

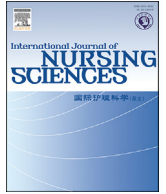
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Original Article

Development and psychometric evaluation of the Hospital Nurse Interpersonal Empathy Questionnaire

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ABSTRACT

Objective: This study aimed to develop the Hospital Nurse Interpersonal Empathy Questionnaire (HNIEQ) and evaluate its psychometric properties.

Methods: The primary version of HNIEQ was deductively developed through reviewing the literature, and then, its face and content validity were assessed. For construct validity assessment, 250 hospital nurses were randomly selected from hospitals of Kashan, Iran. Their data were used for exploratory factor analysis. Internal consistency was assessed through Cronbach's α coefficient and questionnaire stability was assessed through test-retest intraclass correlation coefficient. Ceiling and floor effects were also assessed. Data analysis was done via the SPSS program (v. 16.0).

Results: The final version of HNIEQ contained 45 items. Exploratory factor analysis revealed a six-factor structure (empathetic and ethical attention, perspective adoption, emotional affectability, altruism, emotion identification and responsivity, and reflection forecasting) for the questionnaire which explained 52.7% of the total variance of its total score. The Cronbach's α coefficient and the intraclass correlation coefficient of HNIEQ were 0.953 and 0.972, respectively.

Conclusion: HNIEQ is a valid and reliable instrument for empathy assessment among nurses.

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What is known?

- The existing questionnaires just deal with the empathy between nurses and patients.
- Four components of empathy [Cognitive, Behavioral, Moral and Emotion] are rarely included in one questionnaire.

What is new?

- The questionnaire resulted from this study specifically assesses empathy between nurses.
- This questionnaire contains four components of empathy [Cognitive, Behavioral, Moral and Emotion].

1. Introduction

Empathy is defined as “a cognitive and emotional understanding

of another's experience, resulting in an emotional response that is congruent with a view that others are worthy of compassion and respect and have intrinsic worth” [1]. The concept of empathy consists of emotional, ethical, cognitive, and behavioral components [2]. It is one of the key attributes of interpersonal behaviors which facilitates the establishment of effective communication in social life [3]. In fact, social life and group activities necessitate empathy among group members [4]. Empathy is also essential to the function of organizations [5], because it significantly affects humanistic behaviors, moral decisions, staff performance, and client satisfaction [6].

Compared with other service providers, empathy among healthcare providers, particularly among nurses, is of greater importance due to the significant role of effective teamwork and interpersonal relationships in quality healthcare delivery [7]. In healthcare organizations, nurses need to deal with different problems and challenges including staff shortage [8], heavy workload [9], unpredictable work conditions, anxiety, distress [10], tragic events, and conflicts with colleagues [11]. The management of these challenges necessitates teamwork and empathy.

Empathy among nurses has different positive outcomes for nursing profession, healthcare organizations, and societies. It can facilitate organizational goal attainment, public health promotion

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[12], and loneliness and job burnout prevention [13]. It also enhances life satisfaction [14] and job satisfaction [15], broadens communication and inter-professional skills [13,14], improves occupational health, and enriches professional experiences [13]. It can also improve patient care quality and public image of nursing [6]. On the contrary, lack of empathy among nurses negatively affect teamwork, nurse occupational health [16], patient health, and organizational goal attainment [17].

Development of empathy among nurses necessitates the assessment of their current empathy status using valid and reliable instruments [18]. There are lots of empathy assessment instruments. Some instruments assess empathy in general population. Examples of these instruments are the Hogan Empathy Scale [15], the Toronto Empathy Questionnaire [19], the Questionnaire of Cognitive and Affective Empathy [20], the Empathetic Skill Scale, the Questionnaire Measure of Emotional Empathy [15], the Interpersonal Reactivity Index [21], the Empathy Components Questionnaire [22], and the Basic Empathy Scale [15]. Some other instruments have been developed for empathy assessment in healthcare settings. Examples of these instruments are the Reynolds Empathy Scale [15], the Jefferson Scale of Physician Empathy [23], the Empathy Construct Rating Scale [24], the Consultation and Relational Empathy scale [25], the Layton Empathy Test, the Perception of Empathy Inventory, the Visual Analogue Scale for empathy [15], and the Kiersma-Chen Empathy Scale [26]. All these instruments assess healthcare providers' empathy with patients [15]. Although the developers of the Reynolds Empathy Scale and Empathy Construct Rating Scale claimed that their instruments assess empathy with self, colleague, and patient, these instruments have solely been used for nurse-patient empathy assessment. In addition, most of these instruments just assess some aspects of empathy [26] such as emotional empathy [19], cognitive empathy [23], behavioral empathy [15], cognitive-behavioral empathy [25], and cognitive-emotional empathy [22]. Consequently, there is no specific instrument for assessing the different aspects of empathy among nurses. The present study aimed to develop the Hospital Nurse Interpersonal Empathy Questionnaire (HNIEQ) and evaluate its psychometric properties.

