Nurse Education in Practice 35 (2019) 14–20

Contents lists available at ScienceDirect

Nurse Education in Practice

journal homepage: www.elsevier.com/locate/nepr

Original research

Reliability and validity study of the Spanish adaptation of the "Creighton Simulation Evaluation Instrument (C-SEI)"

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ARTICLE INFO

Keywords:
Creighton simulation evaluation instrument
Home visit simulation
Student evaluation
Assessment
Evaluation
Instrument
Simulation

ABSTRACT

There are multiple advantages to using human patient simulation (HPS) as a teaching method for clinical nursing education. Valid, reliable tools that can be used when applying this teaching method are needed to evaluate nursing student skill acquisition.

The aim of this study was to translate the Creighton Simulation Evaluation Instrument (C-SEI) into Spanish and to analyse the reliability and validity of the Spanish C-SEI version with nursing students.

The study was conducted in two phases: (1) Adaptation of the instrument into Spanish. (2) Cross-sectional study in a sample of 249 nursing students who were evaluated by two observers. The psychometric properties were analysed in terms of reliability (internal consistency and inter-observer consistency) and construct validity using an exploratory factor analysis.

Questionnaire internal consistency was 0.839 for the tool as a whole. Inter-observer concordance for the tool as a whole was 0.936 and greater than 0.80 for the majority of the items. The exploratory factor analysis showed a four-factor structure that explains 49.5% of the total variance.

The results of this study show that the C-SEI-sp tool is a valid and reliable tool that is easy to apply in the monitoring of student performance in clinical simulation scenarios.

1. Introduction

Undergraduate nursing degrees are structured into a theoretical part and a substantial clinical practice component that is performed at healthcare institutions. This practical component has been increasing based on the recommendations of the European Higher Education Area (EHEA) and involves the student's entry into the professional world. There are multiple advantages to using human patient simulation (HPS)

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https://doi.org/10.1016/j.nepr.2018.12.007
Received 1 June 2018; Received in revised form 18 November 2018; Accepted 29 December 2018

as a teaching method for practical nursing education (Yuan et al., 2012). The use of HPS accelerates the student learning process and helps to raise its quality because a scenario can be repeated as many times as necessary. In Spain, the use of clinical simulation as a teaching method has become widespread. Furthermore, HPS is also used for skills competency testing. HPS makes it possible to practise complex procedures, and the skills learnt can be transferred to the real world. Likewise, the speed of instruction can be adapted to the student's needs. HPS provides a means for practising non-technical skills (Moule, 2011). It also increases patient safety by reducing nursing errors, as it enables the improvement of technical skills (Quesada et al., 2007; Meakim et al., 2013).

While HPS has been used in the field of anaesthesiology since the 1980s, this teaching method has been used in nursing departments for approximately 15 years (Nehring and Lashley, 2004). It was introduced mainly due to the shortage of clinical practice placements and to difficulties accessing specific patient populations. HPS also allows teachers to provide students with experiences encompassing the domains of affective, cognitive and psychomotor learning, which are skills required to practice nursing (Scheckel, 2009). Currently, the use of HPS is extremely realistic and it enables a high level of interaction with the student (Meakim et al., 2013; Jeffries, 2012).

Simulation centres at nursing schools provide students and professionals with the opportunity to attain competencies in procedures as well as skills and attitudes at no risk to patients. The competencies cover a combination of knowledge, attitudes and abilities that are essential in ensuring safety and quality of care (Meakim et al., 2013).

2. Background

In Spain, there are currently no validated rubrics available for evaluating nursing skills in clinical simulation scenarios. The use of competency evaluation rubrics during the simulation process is a very useful tool for evaluating nursing skills because the participant is experiencing situations that are similar to real life. To evaluate each of the competencies that participants must attain, evaluation tools must be comprehensive and able to evaluate cognitive, affective and psychomotor factors (Adamson et al., 2012).

Multiple tools have been developed to evaluate clinical simulation experiences. However, a review of the simulation tools available in the literature confirms that for most of them, there is no information on their reliability and validity (Kardong-Edgren et al., 2010; Román-Cereto et al., 2018) and more precise and advanced psychometric tests are required to achieve greater quality standards. Davis and Kimble (2011) reviewed six rubrics for evaluating nursing skills in simulation (Davis and Kimble, 2011).

