

Development of the short and super-short version of the Emergency Reaction Questionnaire

Andras N. Zsido^{a,b,*}, Pedro Dias^{c,d}, Carlos M. Coelho^{a,c,e}

^a Institute of Psychology, University of Pécs, Hungary

^b Research Centre for Contemporary Challenges, University of Pécs, Hungary

^c Department of Psychology, University of the Azores, Portugal

^d Research Centre for Human Development, Universidade Católica Portuguesa, Portugal

^e University Research Center in Psychology (CUIP), University of Azores, Portugal

ARTICLE INFO

Keywords:

Emergency behavior
Emergency reaction questionnaire
Psychometric validation
Resilience
Disaster preparedness

ABSTRACT

Emergencies are sudden, life-threatening situations that challenge individuals' ability to respond effectively. The Emergency Reaction Questionnaire (ERQ) is a measure widely used to assess individual differences in emergency behavior; however, its 30-item length may limit its utility in certain contexts. Consequently, in this study, we aimed to develop two abbreviated versions of the ERQ: a short form retaining the original factor structure, and a super-short form that still captures the two core dimensions of readiness and helplessness. We used Item Response Theory to evaluate the psychometric properties of ERQ items and reduce the length of the scale on a large community sample ($N = 1448$). We assessed external validity on a subsample of participants ($N = 415$). Our results showed that the 16-item short and 6-item super-short forms effectively preserved the psychometric robustness of the original ERQ. Both versions successfully differentiated participants, with readiness scales exhibiting a normal distribution and helplessness scales clustering at the extremes. External validity analyses confirmed positive associations between readiness scores and sensation seeking, while helplessness scores were positively correlated with anxiety and trauma sensitivity. These findings align with theoretical frameworks of defensive behavior and support the utility of the ERQ short forms for assessing adaptive and maladaptive responses to emergencies. The ERQ short forms provide versatile tools for a variety of settings, including large-scale screening, disaster preparedness education, and resilience training programs.

1. Introduction

Emergencies are sudden, unexpected and potentially life-threatening situations that test an individual's ability to respond effectively under pressure [1]. Research on emergency behavior [2–4] has revealed significant individual differences in responses, ranging from adaptive, organized responses to panic or immobilization (e.g. freezing behavior). Understanding these differences is crucial to improving disaster preparedness and response strategies. Frequent exposure to uncontrollable aversive events such as disasters, climate-related crises, and armed conflicts can significantly affect mental health, often leading to psychiatric problems such as depression, anxiety, substance abuse, somatization, and post-traumatic stress disorder [5–7]. Climate change is dramatically altering global weather patterns, leading to an increase in the frequency and intensity of disasters such as forest fires, floods, typhoons and

* Corresponding author. Institute of Psychology, University of Pécs, 6 Ifjusag Street, Pécs, Baranya H, 7624, Hungary.
E-mail address: zsido.andras@pte.hu (A.N. Zsido).

earthquakes [8–11]. Even regions with historically mild weather are now experiencing severe weather events [12], highlighting the urgent need for preparedness and resilience. Similarly, refugees are often exposed to unexpected dangers and threats and are victims of traumatic events on their way to host countries [13]. However, people who are prepared, understand what to expect, and know how to respond to such adversity can feel a greater sense of control over the situation and their destiny [6,14]. This sense of preparedness and control not only enhances their ability to cope during emergencies but can also help to mitigate the psychological impact and reduce the long-term effects on their mental well-being.

In such extreme and unexpected situations, how people respond to disasters can be critical to their survival and safety. Effective responses often require not only innate resilience but also prior knowledge and training, hence early education is crucial [15,16]. Just as fire drills are routinely practiced in many schools, disaster preparedness training could be incorporated into curricula to help children learn how to respond in an organized and effective way. In countries such as Portugal, where disasters such as earthquakes and volcanic eruptions are more common [17–19], schools train children from a young age to respond calmly and systematically to such events. This proactive approach reduces panic, promotes safety and equips individuals with the skills they need to cope with emergencies. Extending these practices globally could significantly improve community resilience in the face of an increasingly unpredictable climate.

The Emergency Reaction Questionnaire (ERQ) has been developed [20] as a psychometrically robust tool to assess individual differences in emergency response, and to serve as a screening tool for studies investigating the impact of disasters, and training effectiveness. The ERQ is based on the defensive behavior framework [21–23] and captures both readiness and helplessness dimensions through its four subscales: General Readiness, Specific Readiness, General Helplessness, and Specific Helplessness. The 30 items ERQ is a reliable and valid tool across a range of samples [20,24,25] for assessing individual differences in emergency response, widely used in research on disasters, crowd safety, and risk perception. However, the original 30-item version can be time-consuming in research and clinical settings. To address this, shorter versions were developed, maintaining the ERQ's psychometric strength while improving efficiency. These streamlined versions enhance feasibility for large-scale studies, field research, and rapid assessments, making them particularly useful in high-stress environments where quick evaluations are essential.

Since its release, the ERQ has gained traction across a wide range of disciplines, including understanding critical phenomena such as mass panic [26], crowd safety [27], and individual responses of laypeople and emergency managers to environmental disasters [28, 28], including floods and volcanic eruptions. It has also been used to assess risk perception in disaster tourism, to explore behavioral patterns in high-stress environments, and to advance occupational and environmental health studies. The versatility and robust psychometric properties of ERQ have facilitated its international adoption, leading to its translation into several languages, including English, Hungarian, Portuguese, French, and Indonesian [20,24,25]. This widespread adoption highlights the growing importance of the ERQ as a tool for assessing emergency behavior and its ability to inform interventions across cultural and contextual boundaries. Recent advances in psychometric methods, such as item response theory (IRT), offer the possibility of developing shorter but equally effective versions of established measures. Short-form questionnaires are increasingly recognized as valuable tools, offering the dual benefits of reduced respondent burden and improved feasibility, without compromising psychometric quality.

