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Developing a scale to measure Japanese nurses' individual readiness for deployment to disasters
（日本における看護師の災害派遣準備評価尺度の開発）

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RESEARCH ARTICLE

Developing a scale to measure Japanese nurses' individual readiness for deployment to disasters

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Abstract

Japan is a disaster-prone country, and Japanese registered nurses (RN) should be evaluated for their individual readiness for unexpected dispatches. The aim of the present study was to develop and validate a scale for measuring individual readiness of Japanese RN for disasters. In our previous study in 2014, we developed a Japanese version of the Readiness Estimate and Deployability Index, which was originally developed in the USA in 1997. Considering the cultural and characteristic aspects of Japanese RN social skills, a preliminary version of the instrument was constructed in a pilot study. In the main survey, construct validity, internal consistency, and concurrent validity of the self-evaluation instrument were assessed in a sample of 964 RN, and its psychometric properties were evaluated. A six dimensional, 37 item tool called the Japanese Disaster Nursing Readiness Evaluation Index (JDNREI) was developed. The Cronbach's alpha for the scale was .93. The reliability of the six dimensions was acceptable, and the validity was supported by confirmatory factor analysis. The JDNREI, whose validity and reliability were evaluated, might enable RN to recognize and assess their level of individual readiness for future disasters.

KEYWORDS

disaster nursing, Japanese Disaster Nursing Readiness Evaluation Index, individual readiness, Japan, self-evaluation instrument, social skills

1 | INTRODUCTION

Because of Japan's susceptibility to disasters, Japanese registered nurses (RN) are likely to be dispatched to an area affected by disasters. Therefore, it is extremely important for each RN to prepare for an unexpected dispatch. To respond to a dispatch call, each RN should possess the appropriate knowledge and skills obtained from education and training programs, and be ready to withstand in case of an urgent dispatch (Al Thobaity, Williams, & Plummer, 2016; Kulig et al., 2017; Wynd, 2006; Yan, Turale, Stone, & Petrini, 2015). To prepare for future disasters, RN should recognize whether they are ready for dispatch.

The term "readiness" is used interchangeably with "preparedness" (Homeland Security Presidential Directive/HSPD-8). "Readiness" is generally defined as "the quality or state of being ready", and according to the Merriam Webster Online Dictionary (2018), "ready" also means "being prepared mentally or physically for some experience or action". Reineck (2004) claimed that "readiness" generally refers to the state of preparedness for something about to happen. "Readiness" in the military is conceptually divided into individual and collective readiness" (p. 350). Despite the absence of consensus on the definition of "individual readiness" in the military context, the term includes family readiness with elements of family support and adaptation, and emphasizes mental and physical preparation as important aspects (Blackburn, 2014). In the present study, we focused on "individual readiness", defined as the capabilities necessary to provide adequate nursing care in a disaster environment along with the required knowledge, skills, and physical and mental preparation. Measuring individual readiness is vital for RN to recognize their capabilities and for their administrators to select the best dispatch team (Alshehri, 2017; Der-Martirosian et al., 2017; Maeda, Kotera, Matsuda, & Edwards, 2016; Tzeng et al., 2016). Furthermore, to evaluate the effectiveness of any

educational program or training designed to improve the readiness of RN, a robust instrument should be developed.

In Japan, in the aftermath of the Great Hanshin–Awaji earthquake that occurred in 1995, several researchers (Hata & Matsuda, 2011; Hayano & Kawahara, 2013; Kanno, Hayano, & Ohara, 2010) developed competency models based on their knowledge and skills necessary for disaster nursing, but only little attention has been paid to individual readiness; a scale for measuring individual readiness has not been developed in Japan. In the USA, however, three major instruments have been developed to date. First, the Readiness Estimate and Deployability Index (READI) was developed in 1997 and was validated to measure the level of individual readiness of US military nurses for deployment missions, including disasters (Reineck 2004; Reineck Huebner, 2014). The READI focuses on the required knowledge and skills, as well as the necessary physical and psychosocial state, and has contributed in the implementation of specific training and education programs in the USA and Korea (Eun Guong, Choi, Ko, & Reineck, 2009; Dremsa, Ryan-Wenger, & Huebner (Reineck, 2006; Reineck, 2004; Stevenson, Scholes, Dremsa, & Austin, 2007; Wilmoth, De Scisciolo, Gilchrest, & Dmochowski, 2007). Second, the Emergency Preparedness Information Questionnaire was developed in 2003 to measure the level of preparation necessary for large scale emergency situations. However, it was developed to assess the effectiveness of educational programs (Wisniewski, Dennik-Champion, & Peltier, 2004) and does not specifically or comprehensively measure individual readiness. Third, the Disaster Preparedness Evaluation Tool was developed in 2007 to evaluate the knowledge and skills required for disaster/postdisaster response and management (Tichy, Bond, Beckstrand, & Heise, 2009) to evaluate the knowledge and skills required for disaster/post-disaster response and management. This scale was originally developed for nurse practitioners and their educational interventions; therefore, it does not address the context of individual readiness. Instruments that rigorously measure individual readiness for future disaster dispatches, and which are culturally adapted to the Japanese environment, are necessary to improve the country's disaster response capabilities.

