EMPIRICAL RESEARCH QUANTITATIVE

Psychometric evaluation of the 'Jefferson Scale of Empathy' in a sample of nursing students in the United Kingdom

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Abstract

Aim: To examine the psychometric properties of the 'Jefferson Scale of Empathy'.

Design: A methodological study was conducted.

Methods: A sample of 230 nursing students was used to analyse the psychometric properties of the 'Jefferson Scale of Empathy'. Exploratory and confirmatory factor analysis was used to test construct validity. Cronbach's alpha and item-total correlations were carried out to test internal consistency reliability.

Results: The mean score of the empathy SUM was 112.0 (SD: 12.6). A three-factor model was explored. This factor structure does not replicate the original 'Jefferson Scale of Empathy' when it was validated with medical students, but it is in line with later research with nursing students. The Cronbach's alpha coefficient was 0.80 for the SUM and 0.80–0.84 for individual items. Item-total correlation coefficients were 0.01–0.63.

No Patient or Public Contribution: Because this study focused on nursing students. No patients or the public were involved.

KEYWORDS
confirmatory factor analysis, empathy, 'Jefferson Scale of Empathy', nursing students, reliability, validity

1 | INTRODUCTION

Empathy is a concept frequently acknowledged to be important in the education and practice of nurses and other health professionals (e.g. medicine, pharmacy and occupational therapy) because it is considered an essential component of quality of patient care (Fashami et al., 2023; Hojat et al., 2018; Serrada-Tejeda et al., 2022; Yu et al., 2021). In counselling psychology, empathy was defined as 'an ability to sense the client's private world as if it were your own, but without ever losing the 'as if' quality' (Rogers, 1957, p. 99). Over the years, empathy has gradually come to be viewed as a multi-dimensional phenomenon consisting of four key components: emotion (the ability to experience what others experience); moral (the drive that motivates people to show empathy); cognition (the ability to recognise and understand the perspectives and views of others); behaviour (the ability to convey empathic understanding) (Morse et al., 1992). Cuff et al. (2016) argue that empathy is a significant driver of caring behaviours, although empathetic understanding may not necessarily lead to optimal behaviours.

In healthcare settings, empathy is perceived as a multi-dimensional phenomenon, where health professionals gain empathic understanding, intend to help and communicate this understanding to the patient (Hojat et al., 2018; Mercer et al., 2004). Therefore,

empathic understanding and behaviours are essential elements of nursing care with beneficial outcomes for both the patient and the nurse (Yu & Kirk, 2008). For example, higher levels of empathy are related to better clinical outcomes, improved satisfaction, enhanced nurse–patient communication and reduced burnout (Nembhard et al., 2022; Ren et al., 2020; Teófilo et al., 2019; Wang & Shan, 2020; Wilkinson et al., 2017).

A number of measurement tools have been developed to assess empathy, and the most frequently used measure in healthcare settings is the 'Jefferson Scale of Empathy' (JES) (Hong & Han, 2020; Williams & Beovich, 2020; Yu & Kirk, 2009). Originally, the scale was developed by Hojat et al. (2001) to measure empathy in medical students, it has been applied to measure empathy in various groups of health and allied health professionals and students, such as nurses, pharmacists and occupational therapists (e.g. Castillo et al., 2021; Mirzayeh et al., 2022; Yu et al., 2021). The scale has been used in 88 countries and translated in 59 languages (Thomas Jefferson University, 2022).

The JSE has been validated in nursing students in several countries/regions, such as the United States (Ward et al., 2009), Spain (Díaz Valentín et al., 2019), Chile (Castillo et al., 2021), Italy (Montanari et al., 2015) and Taiwan (Hsiao et al., 2013). However, to our knowledge, although its psychometric properties have been explored in the context of medicine in the United Kingdom (UK) (Tavakol et al., 2011), no studies have been conducted to test JSE's psychometric properties in nursing students in this country. Nursing training, nursing practice and nursing terminologies often differ to some extend across countries and disciplines, which might make the JSE less relevant in the UK nursing context.