As previous studies also noted anxiety, sensation-seeking, and trauma sensitivity may also be associated with emergencies (e.g., Ref. [29]; Zsido, Csokasi et al., 2020; [30]) and readiness, as measured by the ERQ. Readiness, which reflects a proactive, organized, and adaptive approach to emergencies, may be positively associated with sensation seeking, as those who seek stimulation may cope more effectively with high-stress situations. In contrast, anxiety and trauma sensitivity should correlate negatively with emergency preparedness but positively with helplessness - an avoidant, disorganized response - suggesting that heightened distress may interfere with effective crisis management.

The unique factor structure of the ERQ lends itself well to the creation of abridged versions tailored to specific purposes. For example, a short form that retains the original four-factor structure would allow for nuanced assessments of the different dimensions of emergency behavior. Conversely, a super-short form emphasizing the overarching construct of emergency behavior might be more appropriate for initial screening or in contexts where detailed factor-level insights are less critical. Such flexibility enhances the utility of the ERQ in a variety of settings, from academic research to clinical and organizational applications. In the present study, our overarching goal was to propose two abbreviated forms of ERQ: (1) a short form that retains the original factor structure, and (2) a super-short form that condenses the questionnaire and retains only a few items. We aimed to strike a balance between brevity and precision, responding to the need for versatile instruments that can be adapted to different contexts. We hypothesized that these short forms would maintain the psychometric rigor of the original ERQ while offering increased usability, thereby extending its applicability to a wider range of users. Our second hypothesis was that people more prone to sensation-seeking behavior would feel less helpless and more prepared to deal with emergencies [20,24,31]. However, those who were more anxiety-prone and more sensitive to the trauma of emergencies would feel more helpless and less prepared to act in such situations [20,24,31].

2. Methods

2.1. Participants

We recruited participants via the Internet by posting on social media, mailing lists, and various forums. We used convenience sampling to reach as many members of the general public as possible. Participants completed the survey online using Google Forms, a platform that allows for secure and anonymous responses. Participants were provided with an informed consent form at the beginning of the survey that explained the purpose of the study, the voluntary nature of participation, and the ability to withdraw at any time without penalty. No personally identifiable information was collected, and all responses were stored securely with access restricted to

the research team. Our goal was to collect a sufficient number of respondents to ensure a large enough sample for descriptive analysis. For statistical purposes, we intended to increase the number of respondents by limiting the test battery to questions about age, gender, and the SPQ. Data collection occurred between Fall 2023 and Fall 2024.

The sample consisted of 1448 participants with a mean age of 25.8 years ($SD = 10.6$). Of all participants, 862 were female (63.9 %) and 486 were male (36 %), while 100 participants (0.07 %) chose not to report their gender. Informed consent was obtained from all individual participants included in the study. The research was approved by the Hungarian United Ethical Review Committee for Research in Psychology and was conducted in accordance with the World Medical Association's Code of Ethics (Declaration of Helsinki). Informed written consent was obtained from all participants.

2.2. Measures

All participants completed the Emergency Reaction Questionnaire (ERQ). The ERQ is a self-report questionnaire designed to predict participants' reactions and behavior in an emergency. It contains 30 items organized into four dimensions: General preparedness (8 items), General helplessness (6 items), Specific preparedness (8 items), and Specific Helplessness (8 items). The psychometric properties of the ERQ have been investigated in different samples, and the results show adequate validity and reliability [20,24].

A subsample of participants ($N = 415$) also completed three other questionnaires to assess the convergent validity of the short and super-short ERQ scales. We used the short version of the Spielberger State-Trait Anxiety Inventory (STAI) to measure the severity of anxiety symptoms [32]; with higher scores indicating higher anxiety. The McDonald's ω in this study was 0.89. We also used the Brief Sensation Seeking Scale (BSSS-8) to measure sensation seeking [33]; with higher scores indicating a higher probability of sensation-seeking behavior and recklessness. The McDonald's ω in this study was 0.83. Further, we also used the Impact of Event Scale (IES) to measure the psychological impact and sensitivity to traumas [34]; with higher scores indicating a higher vulnerability to traumas. The McDonald's ω in this study was 0.93.

2.3. Data analysis

There were no missing data, as a response was required for each question in the online survey. We looked for outliers that were ± 3 SDs from the mean but found none (justified by the large sample size). We also looked for duplicate responses and identified seven in the sample; these were removed and not analyzed or mentioned in the sample description.

First, we used confirmatory factor analysis (CFA) to verify the unidimensionality of the latent variable for the ERQ subscales, as the IRT method we intended to use required unidimensional latent variables. To create both a short and super-short version of the ERQ, two different factor structures were tested. The first model retained the original four factors (General Readiness, Specific Readiness, General Helplessness, and Specific Helplessness) but the second model had only the two main factors (Readiness and Helplessness) with the General and Specific items loading onto the same factor. We used the diagonally weighted least squares (DWLS) estimator. To assess model fit, we used the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual index (SRMR). The cut-offs for good model fit were CFI and TFI values of 0.95 or higher [35], RMSEA and SRMR values of 0.08 or lower [36].

We then used the graded response model (GRM) [37] IRT to examine the psychometric properties of each item. IRT is a psychometric approach used to evaluate and refine measurement scales by modeling the relationship between an individual's latent trait (e.g., emergency response tendencies) and their probability of endorsing specific items on a questionnaire. Unlike classical test theory, which assumes that all items contribute equally to a total score, IRT provides item-level insight, allowing the identification of the most informative items. A key parameter in IRT is discrimination ability (denoted "a"), which reflects how well an item discriminates between individuals with different levels of the latent trait. In the present study, higher discrimination scores indicate that an item is more effective at distinguishing between respondents with low and high emergency response tendencies. In our study, we selected the most informative items (i.e., the items from each subscale with the highest discriminating power) for the short and very short versions of the ERQ based on their discriminating power. Specifically, we used a cut-off of a >1.7 [38] to ensure that only items with very high discrimination were retained. This approach allowed us to maintain strong psychometric properties while reducing the length of the questionnaire.

