disasters [48]. These schemas are shaped by the historical experiences, religion, education, or professions ([10,49]; Alexander [8]. The BESECU European project examined first responders from different countries and found cultural variations in their expectations concerning civilians' behavior during evacuations or other emergency situations [50].

An example that could reflect local characteristics is the perceived variability between first responders and the public concerning the authorities' capacity to manage disasters and the commitment of emergency personnel to provide the expected services. Israeli public expressed a low level of trust, while the first responders expressed significantly higher confidence in their ability to manage disaster situations and dedication to their work. The events of October 7, 2023, in Israel and the severe criticism of the emergency response during the attack may have influenced these results [51]. Conversely, previous studies in the U.K showed that the public trusted the authorities' capabilities (Drury et al.2013).

The comparative findings between countries (delineated in Appendix B) suggest that there is a variation in the level of beliefs in specific misconceptions across different countries, among both the public and the first responders. For example, noticeable differences can be seen in the belief that mass panic is characteristic in adversities between Japanese and Israeli professionals. In Japan, municipal professionals are less likely to believe in these myths, although the differences between them and the general public were statistically significant [13]. Despite societal and cultural variabilities, belief in misconceptions about expected behavior during disasters seems to be universal and transcends societies with different cultural characteristics and disaster-related experiences, These misconceptions persist in most societies. This raises the question of whether there is a universal, evolutionary human influence which lead to these misconceptions.

Beyond the learned personal and social schemas, there is also the preparedness theory, which suggests that humans are born with an inherent tendency to fear certain threats that have posed survival risks throughout evolution, including social situations involving chaos and competition [52]. It is recommended that future studies challenge and investigate this contention in varied societies.

5. Limitations

Our study examined numerous misconceptions. However, the findings regarding the belief in most of these misconceptions were derived from a single statement. Using multiple statements might provide a more robust and reinforced understanding of these findings. The research was conducted shortly after the October 7th disaster in Israel. As this event highly impacted the Israeli society, the results may have been influenced by the reports and images from the disaster. Evaluating perceptions at a later date, not in close

proximity to such an event, is recommended, as it might yield some different results.

6. Conclusions

Our study has demonstrated that first responders often hold misconceptions about how people will behave during a disaster, such as beliefs in widespread panic and mass fleeing. These erroneous predictions can influence their decision-making processes, indicating a need for improved training and education. The Naturalistic Decision Making (NDM) theory and the Schema theory partially explain these beliefs, highlighting the need for extensive practice, immediate feedback, and the resistance of mental schemas to change due to confirmation bias. Cultural and professional differences also play a role in shaping these perceptions.

Despite substantial differences among professionals, no group is immune from common misconceptions, underscoring the importance of further research aimed at helping professionals recognize, be aware of, and act upon insights from disaster behavior research. First responders are a vital population to study in terms of disaster preparedness and response, as their impact on disaster outcomes is significant, particularly during the critical hours of an event. Their influence extends to the post-incident process and support for survivors.

Future research should investigate effective methods to decrease professionals' reliance on misconceptions in both perception and practice. Additionally, it is vital to continue exploring these misconceptions' impact on decision-making and to refine the understanding of the factors contributing to erroneous beliefs across different populations. Such research efforts will ultimately improve professionals' skills and capabilities in handling disasters and emergencies, enhancing professionalism and focusing on reducing suffering and saving more lives and property.

CRediT authorship contribution statement

A. Alkalai Tavori: Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **B. Adini:** Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

Use of AI tools

During the preparation of this work the authors used Chat GPT to improve clarity. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. List of perceptions concerning behavior during disasters

	Misconception	Reality
Q1	"Disasters cause a great deal of chaos and cannot possibly be managed systematically".	"There are excellent theoretical models of how disasters function and how to manage them. After >75 years of research in the field, the general elements of disaster are well-known, and they tend to repeat themselves from one disaster to the next.
Q2	"When disaster strikes panic is a common reaction".	"Most people behave rationally in disaster. While panic is not to be ruled out entirely, it is of such limited importance that some leading disaster sociologists regard it as insignificant or unlikely."
Q3	"People will flee in large numbers from a disaster area."	"Usually, there is a "convergence reaction" and the area fills up with people. Few of the survivors will leave and even obligatory evacuations will be short-lived"
Q4	It is anticipated that during disasters, crowds will gather at public shelters, resulting in significant strain on resources.	Public shelters are usually not overwhelmed and can manage the needs of the affected population.