Therefore, we aimed to develop and validate an instrument based on the READI to comprehensively evaluate the individual readiness of Japanese RN for dispatch to disaster situations. We also described the development and initial psychometric evaluation of a disaster nursing readiness instrument for Japanese RN. The study includes two steps: (i) scale development and overview; and (ii) evaluation of psychometric properties, including validity and reliability.

2 | METHODS

2.1 | Step 1: Scale development overview

2.1.1 | Developing and revising Readiness Estimate and Deployability Index–Japanese version

Because the original READI was designed to ensure an adequate readiness standard in delivering nursing care and supporting military deployment missions, we collaborated with its developer, Dr Huebner, to develop the Japanese version: the READI-J-V. This involved translating the original READI into Japanese and modifying it for Japanese RN in our previous studies (Huebner & Maeda, 2016; Maeda et al., 2016). In the present study, the participants included 427 RN dispatched to areas affected by the 2011 Great East Japan Earthquake (GEJE). Based on the analysis of this survey, the structure of the READI-J-V was changed from the six dimensions of the original READI to seven dimensions. In particular, the "personal, psychological, and physical readiness dimension" of the READI was divided into "attitude of mind" and "effective coping with daily stress" in the READI-J-V. "Attitude of mind" refers to one's adaptability to stressful situations encountered at a disaster site, such as lack of privacy and long working hours. Furthermore, the READI does not include items on social skills, and we addressed the need to revise the READI-J-V accordingly by adding items related to Japanese RN social skills.

Some researchers have suggested that RN possess good communication skills for disaster dispatch activities (Loke & Fung, 2014; Nojima, Fujiwara, & Kawahara, 2015; Rafferty-Semon, Jarzembak, & Shanholtzer, 2017; Slepski, 2007). Particularly, first-time dispatched members should have good communication skills in order to collaborate smoothly, including attitudes such as "to respect other's opinion without denying them" (Nojima et al., 2015, p. 19). Additionally, miscommunication in the team could become a stressor and present as a secondary disorder (Otsuka & Matsumoto, 2007, p. 19); dispatched RN have to accomplish critical missions during disasters regardless of how poor the conditions are. These situations are stressful, and social skills play an important role in effective collaboration during these operations. Furthermore, cultural and characteristic aspects of social skills must be considered and applied when discussing the levels of disaster readiness. Because Japanese people tend to take time to break the ice at first encounters, we used two major scales of Japanese people's social skills: Kikuchi's Scale of Social Skills (KiSS-18) (Kikuchi, 2007) and Competency of Nurses (Sakaguchi et al., 2006), to develop a new instrument that measures the individual readiness of Japanese RN. We selected six items from KiSS-18 and 12 related to collaborative relationships from the Competency of Nurses.

2.1.2 | Pilot testing and item screening

In 2015, we conducted a pilot study of 279 RN dispatched to GEJE-affected areas using a preliminary instrument that included the new items selected from the above two scales based on the READI-J-V after obtaining permission from the developers of the scale for Japanese people's social skills. Furthermore, we also confirmed the construct and content validity of the preliminary instrument. As a result, 45 items were extracted. Six items from KiSS-18 and 12 from the Competency of Nurses were included in the preliminary instrument. The proposed instrument was named the Japanese Disaster Nursing Readiness Evaluation Index (JDNREI).