3. Results

3.1. Unidimensionality of the scales

The result of the CFA showed that both models provided acceptable fit (four-factor: CFI = 0.987, TLI = 0.986, RMSEA = 0.062 [90 % CI: 0.060 - 0.065], SRMR = 0.056; two-factor: CFI = 0.974, TLI = 0.972, RMSEA = 0.074 [90 % CI: 0.072 - 0.076], SRMR = 0.067). This indicated that each of the original four subscales as well as the two main factors had a single underlying latent variable and hence was suitable for IRT analysis. See [Supplementary Material 1](#) for factor loadings and more details on the two models tested.

3.2. Item response modeling

We began by analyzing the four subscales with the goal of creating a shorter version of the original ERQ that retains all its original factors. [Table 1](#) provides the a and b values for the items broken down by the four subscales. First, we selected the items with very high

discrimination parameters ($\alpha > 1.7$). These were items 4, 5, 16, and 26 of the General Readiness factor; items 18, 20, 21, and 23 for the Specific Readiness factor; items 22, 25, 27, 28, and 29 for the General Helplessness factor; and items 2, 8, 12, 13, and 14 for the Specific Helplessness factor. To have a symmetrical item disposition across the factors and to get the shortest possible version of the four-factor ERQ, we included the four best items for each subscale. Thus, the ERQ-16 consists of items 4, 5, 16, and 26 of the General Readiness factor; items 18, 20, 21, and 23 for the Specific Readiness factor; items 22, 25, 27, and 28 for the General Helplessness factor; and items 2, 8, 12, and 14 for the Specific Helplessness factor. The final version of the ERQ-16 is provided in [Supplementary Material 2](#).

We then analyzed the two main scales to create a super-shorter version of the original ERQ that retains all of the original factors. See [Table 2](#) for the α and b values for the items broken down by the two main scales. First, we selected the items with very high discrimination parameters ($\alpha > 1.7$). These were items 16, 18 and 23 of the Readiness factor; and items 2, 8, 12, 13, 14, 22, 25, 27, 28, and 29 for the Helplessness factor. To have a symmetrical item disposition across the factors and to get the shortest possible version of the two-factor ERQ, we decided to include the three best items for each subscale. Thus the ERQ-6 comprises items 16, 18, and 23 of the Readiness factor and items 8, 25, and 28 for the Helplessness factor. The final version of the ERQ-6 is provided in [Supplementary Material 2](#).

Descriptive statistics for the ERQ-16 and ERQ-6.

[Fig. 1](#) presents the distribution of responses across all participants, box plots of mean scores, and the distribution of variables while [Table 3](#) presents the central tendencies. The distribution of the subscales and total scores of the short and very short ERQ scales showed that the questionnaires could cover a wide range of participants. They also indicate that the selected items are indeed capable of differentiating between respondents. The distribution of the readiness scales (ERQ-16 F1 and F2 and ERQ-6 F1) shows a Gaussian distribution with the majority of participants scoring around the mean and the standard deviation being relatively low. In contrast, the helplessness scales (ERQ-16 F3 and F4, ERQ-6 F2) show a different distribution with participants clustering towards the ends of the dimension. This suggests that participants tend to answer more towards the extremes and are less likely to give central responses to the items. This is a strength of the questionnaire enhancing its power to differentiate between those who are likely to show organized behavior and those who tend to be disorganized in emergencies. The total scores of both short forms show a normal distribution with a tendency towards a leptokurtic distribution. That is, the responses are dense around the mean, but the distribution has longer tails, indicating a less dense distribution towards the ends of the dimensions.

The external validity of the abbreviated scales.

The statistical results of the correlation analysis are presented as a heat map in [Fig. 2](#). The readiness subscales and total scores of the short and very short versions showed rather strong positive associations with sensation-seeking behavior (BSSS). The specific but not the general readiness subscale and total score of the ERQ-16 and the readiness subscale and total score of the ERQ-6 were negatively correlated with anxiety (STAI) and psychological distress and sensitivity to trauma (IES) with medium strength. Both the general and

Table 1

Discrimination (α) and difficulty (b) parameters for the Emergency Reaction Questionnaire items broken down into four subscales. The 16 items retained in the short version are printed in bold.