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	Misconception	Reality
Q5	Most victims in disasters that are excavated alive from under the rubble are rescued by formal first responders	Most victims in disasters are excavated alive from under the rubble by bystanders who happen to be on-site (family members, friends, neighbors, or others) rather than by formal first responders
Q6	Mass evacuation during a disaster is characterized by self-centered behavior, such as completely ignoring the needs of others except for family members	Self-centered behavior when fleeing from a disaster is uncharacteristic; most people react with social sensitivity.
Q7	"After disaster has struck survivors tend to be dazed and apathetic"	"Survivors rapidly start reconstruction. Activism is much more common than fatalism (this is the so-called "therapeutic community"). Even in the worst scenarios, only 15–30 % of victims show passive or dazed reactions".
Q8	"Disasters usually give rise to widespread manifestations of anti-social behavior "*	"Generally, people's behaviors during disasters are characterized by great social solidarity, generosity, and self-sacrifice."
Q9	In disaster, people resort to violence to protect their own interests.	The 'therapeutic community' is common: people have a greater tendency to help each other during crises than in routine times and violence against others is not common.
Q10	"Looting is a common and presents a serious problem after disasters".	"Looting is rare and limited in scope. It mainly occurs when there are strong preconditions, as when a community already is deeply divided."
Q11	During a disaster, panic spreads rapidly from individuals to a wider audience.	Fleeing a disaster area is often a rational response; unlike in the animal kingdom, where contagion is a concern, hesitation and the need to verify a threat often pose more of a problem than panic.
Q12	Emergency responders will not report to work in a disaster, as they will protect their families instead.	Mass absenteeism of key workers during the aftermath of disasters is not common. On the contrary, people tend to have an enhanced sense of duty.
Q13	A strong military presence is required in areas affected by disasters in order to discourage law-breakers.	Emergency response should transition from primarily military operations to fully civilian-led efforts, as instances of increased lawlessness following disasters are rarely a significant concern.
Q14	"Unburied dead bodies constitute a health hazard".	"Not even advanced decomposition causes a significant health hazard. Hasty burial demoralizes survivors and upsets arrangements for death certification, funeral rites, and, where needed, autopsy".
Q15	"Disease epidemics are an almost inevitable result of the disruption and poor health caused by major disasters".	"Generally, the level of epidemiological surveillance and health care in the disaster area is sufficient to stop any possible disease epidemic from occurring. However, the rate of diagnosis of diseases may increase as a result of improved health care.
Q16	Outbreaks and communicable diseases are frequent following most natural disasters *	Malnutrition rather than outbreaks increases the risk of death from infectious diseases and is more common in populations affected by displacement, especially if their displacement is linked to a long-term conflict
Q17	"Great quantities and assortments of medicines should be sent to disaster areas."*	"The only medicines that are needed are those used to treat specific pathologies, have not reached their sell-by date, can be properly conserved in the disaster area, and can be properly identified in terms of their pharmacological constituents. Any other medicines are, not only useless, but potentially dangerous."
Q18	"Any kind of aid and relief is useful after disaster providing it is supplied quickly enough".*	"Hasty and ill-considered relief initiatives tend to create chaos. Only certain types of assistance, goods, and services will be required. Not all useful resources that existed in the area before the disaster will be destroyed. Donation of unusable materials or manpower consumes resources of organization and accommodation that could more profitably be used to reduce the toll of the disaster. "
Q19	"Disasters kill people without respect for social class or economic status."	"The poor and marginalized are more at risk of death than are rich people or the middle classes".
Q20	"People can survive for many days when trapped under the rubble of a collapsed building".	"The vast majority of people brought out alive from the rubble are saved within 24 or perhaps even 12 h of impact."
Q21-Q23	When given a warning, people flee from an area.	They may evacuate, but 'fleeing' is too emotive and an inaccurate term for the rational decision to put themselves out of harm's way.
Q24	During disasters, both the public and the first responders display unorganized and non-controlled behavior *	First responders are more organized and controlled than the public during disasters
Q25	Any type of food is suitable for any situation in disasters	Different circumstances and local customs require tailored adaptation of food for each unique disaster scenario.

In quotation are misconceptions taken from [8].

*- Denotes questions where respondents were asked to reflect on the extent of their belief in the research-established reality rather than their belief in common misconceptions.

Appendix B. Comparison table with previous studies of practical professionals

	Drury, J., Novelli, D., & Stott, C [14].*	Nogami, T [13].	Lorenz et al [24]
study	survey study	survey study	Mixed-methods approach
participants	N = 448 Police = 115	N = 1001 public = 600 professionals = 401	Field exercise with unaffiliated and professional responders = 24