In 2006, Clark (2006) developed the “Clinical Simulation Grading Rubric”, a tool for evaluating students' results during obstetric simulations through six categories: patient evaluation, collection of the patient's medical history, critical thinking, communication, healthcare education, and the collection of additional tests. Gannt (2010) subsequently conducted a validity study of Clark's rubric (2006) with 69 students. A panel of experts was established to analyse the reliability and validity of the content. The inter-rater reliability was 0.64–0.74.

Herm et al. (2007) developed the “Simulation Evaluation Rubric” tool in order to measure cognitive and psychomotor competencies through 8 categories. The categories they attempted to evaluate were safety, communication, physical evaluation, interventions, pain evaluation, administration of medication, critical thinking and decision making. Once the study ended, the authors reported consistency between the evaluators, although there are no data on reliability and validity. The “Lasater Clinical Jugment Rubric” (LCJR) (Lasater, 2007), was developed to assess the nurses' clinical judgement and decision-making abilities through simulation scenarios. The LCJR describes 11 clinical indicators from the four stages of Tanner's Clinical Judgement model (Tanner, 2006). Notice (observe, recognise deviations in expected patterns and look for information), interpret (prioritisation and interpretation of data), respond (basically whether they are calm and confident, whether they are communicating clearly, have planned properly and are capable) and reflect (determine the patient's response to the nursing care and tailor the interventions according to this evaluation). With regard to the reliability and validity of the LCJR tool (Adamson et al., 2011), the study reports very good inter-rater reliability. However, the other studies (Victor-Chmil and Larew, 2013) suggest there is a need to continue performing reliability and validity tests.

Furthermore, the LCJR has been translated to Spanish and validated (Román-Cereto et al., 2018), obtaining a high inter-observer reliability, with an intraclass correlation coefficient of 0.93 and a Cronbach's alpha also of 0.93.

In 2007, Radhakrishnan et al. (2007) developed a rubric called the “Clinical Simulation Evaluation Tool” (CSET) to evaluate the competencies of nursing students. 5 dimensions were created for the rubric: safety and communication, evaluation and critical thinking, diagnosis and critical thinking, interventions and critical thinking, and reflection and critical thinking. These categories cover cognitive and psychomotor learning. There is a study (Wolf et al., 2011) where the CSET was used to evaluate non-technical abilities, which published reliability and validity data with a reported ICC of 0.95.

In 2008, Gore et al. (2008) developed an evaluation tool for nursing students with 6 measurable, objective categories. The categories are safety and communication, evaluation, diagnosis, interventions, evaluation and reflection. No reliability and validity data has been found.

Todd et al. (2008) developed the Creighton Simulation Evaluation Instrument (C-SEI). The authors developed the tool based on the American Association of Colleges of Nursing (AACN) core competencies document published in 1998. These core competencies are very similar to those described by the National Agency for Quality Assessment and Accreditation of Spain (*Agencia Nacional de Evaluación de la Calidad y Acreditación*, ANECA, 2005) White Book prepared by Spanish universities in order to describe general and specific skills for undergraduate nursing students. The C-SEI quantitatively evaluates the performance of participants during a simulated scenario. It consists of 22 items grouped into four categories (assessment, communication, critical thinking and technical skills).

In the study conducted by Todd et al., the inter-rater reliability was analysed based on two professors who had received training on how to use the rubric. They evaluated all the simulation scenarios and then the agreement percentage between these two professors was calculated for each category.

The evaluation category had an average inter-rater agreement level of 84.4%, the communication category, 89.1%, the critical thinking category, 87.5%, and the clinical abilities category, 78.1%.

Adamson and her colleagues (Adamson et al., 2011) subsequently evaluated the reliability and internal consistency of the C-SEI through recorded simulation scenarios. The internal consistency calculated using Cronbach's alpha was 0.979. The inter-rater reliability was assessed using the intraclass correlation coefficient, which was 0.952. The study conducted in 2016 by Rivers (Rivers Livsey, 2016) used the C-SEI to evaluate nursing degree students during a simulated home visit. 48 scenarios were evaluated by two observers. The reliability of the tool was calculated using Cronbach's alpha, which was 0.776.

Although multiple tools have been developed, the problem in Spain is that few tools have been translated into Spanish. Furthermore, overall these tools across the world do not have strong psychometric data. For this reasons, this study aims to adapt the nursing skills evaluation tool the “Creighton Simulation Evaluation Instrument” (C-SEI) into Spanish and validate it for use in daily teaching practice in our environment.