	Item nr.	$b (\geq 2)$	$b (\geq 3)$	$b (\geq 3)$	$b (=4)$	α
Factor 1 - General Readiness	ERQ1	-2.384	-1.330	-0.319	1.061	1.721
	ERQ4	-0.892	-0.142	0.394	1.281	1.800
	ERQ5	-1.228	-0.389	0.334	1.236	3.362
	ERQ10	-2.337	-1.250	0.044	1.400	1.637
	ERQ11	-0.504	0.512	1.359	2.470	1.695
	ERQ16	-0.868	-0.148	0.444	1.252	2.115
	ERQ26	0.121	1.114	1.907	3.073	1.831
	ERQ30	-0.729	1.041	2.505	4.594	0.896
Factor 2 - Specific Readiness	ERQ9	-2.858	-1.564	-0.283	1.592	1.653
	ERQ15	-2.745	-1.472	-0.259	1.620	1.503
	ERQ17	-2.625	-1.436	-0.253	1.445	1.467
	ERQ18	-2.239	-1.058	0.163	1.566	2.483
	ERQ19	-2.583	-1.073	-0.093	1.456	1.633
	ERQ20	-2.658	-1.448	-0.054	1.661	2.123
	ERQ21	-2.725	-1.391	-0.069	1.559	2.057
	ERQ23	-2.972	-1.464	-0.107	1.683	2.273
Factor 3 - General Helplessness	ERQ22	-1.416	-0.542	0.059	1.037	2.774
	ERQ24	-3.047	-0.748	0.586	2.673	0.942
	ERQ25	-0.994	-0.516	-0.187	0.382	3.259
	ERQ27	-1.632	-0.596	0.094	1.171	2.358
	ERQ28	-0.969	-0.517	-0.113	0.487	3.965
	ERQ29	-1.516	-0.499	0.323	1.466	2.082
Factor 4 - Specific Helplessness	ERQ2	-0.962	-0.442	-0.106	0.349	2.742
	ERQ3	-1.509	-0.540	0.246	1.164	1.741
	ERQ6	-1.888	-0.826	0.067	1.442	1.315
	ERQ7	-1.767	-0.741	-0.099	1.082	1.715
	ERQ8	-0.935	-0.485	-0.243	0.290	3.349
	ERQ12	-1.252	-0.543	-0.043	0.742	2.801
	ERQ13	-1.543	-0.641	0.054	1.014	2.360
	ERQ14	-1.611	-0.723	0.090	1.141	2.525

Table 2

Discrimination (a) and difficulty (b) parameters for the Emergency Reaction Questionnaire items broken down into two main scales. The 6 items retained in the short version are printed in bold.

	Item nr.	b (≥ 2)	b (≥ 3)	b (≥ 3)	b ($=4$)	a
Factor 1 - Readiness	ERQ1	-2.558	-1.437	-0.366	1.128	1.501
	ERQ10	-2.310	-1.239	0.030	1.394	1.653
	ERQ11	-0.669	0.651	1.782	3.287	1.086
	ERQ15	-2.857	-1.510	-0.244	1.693	1.415
	ERQ16	-0.951	-0.184	0.465	1.367	1.726
	ERQ17	-3.157	-1.686	-0.265	1.736	1.115
	ERQ18	-2.618	-1.186	0.228	1.791	1.799
	ERQ19	-2.979	-1.190	-0.072	1.667	1.303
	ERQ20	-3.247	-1.713	-0.028	1.975	1.486
	ERQ21	-3.127	-1.552	-0.041	1.774	1.602
	ERQ23	-3.402	-1.629	-0.085	1.878	1.765
	ERQ26	0.153	1.498	2.606	4.290	1.092
	ERQ30	-1.223	1.736	4.257	7.962	0.486
	ERQ4	-1.056	-0.179	0.454	1.523	1.317
	ERQ5	-1.592	-0.528	0.421	1.634	1.604
	ERQ9	-3.269	-1.740	-0.288	1.797	1.343
Factor 2 - Helplessness	ERQ12	-1.498	-0.720	-0.172	0.694	2.398
	ERQ13	-1.849	-0.842	-0.059	1.015	1.977
	ERQ14	-1.882	-0.913	-0.021	1.126	2.248
	ERQ2	-1.180	-0.610	-0.245	0.252	2.416
	ERQ22	-1.749	-0.751	-0.054	1.039	2.261
	ERQ24	-3.933	-1.061	0.590	3.183	0.729
	ERQ25	-1.250	-0.707	-0.326	0.308	3.011
	ERQ27	-2.066	-0.839	-0.015	1.238	1.762
	ERQ28	-1.229	-0.707	-0.235	0.420	3.723
	ERQ29	-1.838	-0.698	0.233	1.503	1.768
	ERQ3	-1.764	-0.712	0.146	1.141	1.590
	ERQ6	-2.226	-1.039	-0.042	1.498	1.150
	ERQ7	-1.996	-0.912	-0.230	1.032	1.643
	ERQ8	-1.152	-0.658	-0.390	0.194	2.897