2.2 | Step 2: Evaluation of the psychometric properties of the Japanese Disaster Nursing Readiness Evaluation Index

2.2.1 | Participants and procedure

From October 2015 to January 2016, a cross-sectional, self-reported questionnaire was administered to RN. Using the regularly updated list (as of April 2016) of the Japanese Ministry of Health,

Labor, and Welfare, we shortlisted 975 hospitals after excluding those included in our 2014 study to avoid subject duplication. The participants included 1802 RN who were recruited through request letters describing the context and purpose of the study sent to the director of the nursing department of every shortlisted hospital. Inclusion criteria were as follows: RN dispatched to assist survivors after GEJE with >10 years of nursing experience, but with no dispatch experience, despite their interest in disaster relief activities. There were no exclusion criteria. The letter requested the directors of nursing to inform the nursing staff about our study and volunteer to participate.

2.2.2 | Measures

Descriptive characteristics included age, sex, years of nursing experience, experience with disaster training, and experience with disaster and disaster relief activities and circumstances. In addition, one external criterion used to develop the JDNREI included the Professional Identity Scale for Nurses (PISN) (Sasaki & Hariu, 2006), which has 20 items for determining criterion-related validity. Professional identity has a significant influence on RN disaster relief activities (Suenaga, 2015; Yoshino et al., 2013). We obtained permission from the PISN developer for its use.

2.2.3 | Data analysis

IBM SPSS Statistics version 23 for Windows and AMOS version 23 were used for the data analysis. We confirmed the accuracy of all data and identified missing values. In total, 185 invalid questionnaires were detected and excluded from the sample. Descriptive analysis was used to characterize the demographic data (Table 1). The internal consistency of the JDNREI was determined using the Cronbach's alpha coefficient, which estimates the mean of all split-half reliabilities. Exploratory factor analysis (EFA) was used to establish the construct validity of the instrument through a principal factor analysis with varimax rotation. Next, confirmatory factor analysis (CFA) was conducted to test the structural model fit of the JDNREI. Concurrent validity was confirmed by two methods. First, we calculated the Spearman's correlation coefficient among the JDNREI and PISN scores. We then tested the difference in the mean values for the two groups according to the prediction that the total JDNREI score will be higher for RN with disaster dispatch experience than for those with no experience. Linear multiple regression analysis was conducted to confirm the association between the total JDNREI score and RN characteristics and disaster experiences.

2.2.4 | Ethical considerations

The Ethics Committee of Kobe University (approval no. 428) approved our study. We collected the data in accordance with the recommended ethical principles, and all individuals who agreed to participate in the study provided data in an intentional, anonymous, voluntary, and informed manner.

TABLE 1 Demographic characteristics of respondents (n = 964)

	N	%
Sex (%)		
Female	819	85.0
Years of nursing experience		
≤10	66	6.8
11–20	420	43.6
21–30	345	35.8
≥31	132	13.7
Current nursing position		
Staff	433	44.9
Chief	328	34.0
Head nurse & director of nursing	203	21.1
Nursing background		
Internal medicine & surgical nursing	438	45.4
Emergency nursing, ICU, and perioperative nursing	255	26.5
Psychiatric nursing	73	7.6
Others	198	20.5
Past experience of disaster dispatch		
Experienced	389	40.4
Past experience of disaster victim		
Experienced	182	18.9
Experiences in disaster training		
Experienced	647	67.1
Most recent disaster training time		
<1 year	371	57.3
Nomination as a disaster dispatch member		
Yes	208	21.6
Family agreement for the next disaster dispatch		
Yes	498	51.7
Ensuring support for families left at home for future disaster		
Yes	472	49.9
Consideration of own health		
Yes	563	58.4

ICU = intensive care unit.

3 | RESULTS

3.1 | Participants' background

The demographic characteristics of participating RN are presented in Table 1. We received 1149 survey responses from 1802 participants (63.8% response rate) representing 251 hospitals. Initial screening found 185 invalid questionnaires for missing data, thus leaving 964 completed questionnaires (53.5% valid response rate). Of the 964 RN whose completed questionnaires were included in the analysis, 817 (85%) were female and 145 (15%) were male. The mean age of the respondents was 44.1 years (standard deviation = 7.5). Approximately 40% of the respondents participated in GEJE activities, approximately 67% received disaster training, 22% were nominated as dispatch members, 52% responded that the family would agree with the next disaster dispatch, 49% had ensured support for their families left at home while they were dispatched, and 58% considered their own health.

3.2 | Item and factor analyses

The total individual JDNREI scores ranged from 43 to 182, with a mean score of 124.6 ± 19.5; these data showed a monomodal distribution centered on the mean value. According to item-level analysis, five items applicable to the ceiling effect were deleted, all pertaining to emergency nursing skills. These included familiarity with the implementation of basic life support, the bag valve mask, blood protocol procedures, ST elevation, and 12 lead electrocardiogram. In addition, four items applicable to the floor effect were not deleted because they were based on practical skills for disaster response, and were therefore important in the JDNREI. These essential items were sourced from triage experiences on real mass casualties; caring for chemical, biologic, radiological, nuclear, and explosive patients; receiving training on evacuation procedures and implementation; and receiving training on field sanitation, hygiene, and implementation.