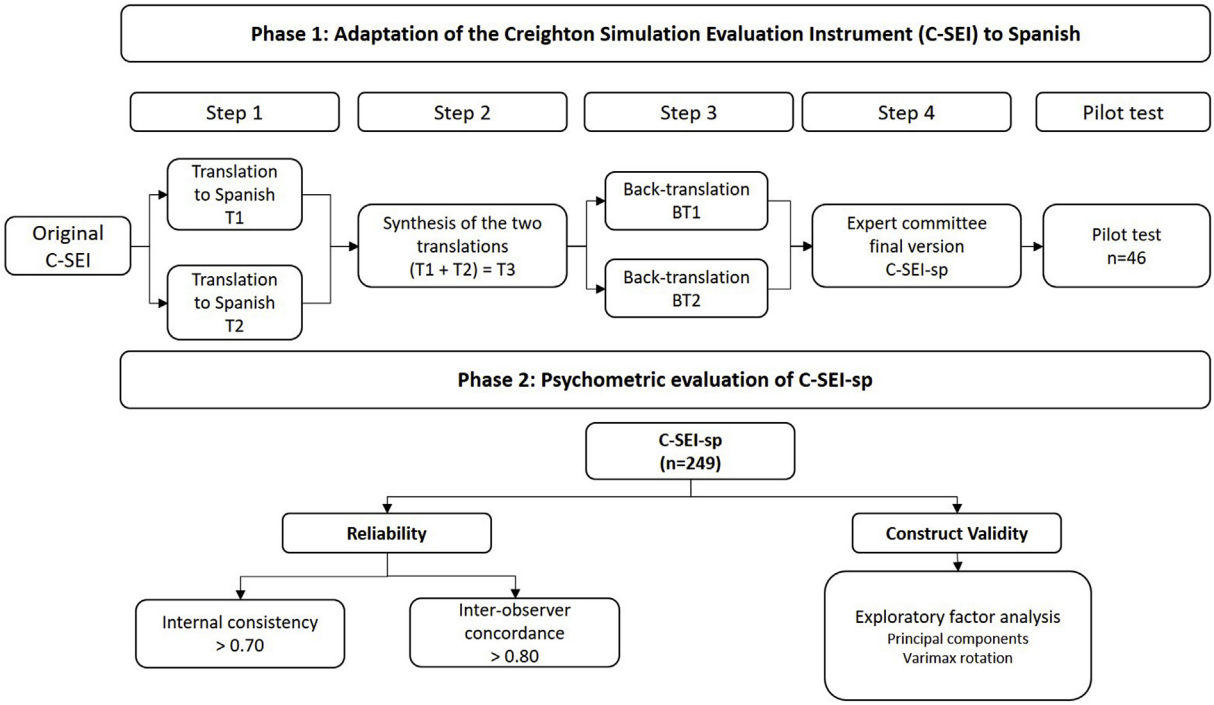

Fig. 1. General description of the two-phase tool validation study.

3. Aim

The aim of this study was to translate the Creighton Simulation Evaluation Instrument (C-SEI) into Spanish and to analyse the reliability and validity of the Spanish version of the C-SEI in undergraduate nursing students.

4. Methods

4.1. Design

The study was conducted in two phases: Adaptation of the *Creighton Simulation Evaluation Instrument (C-SEI)* into Spanish and Validation of the psychometric properties of the C-SEI.

4.1.1. Phase 1: adaptation of the Creighton Simulation Evaluation Instrument (C-SEI) into Spanish

This phase is shown in Fig. 1 and was performed in four stages, following different techniques in each phase in accordance with the recommendations of experts in the adaptation of questionnaires (Beaton et al., 2000; Wild et al., 2005). In the first stage, two bilingual nurses whose mother tongue is Spanish translated the tool from English into Spanish independently, each one creating a new version in Spanish. In the second stage, the two translations were synthesised to resolve any discrepancies between them. In the third stage, a back-translation was prepared by two bilingual nurses whose mother tongue is English. Each of them independently created a translation from the pre-definitive version of the instrument and these translations were compared with each other and with the original version. In the fourth stage, the expert committee created the definitive version based on the assessment of semantic equivalence (equivalent meaning of words, grammatical difficulties in the translation), idiomatic equivalence (colloquialisms, equivalent expressions in Spanish) and conceptual equivalence. This expert committee was composed of 6 teachers with more than five years clinical and teaching experience and two nurses specialising in psychometry.