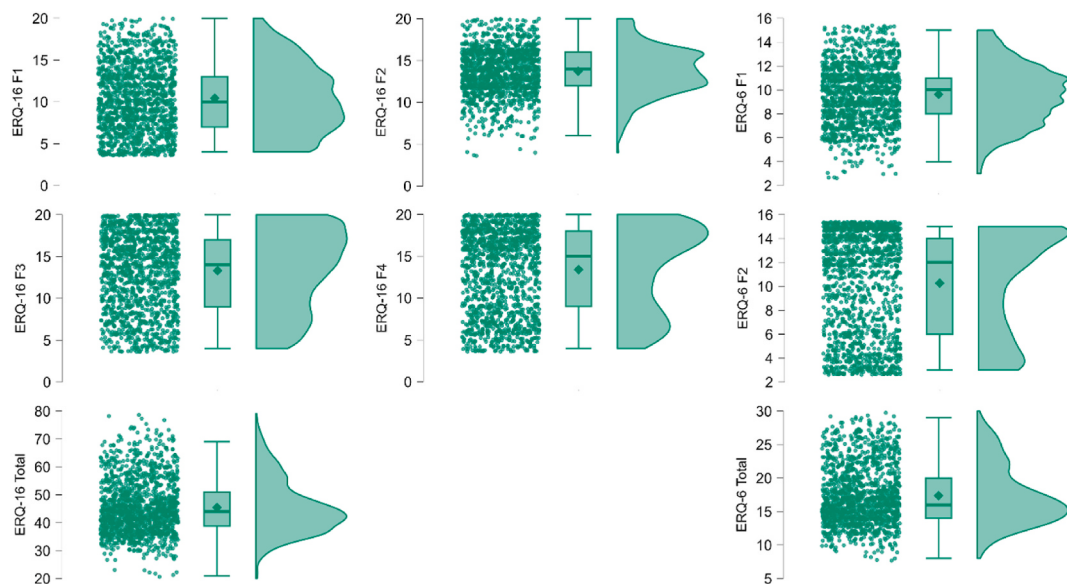


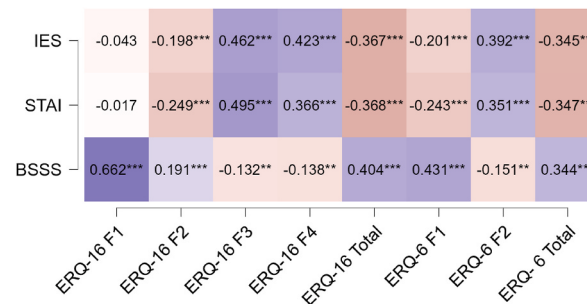
Fig. 1. Raincloud plots for the subscales and total scores of short and super-short versions of the Emergency Reaction Questionnaire. The plots show the distribution of answers across all participants, a box plot with mean scores, and the distribution of the variables.

specific helplessness subscales of the ERQ-16 and the helplessness subscale of the ERQ-6 were positively associated with anxiety psychological distress and sensitivity to trauma with strong to medium strength, and negatively but weakly related to sensation-seeking behavior.

Table 3

Detailed descriptive statistics for the short and super-short versions of the Emergency Reaction Questionnaire including subscales and total scores.

	Median	Mean	Std. Deviation	Minimum	Maximum
ERQ-16 F1	10	10.434	4.107	4	20
ERQ-16 F2	14	13.732	2.885	4	20
ERQ-16 F3	14	13.305	4.803	4	20
ERQ-16 F4	15	13.403	5.108	4	20
ERQ-16 Total	44	45.459	9.779	20	79
ERQ-6 F1	10	9.629	2.495	3	15
ERQ-6 F2	12	10.262	4.301	3	15
ERQ-6 Total	16	17.367	4.442	8	30

**Fig. 2.** A correlational heatmap between the short and super-short versions of the Emergency Reaction Questionnaire (ERQ) including subscales and total scores and variables intended to demonstrate an external validity. Abbreviations: IES = Impact of Event Scale, STAI = Spielberger Trait Anxiety Inventory, BSSS = Brief Sensation Seeking Scale; Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

4. Discussion

Emergency responses range from organized, adaptive behavior to panic or immobilization. Measuring this individual difference is critical to improving disaster preparedness and response strategies, especially as climate change continues to increase the frequency and severity of disasters. The Emergency Reaction Questionnaire (ERQ) was developed to address this need by providing a robust tool for assessing the preparedness and helplessness dimensions of emergency behavior. Despite its strengths, the length of the original 30-item ERQ may limit its practicality in certain contexts. To improve its utility, the present study aimed to develop two abbreviated forms.

The short (ERQ-16) and super short (ERQ-6) forms of the ERQ balance brevity with psychometric precision, while remaining consistent with our theoretical framework [21,23]. The 16-item short form retains the original four-factor structure, allowing for a nuanced assessment of both readiness and helplessness dimensions as described in the defensive behavior framework. In addition, the super-short version with only 6 items captures the two primary factors of readiness and helplessness, providing a quick and efficient measure of an individual's overall emergency response. These versions are particularly relevant given the practical challenges associated with the original 30-item ERQ, as shorter instruments are often more feasible for use in time-limited research, clinical settings, and large-scale disaster preparedness programs. The confirmation of the factor structure of the original 30-item questionnaire and the IRT results are consistent with previous validation studies and support the theoretical basis of the ERQ. The results of the descriptive statistics further support the utility and validity of the two abbreviated forms. The pattern observed reflects a balanced ability of the scales to capture a wide range of individual differences in adaptive, organized behavior under pressure. In contrast, the helplessness scales exhibit a clustering of responses at the extremes, which enhances the ability of the questionnaires to distinguish individuals who are likely to exhibit organized responses from those who are more likely to panic, freeze, or exhibit disorganized behavior – key constructs highlighted in the introduction as critical to understanding and improving emergency preparedness [3,4]. These findings support the versatility of the two short forms. The ERQ-16 is ideal for studies that require a more detailed analysis of the different dimensions of emergency response. This would be particularly useful for assessing the impact of training programs, exploring individual differences in preparedness and helplessness, or informing occupational and environmental health interventions. The ERQ-6 is well suited for initial screening, large-scale surveys, or contexts where only a general measure of emergency preparedness is required, such as disaster drills in schools or workplace preparedness assessments. Early education and training can significantly improve people's ability to respond calmly and effectively to emergencies, reducing panic and increasing safety [15,16]. The two abbreviated versions of the ERQ are therefore valuable tools for promoting preparedness and resilience.

In addition to their psychometric robustness and practical utility, the short forms of the ERQ align well with global disaster preparedness goals outlined in international policy frameworks. For example, the WHO Emergency Preparedness Framework [39] emphasizes the importance of rapid risk assessment tools for strengthening health emergency response systems, while the Sendai Framework for Disaster Risk Reduction [40] calls for the development and implementation of tools to enhance psychological and

community resilience. By providing a quick and valid measure of individual preparedness and helplessness, the ERQ short forms can serve as valuable components within broader resilience assessment systems. Their brevity and ease of use make them particularly suitable for incorporation into large-scale evaluations, school-based training programs, or disaster simulations, supporting the policy need for scalable, evidence-based tools to improve emergency preparedness and mental health outcomes.