2 | METHODS

2.1 | Study design

A methodological study was conducted to explore the psychometric properties of the JSE in a sample of nursing students in the UK.

2.2 | Participants

The target population included 319 second year nursing students attending the 'Acute and continuing care needs of adult clients and their families' module at the University of South Wales. The module was offered to second year nursing students only and one of its key objectives was to enhance students' empathy and promote effective communication with patients/family. All students attending the module on the days of the recruitment were invited. A convenience sample of 230 students in five cohorts were recruited. Students who declined to participate in the research ($n = 12$) also completed the study as part of scheduled teaching and learning, but their data were not included in the analysis. Students received an electronic version of the study information pack in advance, while hard copies were available on the day when the data were collected.

2.3 | The instrument

The JSE was the instrument used to measure empathy in this study. The scale is available in three versions: S-version for medical students; HP-version for health professionals; HPS-version for health professional students. The Health Professional (HP) version was used in this study, as the majority of our participants had had previous experience of caring for people before joining the nursing course. The scale was initially developed to assess the attitudes of medical students in the United States towards empathy, which refers to their cognitive attributes about empathy towards patients in healthcare settings (Hojat et al., 2001). There are 20 items, which are responded on a 7-point Likert-type scale ranging between 1 'strongly disagree' and 7 'strongly agree'. Ten items (JSE 1, JSE 3, JSE 6, JSE 7, JSE 8, JSE 11, JSE 12, JSE 14, JSE 18 and JSE 19) were phrased negatively and reverse scored. The SUM ranges 20–140, where a higher score suggests greater empathy orientation. The reported validity and reliability of this scale were acceptable in its original study. Face validity was assessed by physicians; validity was established by factor analysis, gender comparison ($t = 2.41$, $p < 0.05$) and criterion validity ($r = 0.40$–0.45); and reliability was obtained by internal consistency (alpha = 0.87 for residents and 0.89 for medical students). Evidence of good psychometric properties of this scale has been shown in later studies of nursing and medical students in various countries (Castillo et al., 2021; Díaz Valentín et al., 2019; Hojat et al., 2018; Hsiao et al., 2013).

Demographics (age, gender and ethnicity) and information about participants' experience of working in the care sector were also collected.

2.4 | Data collection

The data were collected between May 2018 and December 2019. The JSE was applied. A hard copy of the scale was distributed to students in classroom on the days of the data collection. A member of the team was present to answer any queries and collect the completed questionnaires on site.

2.5 | Data analysis

The data were analysed using R software version 4.2. (R Core Team, 2022).

2.5.1 | Descriptive statistics

Descriptive statistics were used to explore the data, including means, standard deviations, range, minimum, maximum and

quantiles. Skewness and kurtosis were used to check the normality of the data. Normality distribution was considered if the skewness or kurtosis values were <1.96 times their respective standard error (Field, 2013). A skewness measure of 0 and a kurtosis of 3 indicated normality distribution (Kallner, 2018). Histograms, Q–Q plots and Shapiro test were also performed to confirm normality distribution.

Furthermore, floor and ceiling effects were examined for the SUM of the JSE and individual items. The presence of a floor effect is indicated if the score is >15% on the minimum score for an item, which is 1; the presence of a ceiling effect is shown if the score is >15% on the maximum score for an item, which is 7 (Terwee et al., 2007). The minimum SUM of the JSE is 20 and the maximum SUM is 140.

2.5.2 | Validity analysis

Construct validity was tested to explore the underlying constructs of the JSE using exploratory factor analysis and confirmatory factor analysis (CFA). Descriptive principal component factor analysis (PCFA) was performed first using oblique rotation. The suitability of the data for this analysis was affirmed by Kaiser–Meyer–Olkin Measure (0.5–1.0) and significance Bartlett's test of sphericity ($p < 0.05$). Four goodness-of-fit indices were applied to check whether the data fit a hypothesised model for CFA: CMIN/DF ratio of <3, goodness-of-fit index (GFI) of >0.90, comparative fit index (CFI) of >0.90 and root mean square error (RMSEA) of <0.08 (Hu & Bentler, 1999; Sugawara & MacCallum, 1993).