Finally, a pilot test was performed on a sample of 46 nursing students, with the participation of two evaluators, in order to evaluate the ease of completing each item during the course of the simulation. The professionals who participated in this pilot test had previously been trained on the use of the tool with the audiovisual material provided by its original author (Dr Martha Todd).

The final Spanish-language version of the Creighton Simulation Evaluation Instrument (C-SEI) was named (C-SEI-sp).

4.1.2. Phase 2: validation of the psychometric properties of the C-SEI

Psychometric study of the reliability and validity of the Spanish version of the C-SEI-sp simulation skills evaluation tool in a sample of 249 undergraduate nursing students.

4.2. Participants and setting

The data were collected between January 2017 and June 2017 at the Campus Docent Sant Joan de Déu Fundació Privada [Sant Joan de Déu Private Foundation Teaching Campus], a centre affiliated with the Universidad de Barcelona [University of Barcelona].

Students who met the following criteria were included: (1) subjects of both sexes, (2) enrolled in any subject in which clinical simulation is performed, (3) who agreed to voluntarily participate in the study.

The recommendation of several authors that 5 to 20 participants should be included for each item included in the tool was applied for the calculation of sample size (Streiner and Norman, 2015; Tabachnick and Fidell, 2007). For this study, it was agreed that 10 nursing students would be included per item (n = 220). In the end, the study sample comprised 249 students.

4.3. Variables and source of information

All the observable competencies related to the C-SEI tool were recorded as variables. This tool comprises 22 dichotomous items divided into 4 different components (assessment, communication, critical creative, technical skills). The sum of the scores of all the items in each component provides us with an estimate of the student's level of competence in a simulation scenario. A higher score implies a higher skill level. Other sociodemographic variables were also collected, such as age, sex, academic course, whether the subject was working and

Table 1
Sociodemographic characteristics of the study population (n = 249).

Variables	n	%
Age	22.7 (SD 3.8)	
Sex		
Female	217	87.1
Male	32	12.9
Academic year		
Second	112	45.4
Third	69	27.7
Fourth	67	26.9
Currently employed		
Yes	119	47.8
No	130	52.2
Work experience in the healthcare sector (n = 119)		
Yes	52	43.7
No	67	56.3

whether they had work experience in the academic area.

All the participants completed a standardised simulation scenario that involved inserting a permanent urinary catheter in a post-operative patient and which lasted approximately 15 min. Later, a debriefing was performed using the plus/delta technique (Roussin and Weinstock, 2017), of 30 min of duration. The objective was to reflect on the simulated scenario and discuss what aspects could be improved in future occasions.

4.4. Statistical analysis

Data analyses were performed using SPSS for Windows 22 (SPSS Institute, Chicago, IL, USA). In order to analyse the reliability of the Spanish version of the tool, the C-SEI-sp, the internal consistency was calculated using Cronbach's alpha. Values are considered acceptable when they are between 0.7 and 0.9. Results below 0.7 indicate a poor correlation between the items, and results above 0.9 show a redundancy or duplication of the items (Cronbach, 1951). Inter-observer concordance was analysed using Cohen's kappa coefficient for each item in the tool. Two evaluators took part in this analysis. The values of this coefficient can range from −1 to +1. Values closest to +1 indicate a higher degree of inter-observer concordance (Landis and Koch, 2008; Sim and Wright, 2005). At the same time, the intraclass correlation coefficient (ICC) was calculated for the whole tool and for each of its components. The ICC synthesises the degree of concordance between two quantitative measurements (Argimon Pallás and Jiménez Villa, 2004), establishing a 95% confidence interval. Accepted ICC values range from 0 to 1. Values close to 1 indicate good concordance.

To analyse the construct validity, an exploratory factor analysis was performed using the principal components and varimax rotation method. The following sampling adequacy measurements were examined: Kaiser-Meyer-Olkin (Kaiser, 1974) and Bartlett's test of sphericity (Bartlett, 1950).