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	Drury, J., Novelli, D., & Stott, C [14].*	Nogami, T [13].	Lorenz et al [24]
	sports event stewards = 120 civilian safety professionals = 46 students = 78 public = 89	The experts surveyed were 401 disaster response professionals from 1788 Japanese municipal governments. They were municipal officers responsible for disaster risk reduction and crisis management, including tasks such as emergency planning, preparedness, disaster response, and support for affected individuals. Of them, 54.11 % had direct experience in disaster response.	unaffiliated responders, 120 professional rescue team members (Berlin Fire Brigade and German Red Cross),Semi-structured interviews with experts Experts from the German Red Cross and Berlin Fire Brigade CATI household survey (Berlin citizens) = 1006 Representative sample of citizens
The questionnaire and scales	The questionnaire is structured with several main categories, each containing multiple questions. The main categories include mass panic, crowd behavior in emergencies, breakdown of social order, personal survival, and rational behavior. All items were rated on a 7-point Likert scale.	The questionnaire consisted of 10 items: five questions about beliefs in disaster myths (e.g., panic, looting) and five questions on the information sources participants used to form these beliefs.The questionnaire used a 5-point Likert scale, from 1 (totally disagree) to 5 (totally agree)	: Field exercise, interviews, and a survey. The field exercise observed cooperation between unaffiliated and professional responders. Semi-structured interviews with experts and a CATI survey gathered data on public expectations of behavior in disasters, with a focus on disaster myths and misconceptions (e.g., panic, looting, disaster shock).
Q2 “When disaster strikes panic is a common reaction”.	professional groups like police officers and civilian safety professionals neither agreed nor disagreed with the statement that “mass panic” occurs during emergencies, all three non-specialist groups (stewards, the general public, and students) endorsed this view.	Professionals were less likely to believe in the panic myth compared to the general public. Welch’s t-tests indicated a significant difference ($p < .001$, $r = .15$), with the public showing more belief in this myth	professional = Rare occurrence, but still anticipated and feared. Panic is seen as “infectious” and is planned for in operations. Public 62.3 % expect most people to react with panic, but only 6.1%–11.0 % believe they would react with panic themselves.
Q5 Most victims in disasters that are excavated alive from under the rubble are rescued by formal first responders	**Question:**"When there is emergencies, crowd survivors wait helplessly to be rescued.” **Finding**: All groups rejected this myth. The student group rejected the statement more strongly than the civilian safety professionals ($p = .05$).		Some expect the public to be passive and unprepared, relying on external help rather than self-help.
Q6 Mass evacuation during a disaster is characterized by self-centered behavior, such as completely ignoring the needs of others except for family members	**Question**: " When there is a mass evacuation tends to be orderly.” **Finding**: The police sample marginally disagreed with this statement. Football stewards and the public also disagreed, while civilian safety professionals neither agreed nor disagreed. The student sample significantly differed from the police ($p = .003$).		
Q7 “After disaster has struck survivors tend to be dazed and apathetic”	**Question:**” Eight items represented the idea that emotions and instincts overwhelm rational thought.” **Finding:** All groups agreed with this statement. The general public showed the strongest agreement, with significant differences compared to police officers ($p = .001$), students ($p = .005$), and civilian safety professionals ($p = .002$).	There was no significant difference in the shock myth between the two groups ($p = .01$, $r = .09$), though professionals showed a slightly higher belief than the general public.	professional = Mixed opinions: Some believe it occurs frequently, others believe it is rare. Public 48.5 % expect others to experience shock, but only 5.0%–6.9 % believe they themselves would react with shock
Q8 “Disasters usually give rise to widespread manifestations of anti-social behavior "*	**Question:**” When there is an emergencies, crowd members act selfishly.” **Finding:** The student group rejected this belief, while the general public and stewards agreed with it. The police strongly disagreed with the statement ($p = .001$ compared to the general public; $p = .02$ compared to the stewards.		
Q9 In disaster, people resort to violence to protect their own interests.		crime myth between the two groups, though professionals rated higher.	
Q10″Looting is a common and presents a serious problem after disasters”.		Professionals also believed less in the looting myth than the public, with a statistically significant difference ($p < .001$, $r = .16$).	professional = Rare or non-occurring due to effective law enforcement. Public 42.4 % expect looting to occur in the event of a disaster.

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	Drury, J., Novelli, D., & Stott, C [14].*	Nogami, T [13].	Lorenz et al [24]
Q11″During a disaster, panic spreads rapidly from individuals to a wider audience."	**Question:** " Three items represented the idea of contagion (cf. McDougall, 1920): for example, "When there is an emergency, false rumors spread easily through a crowd, **Finding:** All groups agreed with this statement. The general public and students showed stronger agreement than police officers (p = .001) and civilian safety professionals (p = .02).		professional = Panic is rare but considered infectious and planned for in response Public = 62.3 % believe others will panic; only 6.1%–11 % expect to panic
Q13 A strong military presence is required in areas affected by disasters in order to discourage law-breakers.	**Question:**" When there is an emergencies, social order breaks down." **Finding:** All groups, except police officers (who neither agreed nor disagreed), endorsed this view. The general public agreed significantly more than police officers (p = .001), civilian safety professionals (p = .04), and students (p = .01). Football stewards agreed more strongly than police officers (p = .001).		
Q18″Any kind of aid and relief is useful after disaster providing it is supplied quickly enough".*		The most notable difference was in the donating myth, where the public gave significantly more credit to this myth than professionals (p < .001, r = .34).	
Q21- Q23When given a warning, people flee from an area.	**Question:** "In emergencies, it is best to give out only minimal information about the danger." **Finding:** All groups disagreed with this statement. Police officers disagreed the most, significantly more than students (p = .01), the public (p = .003), and football stewards (p = .001).		
Q24 During disasters, both the public and the first responders display unorganized and non-controlled behavior *	**Question:** "In emergencies, the emergency services are not subject to the same tendency to panic as the crowd." **Finding:** All groups agreed that emergency services do not panic. There was a significant difference, with the public agreeing more strongly than police officers (p = .05), students (p = .02), and civilian safety professionals (p = .04).		

Data availability

Data will be made available on request.

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