2.5.3 | Reliability analysis

Internal consistency reliability was tested using Cronbach's alpha and item-total correlations. Acceptable internal consistency was considered for an alpha value or correlation efficiency value of above 0.7 (Streiner et al., 2014).

2.6 | Ethical considerations

Ethical approval was granted from the Research Ethics Committee at the University of South Wales in the UK (reference No: 18JY0401LR). The general ethical principles as set by UK Health Research Authority (2023) for health and social care research were applied.

The study information sheet was provided to all participants. The participants were also informed of the study verbally, had an opportunity to make an enquiry about the study and their participation, and gave their written consent. Participants were also informed of the right to withdraw and that there would be no consequences to their nursing degree if they chose not to give their consent. They were also informed that all data were unidentifiable and were reported in aggregated group statistics.

3 | RESULTS

3.1 | Descriptive statistics

The analysis included 230 nursing students. The largest proportion of participants in each characteristic were aged 21–30 years (46.7%); female (92.6%); White (93.3%) (Table 1).

The mean SUM of the JSE was 112.0 (SD: 12.6; range: 39–140). The overall distribution of the SUM showed a high negative skewness with a very high peak (kurtosis >3; leptokurtotic). In addition, skewness and kurtosis were >1.96 times their respective standard error, indicating the data were not normally distributed. The histograms (e.g. QQ plots and Shapiro tests) also suggested 'non-normality' of the data.

There were no floor or ceiling effects in the SUM, which was <15% cut off for both maximum and minimum scores. None of participants achieved the minimum expected score (20), while 0.43% achieved the maximum expected score (140). Floor and ceiling effects for 20 individual items were also conducted (minimum = 1; maximum = 7) (Table 2). The lowest mean value was for item 18 (3.88) and the highest mean value was for item 20 (6.33). Small floor effects (0%–5.65%), but large ceiling effects (4.35%–60.43%), were reported for individual items.

3.2 | Exploratory factor analysis

The fit of the data for PCFA was explored using the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (MSA) and the Bartlett's test of sphericity. The MSA for the SUM was satisfactory (0.85). The MSA for individual items was also within the satisfactory range (0.5–1.0). The Bartlett's test of sphericity was statistically significant ($\chi^2_{(190)} = 1036.03$; $p < 0.001$). These results indicated that there were adequate data to explore JSE's dimensions using the PCFA.

The PCFA using oblique rotation suggested a three-factor model. Each factor had an eigenvalue >1, the three factors accounted for 38.2% of the total variance, and the magnitudes of eigenvalues

TABLE 1 Characteristics of the participants ($N = 230$[a]).

Variables	Grouping	Number	Percent
Age (years)	<21	30	13.3
	21–30	105	46.7
	31–40	57	25.3
	41–60	33	14.7
Gender	Male	17	7.4
	Female	213	92.6
Ethnicity	White[b]	209	93.3
	Other	15	6.7

[a]Not all participants answered every question.
[b]White Welsh/English/Scottish/Northern Irish/British.

TABLE 2 Descriptive statistics for individual items on the Jefferson Scale of Empathy ($N=230$).

Item	Mean	SD	Cronbach α (item dropped)	Item-total correlation (item dropped)	Floor effect %	Ceiling effect %
1	4.76	1.74	0.82	0.25	5.65	17.83
2	6.11	1.17	0.81	0.52	0.87	48.26
3	5.60	1.43	0.81	0.43	0.87	29.57
4	6.10	1.08	0.81	0.48	0.87	44.78
5	5.48	1.21	0.82	0.40	0.00	21.74
6	5.72	1.22	0.81	0.42	0.00	28.26
7	6.10	1.30	0.82	0.37	1.74	50.87
8	5.10	1.68	0.82	0.38	3.91	23.91
9	6.03	1.12	0.81	0.47	0.87	38.70
10	5.73	1.11	0.81	0.50	0.87	24.78
11	5.97	1.41	0.82	0.38	2.61	45.65
12	6.05	1.31	0.81	0.45	1.74	46.96
13	5.62	1.44	0.81	0.42	3.04	29.57
14	6.05	1.62	0.82	0.36	1.30	60.43
15	5.07	1.57	0.82	0.30	4.35	18.26
16	6.12	1.02	0.80	0.63	0.43	44.35
17	5.28	1.38	0.82	0.41	2.61	17.39
18	3.88	1.43	0.84	0.01	4.78	4.35
19	4.93	1.80	0.83	0.10	5.22	28.26
20	6.33	1.03	0.81	0.52	1.30	56.96