4.5. Ethical considerations

The study was approved by the Clinical Investigation Ethics Committee of the San Joan de Déu Foundation under code CEIC PIC-74-14. The participants were informed about the authorship and purpose of the investigation and were assured that all the data obtained would remain confidential. The permission of the authors of the original C-SEI tool was also obtained for the translation and adaptation to Spanish. A commitment to the good use of the rubric was signed in a written document.

5. Results

5.1. Phase 1

All the items were translated and back-translated with no significant difficulty. Nor was it necessary to modify the original format of the scale. To obtain the greatest possible degree of semantic, idiomatic and conceptual equivalence, the committee of experts decided to change only items 7 (“escribir” [write] to “registrar” [record]) and 14 (“realiza las intervenciones orientadas hacia los resultados” [perform interventions based on the results]” to “realiza intervenciones justificadas con los resultados” [perform interventions justified by the results]).

When the final, semantically-adapted version was available, the pilot test was performed on a sample of 46 nursing students, with the participation of two evaluators. Both concluded that the tool was easy to use and could be completed during the simulation scenario.

Furthermore, both evaluators positively assessed the prior training they had received for safe administration.

5.2. Phase 2

Psychometric properties were analysed in a sample of 249 students.

The sociodemographic characteristics of the nursing students are shown in Table 1.

The mean age of the nursing students was 22.7 (SD 3.8) and 87.1% were women. Approximately half of the students stated that they were working (47.8%), of which only 43.7% worked in the healthcare sector.

5.2.1. Internal consistency

Cronbach's alpha internal consistency coefficient for the whole scale was 0.839. For each component, values greater than 0.679 were obtained in two of the four components on the C-SEI-sp scale. Cronbach's alpha values were also calculated excluding each item or question on the scale. The exclusion of any of one the questions was not found to significantly improve the internal consistency of the scale (Table 2).

5.2.2. Inter-observer concordance

The degree of inter-observer concordance obtained through Cohen's kappa coefficient was greater than 0.80 in all the items on the scale, except for item 6 (kappa = 0.724), item 8 (kappa = 0.732) and item 17 (kappa = 0.656). The overall intraclass correlation coefficient for the instrument was also calculated, with this value being 0.936 (CI: 0.918–0.950) (Table 3).

5.2.3. Construct validity

The Kaiser-Meyer-Olkin (KMO) sampling adequacy measurement gave a value of 0.770, which indicates excellent adequacy for performing factor analysis (Hutcheson and Sofroniou, 1999). The anti-image correlation matrix also showed acceptable sample adequacy levels, with all values greater than or close to $r > 0.70$.

Bartlett's test of sphericity was very significant ($p < 0.001$). Therefore, there are correlations between the variables that can be analysed ($\chi 2 = 1924.112$; $gl = 231$; $p < 0.0001$).

Construct validity was determined based on an exploratory factor analysis using the principal components with the varimax rotation method to facilitate interpretation. The determinant of the correlations matrix was 0.001, which, being small, indicates that the degree of correlation between the variables is very high, an initial condition that the analysis of principal components must meet. In order to check whether the result is consistent with the four components defined in the original tool, the number of components to be extracted was four (Fig. 2). Table 4 shows that it is possible to explain 49.5% of the variance with four components.

The EFA shows that most of the items correlated with the components identified in the original version, except for five items that had greater correlation with other components. Specifically, item 8

Table 2
Internal consistency coefficient (Cronbach's alpha) for the C-SEI-sp instrument.

Item contents summarised		Cronbach's alpha		
		Total subscale	Total subscale without item	Total scale without item
Assessment		0.679		
Item 1	Obtains Pertinent Subjective Data		0.626	0.834
Item 2	Obtains Pertinent Objective Data		0.623	0.832
Item 3	Performs Follow-Up Assessments as Needed		0.578	0.826
Item 4	Assesses in a Systematic & Orderly Manner Using the Correct Technique		0.620	0.831
Communication		0.468		
Item 5	Communicates Effectively w/Providers (delegation, medical terms, SBAR, WRBO)		0.421	0.837
Item 6	Communicates Effectively with Patient and S. O. (verbal, nonverbal, teaching)		0.413	0.835
Item 7	Writes Documentation Clearly, Concisely, & Accurately		0.442	0.839
Item 8	Responds to Abnormal Findings Appropriately		0.370	0.822
Item 9	Promotes Realism/Professionalism		0.413	0.833
Critical thinking		0.789		
Item 10	Interprets Vital Signs (T, P, R, BP, Pain)		0.769	0.828
Item 11	Interprets Lab Results		0.813	0.838
Item 12	Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)		0.780	0.833
Item 13	Formulates Measurable Priority Outcomes		0.734	0.823
Item 14	Performs Outcome-Driven Interventions		0.743	0.827
Item 15	Provides Specific Rationale for Interventions		0.735	0.823
Item 16	Evaluates Interventions and Outcomes		0.730	0.822
Item 17	Reflects on Simulation Experience		0.797	0.837
Technical Skills		0.289		
Item 18	Uses Patient Identifiers		0.377	0.839
Item 19	Utilizes Standard Precautions Including Hand Washing		0.460	0.847
Item 20	Administers Medications Safely		0.152	0.835
Item 21	Manages Equipment, Tubes, & Drains Therapeutically		0.044	0.837
Item 22	Performs Procedures Correctly		0.037	0.838
Total C-SEI-sp		0.839		