In line with our second hypothesis, we found associations between the short and super-short ERQ scales and other constructs. The correlations revealed the expected relationships with established constructs such as sensation-seeking behavior, anxiety, and psychological distress. Specifically, the readiness subscales and total scores of both the ERQ-16 and ERQ-6 showed significant positive associations with sensation-seeking behavior. This finding is consistent with previous research suggesting that individuals prone to sensation-seeking are more likely to exhibit adaptive, organized behavior in emergencies [20,24,31,41]. This supports the notion that sensation-seeking tendencies may reflect a greater ability to remain engaged and responsive in high-stress, high-risk situations, possibly due to habituation to arousal and greater psychological readiness for challenge. Conversely, the specific readiness subscale and total score of the ERQ-16 and the readiness subscale and total score of the ERQ-6 were negatively correlated with anxiety and sensitivity to trauma. This aligns with the conceptualization of readiness as a form of proactive, organized response to adversity, as opposed to anxiety-driven avoidance or disorganization [6,14,42]. In contrast, the helplessness subscales of both the ERQ-16 and ERQ-6 were positively associated with anxiety, psychological distress and trauma sensitivity, while also showing negative correlations with sensation-seeking behavior. These findings support theoretical models of defensive behavior [21,23], which emphasize that heightened anxiety and sensitivity to trauma may lead to disorganized or immobilized responses (e.g., freezing) during emergencies. Such helpless responses are linked with greater psychological vulnerability and may increase the risk of adverse mental health outcomes, including posttraumatic stress disorder, depression, and anxiety [5,6].

In summary, this brief questionnaire is a valuable tool for assessing the predisposition of individuals to respond to adversity, such as disasters, earthquakes, or war-related situations. Given the increasing frequency and intensity of disasters and climate change-related crises, as well as the trauma faced by refugees, this scale provides a quick yet effective means of identifying individuals who may be at increased risk of developing mental health problems such as anxiety, PTSD, or depression. It also helps to identify those who are more resilient and able to sustain themselves through difficult times, ultimately enabling them to better help others in need.

Some limitations of the present study should be acknowledged. First, the survey-based and cross-sectional nature of the study limits our ability to infer causal relationships or observe dynamic changes in emergency reactions over time. We did not assess the test-retest reliability of the newly developed ERQ scales; therefore, future studies should aim to assess the temporal stability of these abbreviated versions. Second, while the correlations with established constructs such as sensation seeking and anxiety provide strong support for external validity, the reliance on self-reported data introduces the possibility of response biases. In addition, due to practical constraints, we only included a limited set of variables for the validity measures, which, although informative, may not fully capture the complexity of factors influencing emergency behavior. In addition, the online nature of the data collection may have resulted in a sample that is not fully representative of the broader population in terms of emergency experiences and response tendencies. Addressing these limitations in future research, e.g. using different sampling strategies, such as stratified or quota sampling, would further increase confidence in the utility and reliability of the short and super short ERQs as tools for assessing emergency response behavior. Finally, we acknowledge that while the abbreviated forms improve feasibility, they may result in a slight loss of granularity in assessing emergency response tendencies. In some scenarios, the full version may still be preferable, such as detailed clinical diagnostics or research requiring nuanced response patterns.

Overall, our findings confirm the sound psychometric properties and external validity of both the short and super-short forms of the Emergency Reaction Questionnaire. These associations with sensation-seeking behavior and anxiety-related constructs underscore the ability of these scales to capture meaningful individual differences in emergency responses, distinguishing between adaptive, organized behaviors and maladaptive, disorganized reactions. By aligning with established theoretical frameworks of defensive behavior, the readiness and helplessness dimensions further highlight the utility of ERQ in understanding how individuals react under pressure, particularly in life-threatening situations. The development of these abbreviated versions enhances the practical applicability of ERQ across diverse contexts. The growing frequency of disasters due to climate change [9–11] highlights the urgent need for tools that can identify individuals who may require additional training or support to respond effectively to emergencies. By enabling targeted interventions [16,43]—such as disaster preparedness education in schools or tailored resilience training for high-risk professions—the ERQ short forms have the potential to play a significant role in improving individual and community resilience, ultimately reducing panic and enhancing safety during emergencies.

CRedit authorship contribution statement

Andras N. Zsido: Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Pedro Dias:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Carlos M. Coelho:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Funding acquisition, Conceptualization.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Ethical approval

Ethics approval was obtained from the Local Ethical Review Committee of the university of the first author. Data collection was carried out following the Code of Ethics of the World Medical Association (Declaration of Helsinki)

Funding

ANZS was supported by the OTKA FK 146604 research grant provided by the National Research, Development, and Innovation Office. ANZS was also supported by the János Bolyai Research Scholarship provided by the Hungarian Academy of Sciences. CMC was supported by the Center for Psychology at the University of Porto, Foundation for Science and Technology Portugal (FCT UIDB/00050/2020). This study was supported by the Internal Scientific Grant (nr. 014_2024_PTE_RK/5) of the University of Pécs.

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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijdr.2025.105505>.

Data availability

Data will be made available on request.