were 3.807, 2.498 and 1.326 respectively. The factor loadings after oblique rotation are presented in Table 3. The maximum communality explained by the model is 62.2% for item 2 (0.818) and the minimum is 10.7% for item 18 (0.307).

Using the simple rule that only one factor represents each of the JSE's items (i.e. using the corresponding largest loading across all three factors), the factors may be labelled as follows (Table 3). The first factor is 'Perspective taking' comprised of 11 items (JSE 2, JSE 3, JSE 4, JSE 5, JSE 6, JSE 9, JSE 10, JSE 13, JSE 16, JSE 17 and JSE 20) and accounted for 19.0% of the variance. The second factor is 'Compassionate care' comprised of seven items (JSE 1, JSE 7, JSE 8, JSE 11, JSE 12, JSE 14 and JSE 18) and explained 12.5% of the variance. Factor 3 is 'Walking in their shoes' comprised of two items (JSE 15 and JSE 19) and accounted for 6.6% of the variance.

3.3 | Confirmatory factor analysis (CFA)

JSE's latent variable structure was confirmed by CFA within a structural equation modelling (SEM) framework. Only the three-factor model with oblique rotation suggested by the exploratory factor analysis showed a good fit to the data as indicated by CMIN/DF (=1.672), RMSEA (=0.054), CFI (=0.873) and GFI (=0.891). Note that the first two measures satisfy the thresholds, but CFI and GFI are slightly below the thresholds, indicating a reasonably good fit (but

not an excellent one). Based on the three-factor model, the measurement model is as follows: The 20 items modelled as resulting from one of three underlying latent variables: Factor 1: 'Perspective taking' (11 items); Factor 2: 'Compassionate care' (7 items); Factor 3: 'Walking in their shoes' (2 items). The corresponding latent variable structure is shown in Figure 1.

3.4 | Internal consistency reliability

Internal consistency was tested using Cronbach's alpha and item-total correlations (Table 2). The Cronbach's alpha coefficient was 0.80 for the SUM and 0.80–0.84 for individual items. The Cronbach's alpha coefficient was 0.83 for Factor 1 'Perspective taking', 0.60 for Factor 2 'Compassionate care' and 0.33 for Factor 3 'Walking in their shoes'. Item-total correlation coefficients ranged from 0.01 to 0.63.

4 | DISCUSSION

This was the first study that explored JSE's psychometric properties with nursing students in the UK. The findings indicated that the JSE has good validity and reliability to assess empathy in a sample of UK nursing students, adding a psychometrically sound measurement scale to assess empathy in nursing education and practice.

TABLE 3 Exploratory factor analysis (principle components analysis) with oblique rotation.