2. Methods

This study was conducted in 2018 in the following two phases.

2.1. Phase I: Development of HNIEQ

The four-step approach proposed by Waltz and colleagues was used for HNIEQ development. In the first step, the definitions of empathy among hospital nurses and its emotional, ethical, cognitive, and behavioral domains were deductively identified through reviewing the existing literature (including books, articles, and instruments in) [27] by the first researcher and confirmed through discussing by research team. In the second step, measurement goals in the four domains of emotional, ethical, cognitive, and behavioral empathy were defined based on the identified definitions. In the third step, the more specific domains of the questionnaire and the number of their items were determined. In the fourth step, items were generated and frequently revised and their scoring system in form of five-point 1–5 Likert scale was developed [28]. Items were deductively developed [27] through reviewing the existing literature.

2.2. Phase II: Psychometric evaluation

Psychometric properties of HNIEQ were assessed in the following three steps.

Step I: Face and content validity assessments

For qualitative content validity assessment, ten experts in nursing, psychology, and instrument development were requested to comment on the comprehensibility, grammar, wording, scoring, adequacy, clarity, and simplicity of the HNIEQ items. Then, the items were revised based on their comments.

Quantitative content validity assessment [by previous ten experts in nursing] was performed by calculating content validity ratio (CVR) and index (CVI). Item CVR was calculated based on item essentiality [29] and was considered acceptable if it was 0.8 or more. Item CVI was calculated using the item relevance criteria [30] and was considered acceptable if it was 0.78 or more [28]. The clarity and the simplicity criteria were assessed only qualitatively. Scale-level CVI was also calculated through averaging item CVIs and was considered acceptable if it was 0.9 or more. Besides CVI, the modified Kappa statistic was calculated for item relevance. This statistic reflects inter-rater agreement and is interpreted as the following: more than 0.74: excellent; 0.60–0.74: good; and less than 0.6: weak [29].

Qualitative face validity was assessed by ten hospital nurses who were requested to comment on ambiguities, conflicts, and problems in understanding the items [31]. The items were amended based on their comments. For quantitative face validity assessment, the same nurses were requested to comment on item importance. Then, item impact score was calculated and was considered acceptable if it was more than 1.5 [29].

Step II: Construct validity assessment and ceiling and floor effects

Construct validity was assessed through exploratory factory analysis.

Sample size: Sample size in the present study was 250. Some scholars recommended that a sample of 100–300 persons is adequate for factor analysis [29].

Inclusion and exclusion criteria: Inclusion criteria were university degree in nursing, employment as hospital nurse, work experience of more than six months, consent for participation, and no affliction by known mental disorders. Participants who unilaterally withdrew from the study were excluded.

Sampling: The sampling was conducted during June and July 2018. Participants were proportionately selected via simple random sampling from all wards of all six hospitals affiliated to Kashan University of Medical Sciences, Kashan, Iran. Each eligible nurse who refused participation was replaced with another nurse who was randomly selected from the same ward.

Data collection: The first author collected the data using self-reported questionnaires. She referred to the study setting at the beginning of each work shift, administered questionnaires to the selected nurses, and collected the questionnaires at the end of the same shift. If a nurse did not fill out the questionnaires during the shift, an appointment was made with him/her to return the filled out questionnaires. Each nurse was allocated a unique numerical code.

Instruments: Data collection instruments were a demographic questionnaire and the primary version of HNIEQ. The demographic questionnaire included nine items on age, gender, marital status, educational level, birth place, spouse occupation, number of children, family income, and place of residence as well as twelve items on occupational characteristics, namely nursing work experience, employment status, official position, main work shift, ward, work experience in the ward, overtime work, amount of overtime work, average monthly income, doing nursing as the second job, doing other jobs as the second job, and interest in nursing. Six faculty members of Kashan Nursing and Midwifery School, Kashan, Iran assessed and confirmed the content validity of this questionnaire.