According to the results of the item-total correlation, the range of durations was from .376 to .699. No item had a correlation coefficient of ≤.3, which would have indicated impaired consistency. As a result of the inter-item correlation analysis, we further deleted two items with an inter-item correlation of ≥.8: "finding the point of issues of own work immediately" and "having positive images in setting the goal about own work".

The EFA was performed for the remaining 38 items after adjusting for the ceiling effect and inter-item correlation analysis. Factor analysis with an Eigen value of >1.0 was performed to explore the dimensions in the 38 items. In the principal factor analysis with varimax rotation, the item "I can detect danger" had a factor loading of ≤.4, and was thus deleted. Finally, we extracted six factors with 37 items (Table 2). No double loadings were found across the six factors. Factor 1 "communication skills for teamwork" included two items from KiSS-18 and six from "the ability to build cooperative relationships" of the Competency of Nurses. Factor 2 "adaptability to stressful situations at the disaster site" had eight items based on READ-J-V. Factor 3 "practical skills for disaster response" had eight items, including one social skill-related item from KiSS-18 and seven based on the READI-J-V. Factor 4 "emergency nursing skills" consisted of six items from the READI-J-V. Factor 5 "cooperation skills" had four items from the Competency of Nurses and one from KiSS-18. Factor 6 "effective coping with daily stress" had two items based on the "stress management" domain of the READI-J-V.

The CFA was conducted on datasets of 964 participants to test the validity of the correlated six-factor measurement model based on the EFA. This model produced the following statistical test outcomes: goodness of fit index (GFI) = .858, adjusted goodness of fit index (AGFI) = .838, comparative fit index (CFI) = .897, and root mean square error of approximation (RMSEA) = .058 (Figure 1).

3.3 | Reliability and validity

Reliability testing consisted of consistency and stability tests on the six factors in the questionnaire. The results indicated acceptable and fairly strong reliability coefficients overall (.93) and for the six factors (.93, .88, .83, .86, .86, and .83), respectively (Table 2). The result of concurrent validity testing is presented in Table 3. Two-tailed Spearman's correlation coefficients demonstrated significant, moderately strong correlations between the total score of the JDNREI and PISN(r = .50; $P < .001$) (Table 3). We tested the predictable difference in the mean values of the six factors and total The JDNREI scores for RN with disaster dispatch experience and for those with no experience. With the exception of "cooperation skills", significant differences were found between the scores for the five groups and total score.

3.4 | Association between the Japanese Disaster Nursing Readiness Evaluation Index total scores and attributes

The Japanese RN actual disaster readiness levels were determined based on the results of the JDNREI. Based on *t*-test results, items with significant differences were extracted. The JDNREI has a six factor structure; however, only the total score is normally distributed. Therefore, the association between the total JDNREI scores and background factors was explored via multiple linear regression analysis using the forced-entry method (Table 4).

These regression analyses were conducted by confirming the absence of any autocorrelation or multiple collinearity. As a result, the eight variables accounted for 31% of variance in the desirable model ($F = 58.84$, $P < .001$). All the variables shared a significant correlation with the total JDNREI scores, particularly the top three, including "ensuring support for families left at home for the next dispatch", "nomination as a dispatch member", and "past experience of disaster dispatch." Subsequently, RN working in the intensive care unit, perioperative care, and emergency department had significantly higher scores than other specialists. Nurse administrators scored better than staff nurses, while RN with dispatch experience performed similar to those with no experience.

4 | DISCUSSION

The purpose of the present study was to develop the JDNREI and estimate its reliability and validity through psychometric testing.

4.1 | Reliability and validity of the Japanese Disaster Nursing Readiness Evaluation Index

Our validation study included the assessment of the scale's construct and concurrent validity, and internal consistency. The internal consistency of the instrument was examined using the Cronbach's alpha coefficient for the total scale (.93) and all subscales (.83–.93). The overall reliability of the JDNREI demonstrated that the questionnaire consistently measures the intended concept.