References

- [1] J. López-Ibor, What is a disaster? in: J. López-Ibor, G. Christodoulou, M. Maj, N. Sartorius, A. Okasha (Eds.), *Disasters and Mental Health* Wiley Blackwell, 2005, pp. 1–11.
- [2] J. Drury, The role of social identity processes in mass emergency behaviour: an integrative review, *Eur. Rev. Soc. Psychol.* 29 (1) (2018) 38–81, <https://doi.org/10.1080/10463283.2018.1471948>.
- [3] J. Leach, Why people 'freeze' in an emergency: temporal and cognitive constraints on survival responses, *Aviat Space Environ. Med.* 75 (6) (2004) 539–542.
- [4] X. Song, Q. Zhang, Y. Sekimoto, R. Shibasaki, Prediction of human emergency behavior and their mobility following large-scale disaster. Proceedings of the 20th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 2014, pp. 5–14, <https://doi.org/10.1145/2623330.2623628>.
- [5] J.M. Furr, J.S. Comer, J.M. Edmunds, P.C. Kendall, Disasters and youth: a meta-analytic examination of posttraumatic stress, *J. Consult. Clin. Psychol.* 78 (6) (2010) 765–780, <https://doi.org/10.1037/a0021482>.
- [6] C. Grillon, J.P. Baas, S. Lissek, K. Smith, J. Milstein, Anxious responses to predictable and unpredictable aversive events, *Behav. Neurosci.* 118 (5) (2004) 916–924, <https://doi.org/10.1037/0735-7044.118.5.916>.
- [7] M.E.P. Seligman, S.F. Maier, R.L. Solomon, Chapter 6—Unpredictable and uncontrollable aversive events, in: F.R. Brush (Ed.), *Aversive Conditioning and Learning*, Academic Press, 1971, pp. 347–400, <https://doi.org/10.1016/B978-0-12-137950-6.50011-0>.
- [8] T. Barlattani, F. Salfi, V. Succi, et al., Patterns of psychiatric admissions across two major health crises: L' aquila earthquake and COVID-19 pandemic lockdown, *BMC Psychiatry* 24 (2024) 658, <https://doi.org/10.1186/s12888-024-06078-3>.
- [9] J.H. Hashim, Z. Hashim, Climate change, extreme weather events, and human health implications in the Asia Pacific region, *Asia Pac. J. Publ. Health* 28 (2 suppl) (2016) 8S–14S, <https://doi.org/10.1177/1010539515599030>.
- [10] M. Ohba, S. Sugimoto, Differences in climate change impacts between weather patterns: possible effects on spatial heterogeneous changes in future extreme rainfall, *Clim. Dyn.* 52 (7) (2019) 4177–4191, <https://doi.org/10.1007/s00382-018-4374-1>.
- [11] P. Stott, How climate change affects extreme weather events, *Science* 352 (6293) (2016) 1517–1518, <https://doi.org/10.1126/science.aaf7271>.
- [12] E.M. Fischer, S. Sippel, R. Knutti, Increasing probability of record-shattering climate extremes, *Nat. Clim. Change* 11 (8) (2021) 689–695, <https://doi.org/10.1038/s41558-021-01092-9>.
- [13] T. Barlattani, G. Renzi, C. D'Amelio, F. Pacitti, Acute depressive reaction as a consequence of war trauma exposure: a case report of a Ukrainian refugee, *Riv Psychiatr* 58 (5) (2023) 237–240, <https://doi.org/10.1708/4113.41073>.
- [14] K.S. Wang, M.R. Delgado, The protective effects of perceived control during repeated exposure to aversive stimuli, *Front. Neurosci.* 15 (2021), <https://doi.org/10.3389/fnins.2021.625816>.
- [15] F.T. Aka, G.W. Buh, W.Y. Fantong, Issa, I.T. Zouh, S.L.B. Djomou, R.T. Ghogomu, T. Gibson, M.-A. Marmol del, L.N. Sigha, T. Ohba, M. Kusakabe, Y. Yoshida, G. Tanyileke, J.M. Nnange, J.V. Hell, Disaster prevention, disaster preparedness and local community resilience within the context of disaster risk management in Cameroon, *Nat. Hazards* 86 (1) (2017) 57–88, <https://doi.org/10.1007/s11069-016-2674-5>.
- [16] A. Delicado, J. Rowland, S. Fonseca, A.N. de Almeida, L. Schmidt, A.S. Ribeiro, Children in disaster risk reduction in Portugal: policies, education, and (Non) participation, *International Journal of Disaster Risk Science* 8 (3) (2017) 246–257, <https://doi.org/10.1007/s13753-017-0138-5>.
- [17] J. Fontiela, P. Rosset, M. Wyss, M. Bezzegehoud, J. Borges, F. Cota Rodrigues, Human losses and damage expected in future earthquakes on faial island-azores, *Pure Appl. Geophys.* 177 (4) (2020) 1831–1844, <https://doi.org/10.1007/s00024-019-02329-7>.
- [18] V.N. Martins, D.S. e Silva, P. Cabral, Social vulnerability assessment to seismic risk using multicriteria analysis: the case study of Vila Franca do Campo (São Miguel Island, Azores, Portugal), *Nat. Hazards* 62 (2) (2012) 385–404, <https://doi.org/10.1007/s11069-012-0084-x>.
- [19] C. Ramos, E. Reis, Floods in southern Portugal: their physical and human causes, impacts and human response, *Mitig. Adapt. Strategies Glob. Change* 7 (3) (2002) 267–284, <https://doi.org/10.1023/A:1024475529524>.
- [20] A.N. Zsido, K. Csokasi, O. Vincze, C.M. Coelho, The emergency reaction questionnaire – first steps towards a new method, *Int. J. Disaster Risk Reduct.* 49 (2020) 101684, <https://doi.org/10.1016/j.ijdr.2020.101684>.