The primary version of HNIEQ contained 66 items in four domains, namely emotional empathy (ten items), cognitive empathy (seventeen items), ethical empathy (fifteen items), and behavioral empathy (24 items). Items were scored on a five-point Likert scale as follows: “Always”: 5; “Often”: 4; “Usually”: 3; “Sometimes”: 2; and “Rarely”: 1. The minimum and maximum possible total scores of the questionnaire were respectively 66 and 330, with higher scores showing greater empathy.

Step III: Reliability assessment

The internal consistency of the final HNIEQ and its subscales [extracted factors in factor analysis] was assessed through Cronbach’s α coefficient calculation using the data collected from all participants. The stability of the final HNIEQ was also assessed through the test-retest method, in which fifteen nurses filled out the questionnaire two times with a one-week interval. The data were used to calculate test-retest intraclass correlation coefficient (ICC). The agreement standard error of measurement ($SEM_{agreement}$) was also calculated through the following formula, where SD was the standard deviation of the total sum score in the test and the retest steps: $SEM_{agreement} = SD \times \sqrt{1 - ICC_{agreement}}$ [32]. Then, the smallest detectable change was calculated using the following formula $SDC = 1.96 \times \sqrt{2} \times SEM$ [33].

2.3. Data analysis

Data analysis was performed via the SPSS software (v. 16.0). Numerical variables were described using central tendency and

dispersion measures, while categorical variables were described using absolute and relative frequency measures. Cronbach’s α was calculated to assess the internal consistency of the questionnaire and its subscales and ICC was calculated to analyze the correlation between the test and the retest scores.

CVR and CVI were calculated for quantitative content analysis assessment and impact score was calculated for quantitative face validity assessment. Construct validity was assessed through exploratory factor analysis. HNIEQ factors were extracted through the principal component analysis with varimax rotation. The number of factors was determined based on Scree plot and an Eigen value of more than 1. The minimum factor loading value was 0.4. Inappropriate items were excluded and items with common factor loading were allocated to the factors with greatest factor loading value. Extracted factors were labeled based on the content of their items.

The appropriateness of the data for factor analysis was assessed by conducting the Kaiser-Meyer-Olkin and the Bartlett’s tests which respectively tested sampling adequacy and the hypothesis that the inter-item correlation coefficient is not equal to zero. To determine ceiling and floor effects, the frequencies of participants who respectively obtained the minimum and the maximum possible total scores of the questionnaire were calculated [33]. The Kolmogorov-Smirnov test was done for normality testing.

2.4. Ethical considerations

Approvals for the study were obtained from the Ethics Committee and the Research Administration of Kashan University of Medical Sciences, Kashan, Iran (codes: IR.KAUMS.NUHEPM.REC.1396.33 and 2018.11.03.96208, respectively). Informed written consent was obtained from all participants. They were ensured of the confidentiality of their data and their freedom to unilaterally withdraw from the study.

3. Results

3.1. Phase I: Development of HNIEQ

The primary version of HNIEQ contained 66 items in the four domains of emotional empathy (ten items), cognitive empathy (seventeen items), ethical empathy (fifteen items), and behavioral

Table 1
Participants’ demographic and occupational characteristics ($n = 250$).

Characteristics		n (%)
Gender	Female	202 (80.8)
	Male	48 (19.2)
Marital status	Single	48 (19.2)
	Married	200 (80)
	Divorced or widowed	2 (0.8)
University degree	Bachelor’s	233 (93.2)
	Master’s	17 (6.8)
Official position	Head nurse	8 (2.3)
	Staff nurse	242 (96.8)
Monthly income (\$)	>71.4	2 (0.8)
	71.4–142.8	67 (26.8)
	142.8–214.2	157 (62.8)
	>214.2	24 (9.6)
Main work shift	Morning	89 (35.6)
	Evening	85 (34)
	Night	76 (30.4)
Age (Years, Mean \pm SD)		6.68 \pm 33.12
Work experience (Months, Mean \pm SD)		72.77 \pm 105.03
Duration of work in the current ward (Months, Mean \pm SD)		55.40 \pm 57.29
Interest in nursing (on a 0–10 scale, Mean \pm SD)		1.98 \pm 7.73

Table 2
The items of the extracted factors and their factor loading values.