For concurrent validity, the correlation coefficient was significantly positive between the JDNREI and PISN. The PISN seems to be a reasonable measure for evaluating the concurrent validity of the JDNREI, because higher levels of individual readiness could lead to high professional motivation and responsibility among RN. Additionally, the prediction that those with disaster dispatch

TABLE 2 Exploratory factor analysis (n = 964)[a]

Factor		Items	Factors (factor loading) 1	2	3	4	5	6	Communality
Factor 1 (8 items): Communication skills for teamwork (α = .93)									
Q27	K	I can easily participate in conversations with other people	**.788**	.086	.063	.111	.137	.049	.665
Q23	C	I can talk positively and expressively	**.764**	.152	.102	.102	.171	.073	.663
Q24	C	I can often speak to my colleagues	**.751**	.123	.116	.120	.204	.049	.650
Q28	C	I can build trust relationships	**.734**	.108	.058	.155	.253	.065	.646
Q25	C	I can use humor	**.731**	.133	.128	.087	.106	.029	.589
Q29	C	I can change my communication style with each person	**.728**	.136	.065	.126	.286	.100	.661
Q26	C	I can follow work instructions well	**.626**	.140	.113	.220	.210	.120	.531
Q30	C	I can find points of compromise	**.621**	.146	.119	.172	.324	.179	.588
Factor 2 (8 items): Adaptability to stressful situations at the disaster site (α = .88)									
Q40	R	I am ready for weather extremes	.062	**.832**	.203	.132	.070	.053	.762
Q41	R	I am ready to deal with lack of privacy	.115	**.779**	.165	.089	.100	.015	.666
Q42	R	I am ready to work for long hours	.130	**.714**	.193	.150	.112	.125	.614
Q43	R	When I am depressed during dispatching, I can understand how to deal with myself	.169	**.659**	.255	.102	.128	.150	.577
Q39	R	I am ready for my possible death	.013	**.576**	.077	.056	.063	.028	.346
Q38	R	I am ready for victims' deaths	.182	**.528**	.074	.161	.142	.050	.366
Q45	R	I am ready to use crowded and co-ed sleeping quarters	.200	**.515**	.199	.097	.049	.135	.375
Q44	R	I am ready to provide different nursing documentation and nursing care depending on affected areas	.196	**.512**	.139	.257	.177	.181	.450
Factor 3 (8 items): Practical skills for disaster response (α = .83)									
Q15	R	I have been trained on the evacuation procedure and have experience of its implementation	.089	.119	**.847**	.106	.020	.044	.753
Q16	R	I have been trained on field sanitation and hygiene and have experience of its implementation	.083	.148	**.806**	.116	.019	.073	.697
Q22	R	I can operate communication equipment	.110	.244	**.540**	.237	.029	.020	.421
Q14	R	I can care for patients with CBRNE injuries	.054	.129	**.531**	.291	-.036	-.002	.387
Q12	R	I have experienced receiving MASCAL training	.051	.165	**.489**	.284	.076	.052	.358
Q13	R	I have experienced triage for real MASCAL	.062	.143	**.485**	.190	.035	.049	.299
Q21	R	I can decontaminate myself and patients using standard decontamination equipment	.097	.149	**.420**	.259	.019	-.004	.276
Q17	K	I can decide on the priority and methods of my work	.159	.213	**.408**	.353	.107	.164	.400
Factor 4 (6 items): Emergency nursing skills (α = .86)									
Q7	R	I can provide required patient information to doctors	.184	.089	.189	**.734**	.098	.052	.628
Q1	R	I am familiar with different types of shock	.129	.174	.297	**.665**	.067	.036	.584
Q2	R	I can care for life-threatening injuries	.098	.205	.378	**.652**	.049	.007	.622
Q3	R	I can explain ABC protocols in detail	.138	.118	.216	**.635**	.115	.095	.504
Q8	R	I am familiar with field infection control	.190	.148	.186	**.629**	.116	.093	.510
Q11	R	I can select the appropriate airway for patients with signs of breathing difficulty	.130	.108	.289	**.493**	.097	.011	.365
Factor 5 (5 items): Cooperation skills (α = .86)									
Q35	C	I can accept my own mistakes	.276	.128	.040	.104	**.761**	.045	.686
Q36	K	I can apologize for failure	.255	.149	.035	.107	**.759**	.045	.679
Q37	C	I have listening skills	.363	.141	.028	.047	**.620**	.040	.540
Q34	C	I can accomplish what I promised	.280	.090	.026	.154	**.551**	.169	.443
Q33	C	I can respect other's opinions without denying them	.307	.185	.028	.082	**.545**	.125	.448
Factor 6 (2 items): Effective coping with daily stress (α = .83)									
Q32	R	I can cope with the daily stress of my economy	.177	.226	.097	.107	.145	**.765**	.709
Q31	R	I can cope with the daily stress of my family	.201	.228	.090	.101	.172	**.730**	.673
Factor contribution			5.04	4.07	3.53	3.32	2.76	1.40	18.72
Cumulative proportion of variance explained			13.64	24.62	34.19	43.17	50.64	54.41	