- [21] H.S. Bracha, Human brain evolution and the “Neuroevolutionary Time-depth Principle:” implications for the reclassification of fear-circuitry-related traits in DSM-V and for studying resilience to warzone-related posttraumatic stress disorder, *Prog. Neuro Psychopharmacol. Biol. Psychiatr.* 30 (5) (2006) 827–853, <https://doi.org/10.1016/j.pnpbp.2006.01.008>.
- [22] J.M. Gorman, J.M. Kent, G.M. Sullivan, J.D. Coplan, Neuroanatomical hypothesis of panic disorder, revised, *Am. J. Psychiatr.* 157 (4) (2000) 493–505, <https://doi.org/10.1176/appi.ajp.157.4.493>.
- [23] J.E. LeDoux, N.D. Daw, Surviving threats: neural circuit and computational implications of a new taxonomy of defensive behaviour, *Nat. Rev. Neurosci.* 19 (5) (2018) 269–282, <https://doi.org/10.1038/nrn.2018.22>.
- [24] P. Dias, C.M. Coelho, A.N. Zsido, Psychometric properties and further validation of the emergency reaction questionnaire in a sample of Portuguese adults, *Int. J. Disaster Risk Reduct.* 97 (2023) 104042, <https://doi.org/10.1016/j.ijdr.2023.104042>.
- [25] S.H.N. Hafida, N.K.M. Isa, M.H. Ibrahim, Jumadi, M. Toyib, M. Musiyam, Data survey of students behavioral and psychological adaptations in disaster-prone areas of Mount Merapi in Indonesia, *Data Brief* 42 (2022) 108229, <https://doi.org/10.1016/j.dib.2022.108229>.
- [26] H.W. Fletcher, R. Aunger, Understanding mass panic, *J. Appl. Soc. Sci.* 18 (2) (2024), <https://doi.org/10.1177/1936724424124570>.
- [27] M. Haghani, M. Coughlan, B. Crabb, A. Dierickx, C. Feliciani, R. van Gelder, P. Georg, N. Hocaoglu, S. Laws, R. Lovreglio, Z. Miles, A. Nicolas, W.J. O’Toole, S. Schaap, T. Semmens, Z. Shalhoseini, R. Spaaij, A. Tatrai, J. Webster, A. Wilson, A roadmap for the future of crowd safety research and practice: introducing the Swiss Cheese Model of Crowd Safety and the imperative of a Vision Zero target, *Saf. Sci.* 168 (2023) 106292, <https://doi.org/10.1016/j.ssci.2023.106292>.
- [28] S.S. Patel, K. Guevara, T.L. Hollar, R.A. DeVito, T.B. Erickson, Surveying mental health stressors of emergency management professionals: factors in recruiting and retaining emergency managers in an era of disasters and pandemics, *Journal of Emergency Management (Weston, Mass.)* 21 (5) (2023) 375–384, <https://doi.org/10.5055/jem.0820>.
- [29] S.L. Farra, S.J. Smith, Anxiety and stress in live disaster exercises, *J. Emerg. Nurs.* 45 (4) (2019) 366–373, <https://doi.org/10.1016/j.jen.2019.01.012>.
- [30] Y. Inoue, D.C. Funk, D.L. Wann, M. Yoshida, M. Nakazawa, Team identification and postdisaster social well-being: the mediating role of social support, *Group Dyn.: Theory, Research, and Practice* 19 (1) (2015) 31–44, <https://doi.org/10.1037/gdn0000019>.
- [31] C.H. Lai, Fear network model in panic disorder: the past and the future, *Psychiatry Investigation* 16 (1) (2019) 16–26, <https://doi.org/10.30773/pi.2018.05.04.2>.
- [32] A.N. Zsido, S.A. Teleki, K. Csokasi, S. Rozsa, S.A. Bandi, Development of the short version of the spielberger state–Trait anxiety inventory, *Psychiatry Res.* 291 (2020) 113223, <https://doi.org/10.1016/j.psychres.2020.113223>.
- [33] R.H. Hoyle, M.T. Stephenson, P. Palmgreen, E.P. Lorch, R.L. Donohew, Reliability and validity of a brief measure of sensation seeking, *Pers. Individ. Differ.* 32 (3) (2002) 401–414, [https://doi.org/10.1016/S0191-8869\(01\)00032-0](https://doi.org/10.1016/S0191-8869(01)00032-0).
- [34] E.C. Sundin, M.J. Horowitz, Impact of Event Scale: psychometric properties, *Br. J. Psychiatr.* 180 (3) (2002), <https://doi.org/10.1192/bjp.180.3.205>.
- [35] L. Hu, P.M. Bentler, Fit indices in covariance structure modeling: sensitivity to underparameterized model misspecification, *Psychol. Methods* 3 (4) (1998) 424–453, <https://doi.org/10.1037/1082-989X.3.4.424>.
- [36] M.W. Browne, R. Cudeck, Alternative ways of assessing model fit, *Socio. Methods Res.* 21 (2) (1992) 230–258, <https://doi.org/10.1177/0049124192021002005>.
- [37] F. Samejima, Estimation of latent ability using a response pattern of graded scores, *ETS Research Bulletin Series* 1968 (1) (1968) 1–169, <https://doi.org/10.1002/j.2333-8504.1968.tb00153.x>.
- [38] F.B. Baker, *The Basics of Item Response Theory*, ERIC Clearinghouse on Assessment and Evaluation, 2001.
- [39] WHO Team, A strategic framework for emergency preparedness, WHO Document Production Services (2017), 1–29., Geneva, Switzerland, <https://www.who.int/publications/i/item/a-strategic-framework-for-emergency-preparedness>.
- [40] UNDRR Team, Sendai framework for disaster risk reduction 2015–2030, The United Nations Office for Disaster Risk Reduction (2015), 1–32, Geneva, Switzerland, <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>.
- [41] A. Norbury, M. Husain, Sensation-seeking: dopaminergic modulation and risk for psychopathology, *Behav. Brain Res.* 288 (2015) 79–93, <https://doi.org/10.1016/j.bbr.2015.04.015>.
- [42] G.A. Bonanno, S. Galea, A. Bucciarelli, D. Vlahov, What predicts psychological resilience after disaster? The role of demographics, resources, and life stress, *J. Consult. Clin. Psychol.* 75 (5) (2007) 671–682, <https://doi.org/10.1037/0022-006X.75.5.671>.
- [43] E. Oliver, J. Cooper, D. McKinney, Can first aid training encourage individuals’ propensity to act in an emergency situation? A pilot study, *Emerg. Med. J.* 31 (6) (2014) 518–520, <https://doi.org/10.1136/emmermed-2012-202191>.