Items	Factors					
	1	2	3	4	5	6
1-When my colleagues are appreciated, I feel that I have been appreciated.						
2-Colleagues' concern disturb me.			0.656			
3-Colleagues' grief and sorrow make me feel bad.			0.706			
4-I feel comfortable with my colleagues' comfort.			0.453			
5-I feel unhappy at disrespect towards a colleague.			0.701			
6-When a colleague is under stress due to his/her work schedule pressure, I can understand his/her conditions.			0.636			
7-Before criticizing my colleagues, I attempt to put myself in their shoes for moments.						0.544
8-Before any action in relation to my colleagues, I attempt to imagine their reactions towards that action.						0.698
9-I understand my colleagues hide their emotions.						0.540
10-I can easily view different events and issues from my colleagues' viewpoint.		0.573				0.401
11-I can accurately predict how my colleagues perceive my speech and behaviors.		0.520				
12-I can effectively show my colleagues how valuable they are for me.		0.580				
13-I can effectively show my colleagues how important their opinions are for me.		0.658				
14-I predict my colleagues' need for help in doing job tasks.		0.646				
15-I create an atmosphere in which my colleagues can easily express their emotions.		0.685				
16-I guide my colleagues without imposing my feelings and values on them.		0.482				
17-I value the important issues for my colleagues and react to them					0.466	
18-I share my perception of my colleagues' speeches with them.					0.436	0.470
19-I'm kind to my colleagues.					0.662	
20-I'm warm and humble towards my colleagues.					0.737	
21-I attempt to transfer professional interest and motivation to my colleagues.					0.626	
22-When a colleague is under mental strain, I soothe him/her.	0.404					
23-Through my behaviors, I show my colleagues that I'm ready to listen to their speeches with open arms and without prejudice.	0.552					
24-I thoroughly answer my colleagues' work-related questions.						
25-I transfer optimism and positive thinking to my colleagues.	0.418					0.447
26-If a colleague needs changes in his/her work schedule, I collaborate with him/her as much as I can.	0.529					
27-I consider individual differences in establishing communication with my colleagues.						0.435
28-I pay attention to colleagues' non-verbal communications.						0.420
29-I voluntarily and honestly share my work-related experiences with my novice colleagues.	0.528					
30-I attempt to understand why my colleagues are angry.						0.433
31-I help my colleague in doing their work-related activities.		0.603				
32-I consider my colleagues' opinions (approvals and disapprovals) before making work-related decisions.	0.484					
33-I help my colleagues in career advancement and professional development.	0.588					
34-I attempt to give good feelings to my colleagues.	0.520					
35-I consider my colleagues' conditions when giving them bad news.	0.552					
36-I attempt to devote time to an unhappy colleague even when I have inadequate time or heavy workload.	0.541					
37-I respect my colleagues' thoughts, beliefs, emotions, opinions, and values.	0.608					
38-I'm honest with my colleagues.	0.626					
39-I feel responsible towards fulfilling my colleagues' educational and professional needs.	0.525					
40-I accept my colleagues as they are.						
41-I consider my colleagues' conditions when applying for my new monthly work schedule.	0.517					
42-If I have a lower workload in a shift compared with my colleagues, I attempt to help them.	0.768					
43-I attempt to promote healthy and humanistic relationships in the ward.	0.765					
44-I attempt to boost teamwork morale for participatory task performance in the ward	0.754					
45-If a colleague does not have enough endeavor and perseverance at work, I notify him/her of that in order to protect other colleagues' rights.						0.700
46-Whenever I request change in work schedule, if the head nurse makes the change without my colleague's consent, I will disagree.		0.415				
47-In case of any violation of a colleague's rights, I attempt to defend his/her rights.						0.549
48-When a responsibility is proposed to me that I know another colleague can perform it	0.475					

Factor labeling.

Factor 1 contained eighteen items (i.e. items 22, 23, 26, 29, 31–39, 41–44, and 48) and was labeled empathetic and ethical attention.

Factor 2 contained eight items (i.e. items 10–16 and 46) and was labeled perspective adoption.

Factor 3 contained five items (i.e. items 2–6) and was labeled emotional affectability.

Factor 4 contained four items (i.e. items 17, 19–21) and was labeled altruism.

Factor 5 contained seven items (i.e. items 18, 25, 27, 28, 30, 45, and 47) and was labeled emotion identification and responsivity.

Factor 6 contained three items (i.e. items 7–9) and was labeled reflection forecasting.

empathy (24 items).