[a] Principal factor method: varimax rotation.
ABC = airway, breathing, and circulation; C = Competency of Nurses-based item; CBRNE = chemical, biologic, radiological, nuclear, and explosive; K = KiSS-18-based item; MASCAL = mass casualties; Q = question; R = Readiness Estimate and Deployability Index -Japanese version-based item. Cronbach's coefficient alpha for the total on the Japanese Disaster Nursing Readiness Evaluation Index was .93.
Factor loardings greater than .40 are shown in boldface and highlighted by shading.

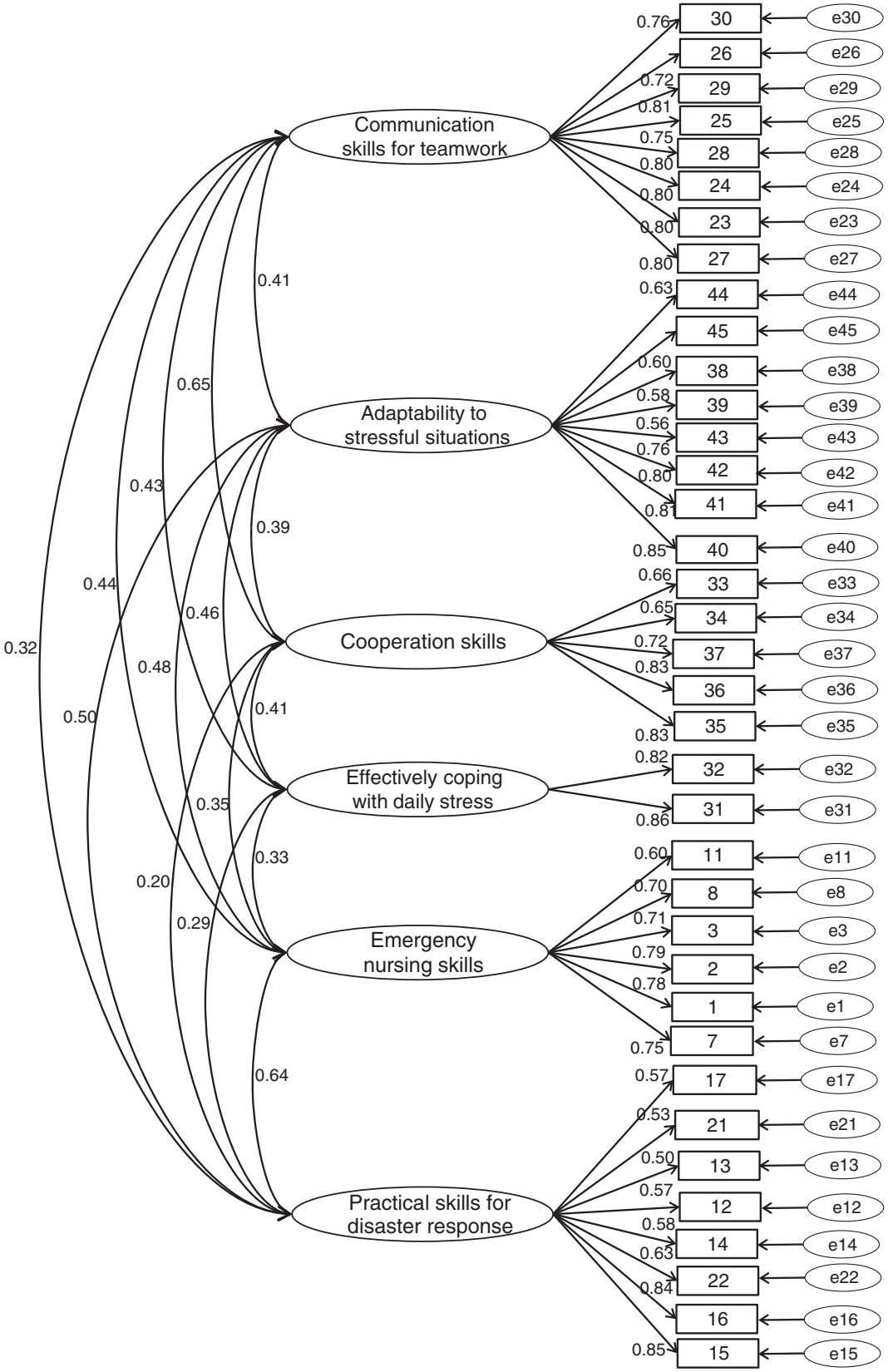

FIGURE 1 Confirmatory factor analysis results of the Japanese Disaster Nursing Readiness Evaluation Index (n = 964). Curved double-headed arrows indicate intercorrelation patterns. Single-headed arrows from the circles to the rectangles are regression paths representing the link between the factors and each set of observed variables; these coefficients indicate standardized factor loadings. Error terms (el–e37) indicate the measurement for each observation variable. Numbers in the boxes indicate the research question numbers of preliminary instrument with 45 items.

TABLE 3 Mean factor scores and concurrent validity of the Japanese Disaster Nursing Readiness Evaluation Index (n = 964)

Factor	No. items	Mean score [a]	SD	Score range		PISN[b]	Past experience of disaster dispatch (mean score ± SD)		*P*-value
				Raw	Reported		Yes (N = 389)	No (N = 575)	
1 (CST)	8	30.3 **(75.8)**	5.4	8–40	8–40	.56**	31.1 ± 5.0	29.9 ± 5.6	.001
2 (ASS)	8	26.9 **(67.3)**	6.1	8–40	8–40	.33**	29.0 ± 5.4	25.5 ± 6.1	<.001
3 (PSD)	8	17.5 **(43.8)**	6.5	8–40	8–39	.27**	20.8 ± 4.6	15.3 ± 5.5	<.001
4 (ENS)	6	21.7 **(72.3)**	4.7	6–30	6–30	.35**	23.0 ± 4.6	20.8 ± 4.6	<.001
5 (CS)	5	20.8 **(83.2)**	2.6	5–25	8–20	.46**	21.0 ± 2.4	20.7 ± 2.8	.109