No	Item	Factor 1 (Perspective taking)	Factor 2 (Compassionate care)	Factor 3 (Walking in their shoes)
2	Patients feel better when I understand their feelings	**0.818**	−0.100	−0.058
3	It is difficult for me to view things from my patients' perspectives	**0.481**	0.155	−0.451
4	I consider understanding my patients' body language as important as verbal communication in caregiver-patient relationships	**0.656**	0.026	0.103
5	I have a good sense of humour that I think contributes to a better clinical outcome	**0.724**	−0.182	0.170
6	Because people are different, it is difficult for me to see things from my patients' perspectives	**0.465**	0.160	−0.441
9	I try to imagine myself in my patients' shoes when providing care to them	**0.502**	0.175	−0.145
10	My patients value my understanding of their feelings which is therapeutic in its own right	**0.590**	0.131	−0.084
13	I try to understand what is going on in my patients' minds by paying attention to their non-verbal cues and body language	**0.355**	0.276	0.122
16	An important component of the relationship with my patients is my understanding of their emotional status, as well as that of their families	**0.542**	0.348	0.062
17	I try to think like my patients in order to render better care	**0.532**	0.036	0.267
20	I believe that empathy is an important therapeutic factor in medical or surgical treatment	**0.411**	0.314	0.291
1	My understanding of how my patients and their families feel does not influence medical or surgical treatment	−0.214	**0.670**	0.059
7	I try not to pay attention to my patients' emotions in history taking or in asking about their physical health	0.006	**0.592**	0.156
8	Attentiveness to my patients' personal experiences does not influence treatment outcomes	0.017	**0.585**	0.127
11	Patients' illnesses can be cured only by medical or surgical treatment; therefore, emotional ties to my patients do not have a significant influence on medical or surgical outcomes	0.007	**0.630**	−0.193
12	Asking patients about what is happening in their personal lives is not helpful in understanding their physical complaints	0.169	**0.540**	−0.118
14	I believe that emotion has no place in the treatment of medical illness	0.230	**0.345**	−0.107
18	I do not allow myself to be influenced by strong personal bonds between my patients and their family members	−0.261	**0.307**	0.025
15	Empathy is a therapeutic skill without which success in treatment is limited	0.237	0.130	**0.653**
19	I do not enjoy reading non-medical literature or the arts	0.109	0.014	**0.385**
Eigenvalues		3.807	2.498	1.326

Note: The values in bold indicate the items with the highest loadings within each factor.

4.1 | Distribution of the empathy scores

A mean SUM of 112.0 out of 140 points in a sample of nursing students was reported in this study. This finding is similar to what reported in previous studies of nursing students in other countries, where the average empathy scores ranged between 104 and 115 (Castillo et al., 2021; Díaz Valentín et al., 2019; Montanari et al., 2015).

There was no evidence of floor or ceiling effects in the SUM of the scale. Although no participants achieved the minimum score

(20), 0.43% achieved the maximum expected score (140). In addition, a small floor effect (0%–5.65%), but a large ceiling effect (4.35%–60.43%), were noticed for individual items. Similar findings were reported by others, suggesting that to some extent our sample is similar to other samples previously completing the JSE (Hojat & LaNoue, 2014). The reported large ceiling effect would make it difficult for the JSE to differentiate individuals with the highest possible scores from each other, which may limit the scale's content, validity and reliability (Terwee et al., 2007).
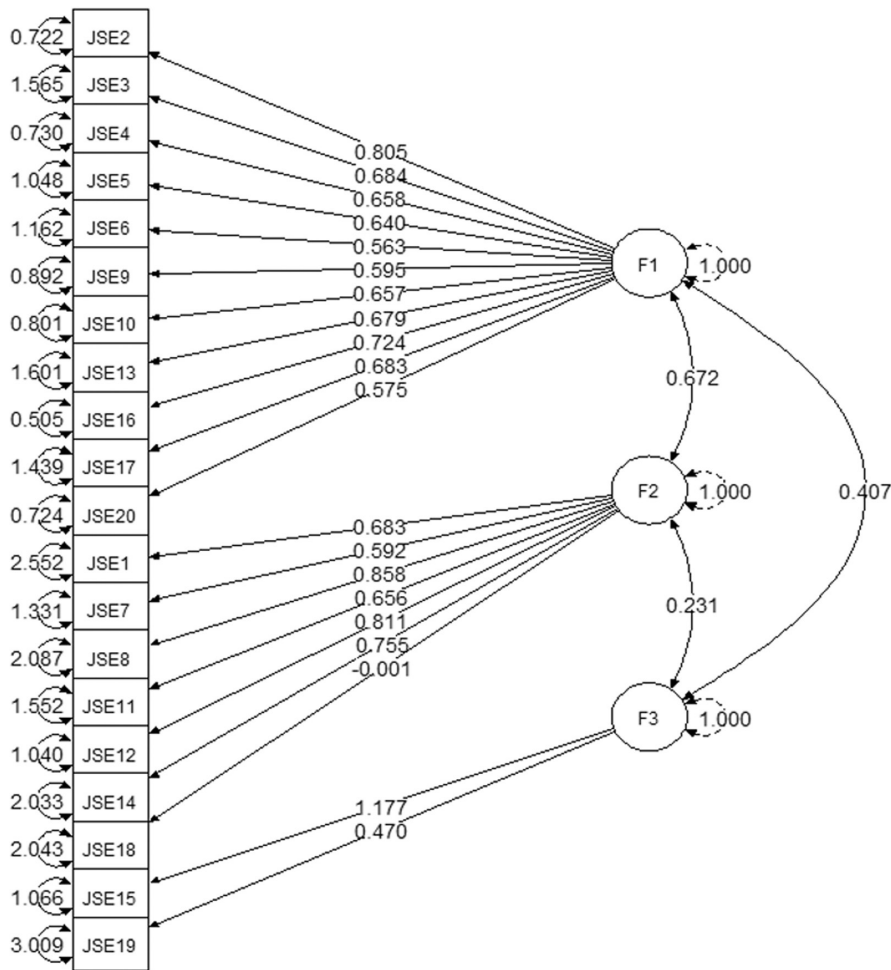
FIGURE 1 Confirmatory factor analysis: Three-factor model of the Jefferson Scale of Empathy.