3.2. Phase II: Psychometric evaluation

3.2.1. Step I: Face and content validity assessments

During qualitative content validity assessment, some items (such as “I am kind, humble, warm, and receptive to my colleagues”) were changed to two items and some items (such as “I listen to my colleagues without any prejudice”) were excluded due

to their overlaps with other items. The wording of some items was also changed. For instance, the item “Colleagues' depression makes me feel bad” was changed to “Colleagues' grief and sorrow make me feel bad”. Accordingly, the number of items was reduced to 59.

In quantitative content validity assessment, the CVR values of ten items were less than the minimum acceptable value for ten experts, i.e. 0.8 [30]. These ten items were excluded. The relevance CVI value of one item was also less than the minimum acceptable value for ten experts, i.e. 0.78. However, as the modified Kappa

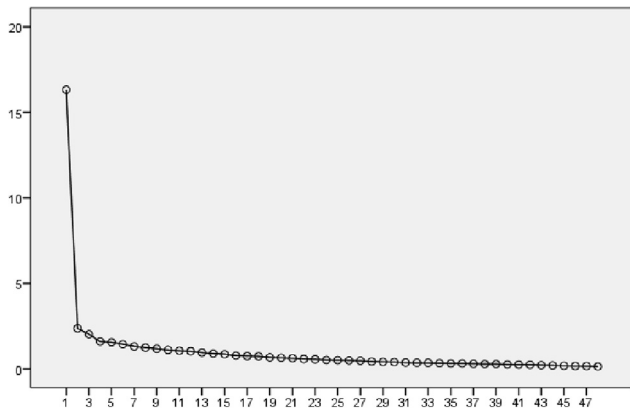


Fig. 1. The scree plot of the factor structure of HNIEQ in factor analysis.

statistic values of all items were excellent, all items were retained. Scale-level CVI was 0.94.

In qualitative face validity assessment, none of the items were changed. In quantitative face validity assessment, one item was deleted due to an impact score of less than 1.5. At the end of face and content validity assessments, HNIEQ contained 48 items.

3.2.2. Step II: Construct validity assessment and ceiling and floor effects

In total, 250 nurses were recruited to fill out HNIEQ. Most of them were female (80.8%) and married (93.2%). The means of their age and work experience were 33.12 ± 6.68 years and 105.03 ± 72.77 months, respectively (Table 1).

The Kaiser-Meyer-Olkin test indicated sampling adequacy (test value = 0.923) and the Bartlett's test showed that the inter-item correlation matrix was appropriate for factor analysis ($\chi^2 = 649$; $P < 0.001$). In exploratory factor analysis, three items (i.e. items 1, 24, and 40) were excluded and the remaining 45 items were loaded on six factors. These factors were labeled empathetic and ethical attention, perspective adoption, emotional affectability, altruism, emotion identification and responsivity, and reflection forecasting. These factors explained 52.7% of the total variance of the HNIEQ total score (Table 2). Scree plot also confirmed that HNIEQ included six factors with Eigen values greater than 1 (Fig. 1).

In the assessment of ceiling and floor effects, the relative frequencies of participants with the minimum and the maximum possible total scores of HNIEQ (i.e. 45 and 225) were 0.8%.

3.2.3. Step III: Reliability assessment

Internal consistency assessment revealed that the Cronbach's α value of the 45-item HNIEQ was 0.953 and the Cronbach's α coefficient of its empathetic and ethical attention, perspective adoption, emotional affectability, altruism, emotion identification and responsivity, and reflection forecasting subscales were 0.931, 0.826, 0.759, 0.794, 0.786, and 0.679, respectively.

Stability assessment showed that the ICC of the 45-item HNIEQ was 0.972 (95% CI: 0.917–0.991; $P < 0.001$). SEM and SDC (with a 95% confidence interval) were ± 5.19 and 6.31, respectively.

4. Discussion

This study aimed to develop HNIEQ and evaluate its psychometric properties. Findings revealed that the 45-item HNIEQ has

acceptable validity and reliability in the target population and can determine the score of interpersonal empathy among hospital nurses in the range of 45–225. The draft of the questionnaire was developed using the four-step approach proposed by Waltz and colleagues [28] through reviewing the existing literature and based on the cultural atmosphere and the organizational structure of hospitals.