6 (ECDS)	2	7.3 **(73.0)**	1.6	2–10	2–10	.33**	8.0 ± 1.5	7.1 ± 1.6	<.001
Total score	37	124.6 **(67.4)**	19.5	37–185	43–182	.50**	132.5 ± 18.2	119.3 ± 18.6	<.001

**Significant at $P < .01$
[a] All subscale scores were rescaled to 0–100 in boldface.
[b] Values are Spearman's correlation coefficients.
ASS = adaptability to stressful situations at the disaster site; CS = cooperation skills; CST = communication skills for teamwork; ECDS = effective coping with daily stress; ENS = emergency nursing skills; PISN = Professional Identification Scale for Nurses; PSD = practical skills for disaster response; SD = standard deviation.

TABLE 4 Factors influencing individual readiness with the Japanese Disaster Nursing Readiness Evaluation Index (n = 964)

Variable	B	Standard error	β	*t*	*P*-value
(Constant)	104.004	1.265		42.776	<.001
Ensuring support for families left at home for future disaster	7.111	1.114	.182	−6.382	<.001
Nomination as dispatch member	8.157	1.388	.172	−5.879	<.001
Past experience of disaster dispatch	6.546	1.166	.165	−3.263	<.001
Consideration of own health	6.525	1.089	.165	−5.994	<.001
Experience in disaster training	5.414	1.213	.130	−4.464	<.001
Nursing background[a]	4.745	1.097	.121	−4.324	<.001
Current nursing position[b]	4.260	1.074	.109	3.967	<.001
Past experience of disaster victim	4.391	1.346	.088	−3.263	.001
F = 53.843***					
Adjusted R2 = .311					

[a] 0 = psychiatric, internal medicine, Obstetrics and Gynecology, pediatrics, orthopedic, and other department; 1 = intensive care unit, perioperative, emergency, and surgical department.
[b] 0 = staff; 1 = chief, head nurse, director of nursing.
β, standardized partial regression coefficient. ***Significant at $P < .001$

experience had higher scores was verified, and concurrent validity was confirmed.