4.2 | Validity

Exploratory factor analysis and CFA were carried out to explore the JSE's dimensionality, revealing a three-dimensional factorial structure ('Perspective taking'; 'Compassionate care'; 'Walking in the patient's shoes') being a good overall fit. Two factors ('Perspective taking' and 'Walking in the patient's shoes') are associated with cognitive domain of empathy, while one factor ('Compassionate care') is related to emotional domain of empathy.

The three-factor model identified in this study fails to replicate the original four-factor solution of the JSE when it was tested with medical students in the United States. The four factors were 'Viewing the world from the patient's perspective', 'Understanding the patient's experiences, feelings and clues', 'Ignoring emotions in patient care' and 'Thinking like the patient' (Hojat et al., 2001). However, we replicate the three-factor solution widely reported in later literature, although some differences were found between the number of items loaded for each factor. For example, three factors with acceptable factor load value were reported when the JSE was validated with nursing students in Chile (Castillo et al., 2021), Spain (Díaz Valentín et al., 2019), Italy (Montanari et al., 2015) and the United States (Ward et al., 2009).

In our model, the first factor, 'Perspective taking' comprised 11 items. Item 3, 'It is difficult for me to view things from my patients'

perspectives' and item 6, 'I have a good sense of humour that I think contributes to a better clinical outcome' included in this factor tend to be loaded in the 'Walking in their shoes' factor in other studies (Hojat et al., 2018; Montanari et al., 2015; Ward et al., 2009). The second factor, 'Compassionate care' included seven items. The items in this factor replicate what reported by Díaz Valentín et al. (2019) in their study of nursing students in Spain. The third factor, 'Walking in their shoes' included two items (JSE 15 and JSE 19). Item 19, 'I do not enjoy reading non-medical literature or the arts' was included in the same factor in the three-factor model reported by Díaz Valentín et al. (2019). However, item 15, 'Empathy is a therapeutic skill without which success in treatment is limited' has not often been included in this factor in previous studies. The third factor only contained two items, which was below the minimum requirement of three items suggested by Velicer and Fava (1998).

4.3 | Reliability

The findings indicate satisfactory reliability of the JSE, as demonstrated by internal consistency reliability using Cronbach alpha and item-total correlations.