Content validity assessment based on the comments of experts in different specialties revealed a scale-level CVI of 0.94. Scale-level CVI values greater than 0.90 are acceptable [29]. Content validity assessment is an essential component of instrument development [29,34] because it shows that the items of the intended instrument accurately measure the intended concept [34]. Face validity assessment in the present study also showed the acceptable face validity of HNIEQ. Face validity refers to the comprehensibility of the items for the target population [28]. The acceptable face validity of HNIEQ denotes that its items are comprehensible for hospital nurses.

Exploratory factor analysis revealed that HNIEQ consists of six subscales, namely empathetic and ethical attention, perspective adoption, emotional affectability, altruism, emotion identification and responsivity, and reflection forecasting. These six subscales accounted for 52.7% of the total variance of the total score of nurses' interpersonal empathy. The greatest subscale variance was related to the subscales one (16.6%) and two (8.2%). One of the most significant factors to judge about the construct validity of a scale is the amount of variance explained by its subscales. A scale is considered to have acceptable construct validity provided that its subscales explain at least 40% of its total variance [35].

The perspective adoption, emotional affectability, and emotion identification and responsivity subscales of HNIEQ are almost similar to the perspective taking, online simulation, emotion contagion, proximal responsivity, and peripheral responsivity subscales of the Questionnaire of Cognitive and Affective Empathy. The five subscales of that questionnaire explained 41.9% of the total variance of cognitive and affective empathy [20]. Moreover, the subscales of HNIEQ are also similar in some ways to the subscales of the Questionnaire Measure of Emotional Empathy. The six subscales of that questionnaire were relational empathy, expressive empathy, cooperative empathy, movement by others' emotional experience, emotional stability, and empathy with others, and explained 40% of the total variance [36]. The greater variance of empathy explained by HNIEQ in the present study compared with those two instruments [52.7% vs. 41.9% and 40%] denotes the appropriateness of HNIEQ for empathy assessment.

Six identified factors in this study fully cover four aspects of the empathy; emotional, ethical, cognitive, and behavioral. Content related to items of "emotional affectability" factor is consistent with the aspect of "emotional empathy". Items of "perspective adoption" factor and "reflection forecasting" factor cover aspect of "cognitive". Items of three factors; "empathetic and ethical attention", "emotion identification and responsivity" and "altruism" are accordance with aspect of "behavioral". Moreover, Content related to items of "empathetic and ethical attention", "emotion identification and responsivity" and "perspective adoption" factor cover aspect of "ethical".

Our findings revealed that HNIEQ does not have ceiling and floor effects. These effects are present when more than 15% of respondents obtain respectively the maximum and the minimum possible total scores of the intended instrument. The presence of these effects indicates low content validity [27].

The Cronbach's α coefficient of HNIEQ was 0.953. Cronbach's α coefficients greater than 0.70 are acceptable. Thus, HNIEQ has acceptable internal consistency and reliability. Moreover, test-retest ICC was 0.97 ($P < 0.001$). ICC values greater than 0.7 are acceptable and show the stability of the intended instrument [37]. Stability or repeatability assessment is among the methods for reliability assessment [33]. Therefore, the acceptable stability of HNIEQ shows its acceptable reliability.

The SEM of HNIEQ was ± 5.19 and its SDC was 6.31. Small SEM supports instrument stability. An SEM of ± 5.19 in the possible range of 45–225 for the total score of HNIEQ is considered very small and denotes the stability, repeatability, and reliability of HNIEQ.

Strengths and limitations of the study: Limitation of this study was selection of samples just from educational hospital nurses in Kashan, Iran. Among the strengths of the study were a response rate of 100% and random sampling from all hospital wards affiliated to a medical science university.

5. Conclusion

The 45-item HNIEQ has acceptable validity and reliability. Nursing managers can use this instrument to determine and select the best nurses for each hospital ward, nursing arrangements in work shift and nursing job interviews. Future studies in the area of nurse empathy are recommended to use HNIEQ for empathy assessment.

CRedit authorship contribution statement

Mina Montazeri: Writing - original draft, Conceptualization. **Zahra Tagharrobi:** Methodology, Software, Visualization, Formal analysis. **Zahra Sooki:** Writing - review & editing, Conceptualization, Writing - original draft. **Khadijeh Sharifi:** Writing - original draft, Methodology, Supervision, Visualization, Investigation.

Declaration of competing interest

The authors declare no potential conflict of interest with regard to the research, authorship, and publication of this study.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2020.06.012>.

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