For construct validity, we performed the CFA after the EFA to determine the factor validity. Six factors with 37 items were extracted based on repeated analysis. Four of six factors, "adaptability to stressful situations at the disaster site", "communication skills for teamwork", "cooperation skills", and "effective coping with daily stress", were found to be essential for providing excellent care in emergency situations. O'Daniel and Rosenstein (2008) claimed that effective communication among staff encourages effective teamwork, promotes continuity and clarity within the patient-care team, and helps prevent errors. Therefore, "communication skills for teamwork" and "cooperation skills" are important for harmony and unity in disaster relief activities, and "adaptability to stressful situations at the disaster site" is a key to discipline and self-control, because RN themselves conduct risk management and assess emergency situations. Other researchers also expressed the importance of these four factors, and their concepts were consistent with their arguments. The sixth factor, "effective coping with daily stress", included only two items; however, this result supports Wynd's (2006) argument that family and economy are vital to mental readiness. Overall, this interpretation of the EFA was reasonable. As expected, the ensuing CFA indicated acceptable levels of overall fit. Consequently, we confirmed the model structure's goodness of fit, and based on the above discussions, verified construct validity and, although these findings showed the possibility of measuring RN readiness levels to cope with unpredictable disasters using the JDNREI questionnaire.

4.2 | Association between the Japanese Disaster Nursing Readiness Evaluation Index and attributes

The results of this research indicated that the lowest subscale level of the JDNREI was "practical skills for disaster response" (Table 3). The reason for low-level "practical skills for disaster response" could be related to fewer opportunities to hold practices or drills on a routine basis because of lack of time and effective programs. The nursing administrators can create effective educational programs to cultivate practical skills of RN for future disaster response based on the results of their readiness level. In addition, each hospital should consider

measures to enable many RN to actively participate in trainings and programs while working, such as encouraging them to participate in trainings or developing an e-learning system.

These associations possess two significant factors. First, it is valuable to gain sufficient support for their family members left at home in future activities. This finding is consistent with previous published literature that showed RN who independently made family support plans ahead of a disaster had significantly higher motivation to be involved in disaster dispatch than those with no such plans (Arbon et al., 2013). In order to effectively carry out their responsibilities during a disaster, it is important for dispatched nurses not to have any concerns about their families. This result suggested that RN need to develop their own disaster plan as part of individual readiness, including how to gain support for their families, and listing formal or informal services they could use for family support. Second, being nominated as a dispatch member is important to improve their readiness level. However, in terms of nomination, we need to ensure complete information by collecting relevant data from hospitals. In future analyses, we need to account for whether hospital and other factors differ depending on the hospitals and their geographies. Therefore, to improve individual readiness level, family readiness level and nomination as a dispatch member are significantly important factors.

4.3 | Study limitations

Our study had several limitations. First, because we received the questionnaires from hospitals whose directors of nursing actively cooperated with the research, RN who completed the questionnaire were probably more interested in and motivated by this topic than randomly-selected RN. Second, we obtained the data using self-reports, possibly introducing some degree of respondent bias. Finally, the present study focused on an acute-phase disaster occurrence, thus creating doubt on the implication of the results for all disaster phases.

4.4 | Study implications for disaster nursing management

The results of the present study provide four implications for disaster management. First, our findings indicated that the JDNREI is a useful instrument for RN to self-evaluate their individual readiness, which can then boost their confidence in future disaster dispatch activities. Self-evaluation is important for RN to strengthen their motivation for attending disaster trainings and cope with their fears and weaknesses. Second, a particular understanding of "adaptability to stressful situations at the disaster site", "cooperation skills", "effective coping with daily stress", and "communication skills for teamwork" encountered in disaster work enables RN to be ready for stress in affected areas. RN will be encouraged to cultivate awareness of, for instance, their potential not being developed. Through these trainings, RN can face never-before-experienced difficulties of nursing in devastated areas, which improves their readiness for disasters. Furthermore, nursing administrators can use the JDNREI as a self-evaluation instrument and maximize its use by encouraging personnel management to select the appropriate dispatch candidates. Finally, the JDNREI can help plan and develop effective programs focusing on more practical experiences of RN and their families.

5 | CONCLUSION

In the present study, a new instrument, the JDNREI was developed, and its validity and reliability were evaluated. This proposed instrument could be used for further applications for the following two reasons: (i) it enables RN to recognize and assess his or her individual readiness levels for future disasters; and (ii) it can be applied to develop future educational programs. Thus, the JDNREI is highly expected to contribute to improving the disaster response abilities of all RN across Japan.

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AUTHOR CONTRIBUTIONS

Study design: T.M, S.K, N.M, and C.H.
Data collection: T.M and S.K.
Data analysis: T.M and S.K.
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