The Cronbach's alpha coefficient for the SUM and for individual items was 0.80 or above, indicating a good level of internal

consistency (Streiner et al., 2014). The values are within the range of Cronbach's alpha coefficients reported in studies of nursing students in other countries/regions, such as in Chile (0.75) (Castillo et al., 2021), the United States (0.77) (Ward et al., 2009) and Taiwan (0.93) (Hsiao et al., 2013). The Cronbach's alpha coefficient for Factor 2 'Compassionate care' and Factor 3 'Walking in Their Shoes' was below the threshold of 0.7 being considered to be acceptable (Streiner et al., 2014) and lower than those reported by others in previous studies of nursing students (Castillo et al., 2021; Hsiao et al., 2013). These findings may reflect the factorial solution of our sample, and thus results obtained using those subscales should therefore be interpreted with caution.

The item-total correlation coefficients ranged from 0.01 (item 18) to 0.63 (item 16). These correlation coefficients are generally lower than those reported in other studies of nursing students. For example, the item-total correlation coefficients were 0.20–0.50 as reported by Castillo et al. (2021), and 0.52–0.72 as reported by Hsiao et al. (2013). Furthermore, the correlation coefficients for two items (item 18 and item 19) were below the threshold of 0.2, indicating that the items do not correlate well with the rest of the items and therefore may be dropped (Field, 2013). Further research is still required to explore item-total correlations of the JSE using a larger representative sample.

4.4 | Strengths and limitations

This is the first time that the JSE has been validated in a sample of nursing students in the UK. There are two main limitations. First, as the study was conducted in a single university, the generalisation of the results may be jeopardised. Further research needs to include a more diverse representative sample across the UK to confirm the validity and factorial structure of the JSE and to confirm whether the validity and reliability of the JSE found in this study would be repeated across nursing students in the UK. Additional research with UK nurses in practice are also recommended to explore whether the JSE would be a valid tool to assess their empathy, as previous studies have shown empathy of nurses may change with clinical practice and experience (Yi et al., 2021).

Second, our sample was mainly white and female. Evidence has shown that people from ethnic minority backgrounds tend to exhibit higher empathy than white people and that women are more empathetic than men mainly due to the caring role of women (Roberts et al., 2021; Sommerlad et al., 2021). The small number of male participants and ethnic minority participants recruited in this study makes it impossible to analyse any difference in empathy based on participants' gender and ethnicity. Furthermore, in a study of Australian and Chinese participants, Zhao et al. (2021) reported the effects of culture-sex interaction in empathy, highlighting the importance for future research to explore empathy in a purposive sample of both male and female nursing students from various ethnic groups.

5 | CONCLUSION

The JSE has shown good validity and reliability, which can be a useful measurement tool for measuring empathy in nursing students. Empathy is a concept central to patient–nurse relationships and quality of care with a positive impact on clinical outcomes. This demonstrate the importance of empathic skills of nurses and nursing students, while a psychometrically sound instrument will help evaluate the outcomes of nursing training to promote empathy. However, future research is still required to understand what constitutes empathy in participants of different genders and different ethnic groups and what factors contributes to its development, maintenance and improvement in education and practice.

AUTHOR CONTRIBUTIONS
Juping Yu: Contributions to concept and design; Data collection; Data analysis; Interpretation of data; Drafting the manuscript; Revising the manuscript; Final approval of the submitted version; Agreed to be accountable for all aspects of the work; Agreed on the order in which their names will be listed. **Siva Ganesh:** Data analysis; Interpretation of data; Revising the manuscript; Final approval of the submitted version; Agreed to be accountable for all aspects of the work; Agreed on the order in which their names will be listed. **Deborah Lancastle:** Contributions to concept and design; Data collection; Interpretation of data; Revising the manuscript; Final approval of the submitted version; Agreed to be accountable for all aspects of the work; Agreed on the order in which their names will be listed.

CONFLICT OF INTEREST STATEMENT
The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT
Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data are not available.

ETHICS STATEMENT
Ethics approval was granted by the Faculty of Life Sciences and Education Research Ethics Committee at the University of South Wales (reference number: 18JY0401LR).

STATISTICS

There is an expert statistician in the author team (Siva Ganesh, siva-ganesh1955@outlook.com).

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