Table 3
Inter-observer concordance for the C-SEI-sp.

Item		Kappa	CI (95.0%)
Assessment			
Item 1	Obtains Pertinent Subjective Data	0.804	0.687–0.922
Item 2	Obtains Pertinent Objective Data	0.875	0.776–0.973
Item 3	Performs Follow-Up Assessments as Needed	0.904	0.848–0.959
Item 4	Assesses in a Systematic & Orderly Manner Using the Correct Technique	0.831	0.762–0.900
Communication			
Item 5	Communicates Effectively w/Providers (delegation, medical terms, SBAR, WRBO)	0.879	0.818–0.940
Item 6	Communicates Effectively with Patient and S. O. (verbal, nonverbal, teaching)	0.724	0.629–0.818
Item 7	Writes Documentation Clearly, Concisely, & Accurately	0.815	0.705–0.926
Item 8	Responds to Abnormal Findings Appropriately	0.732	0.642–0.821
Item 9	Promotes Realism/Professionalism	0.836	0.732–0.940
Critical thinking			
Item 10	Interprets Vital Signs (T, P, R, BP, Pain)	0.848	0.756–0.939
Item 11	Interprets Lab Results	0.917	0.851–0.982
Item 12	Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0.849	0.781–0.918
Item 13	Formulates Measurable Priority Outcomes	0.877	0.817–0.937
Item 14	Performs Outcome-Driven Interventions	0.826	0.752–0.901
Item 15	Provides Specific Rationale for Interventions	0.847	0.781–0.912
Item 16	Evaluates Interventions and Outcomes	0.831	0.762–0.900
Item 17	Reflects on Simulation Experience	0.656	0.374–0.938
Technical Skills			
Item 18	Uses Patient Identifiers	0.966	0.932–0.999
Item 19	Utilizes Standard Precautions Including Hand Washing	0.951	0.913–0.989
Item 20	Administers Medications Safely	0.874	0.808–0.940
Item 21	Manages Equipment, Tubes, & Drains Therapeutically	0.820	0.735–0.904
Item 22	Performs Procedures Correctly	0.857	0.785–0.929
		ICC	**CI (95.0%)**
Total C-SEI-sp		0.936	0.918–0.950

CI: Confidence interval; **ICC:** Intraclass correlation coefficient.

(Responds to Abnormal Findings Appropriately) correlated with factor 3 (Critical thinking); item 9 (Promotes Realism/Professionalism) and item 11 (Interprets Lab Results) correlated with factor 4 (Technical skills); item 17 (Reflects on Simulation Experience) correlated with factor 1 (Assessment) and item 18 (Uses Patient Identifiers) correlated with factor 2 (Communication) (Table 4).

6. Discussion

The purpose of the study was to evaluate the psychometric properties of the Spanish version of the C-SEI-sp tool. This instrument consists of 22 items grouped into four categories (assessment, communication, critical thinking and technical skills). The C-SEI was designed to be used effectively with nursing students of different levels in any clinical simulation situation, following rater training and agreement upon item scoring. The results have shown that the psychometric properties are adequate in terms of internal consistency and temporary stability.

An important aspect to highlight is the sample size: 249 students from different academic courses participated in the study. This figure is greater than the one used in the other studies where the tool has been validated: 72 students in the original version (Todd et al., 2008) and 48 students in the study conducted by Rivers Livsey (2016). With regard to the reliability of the scale, the Cronbach's alpha for the tool overall was 0.839. This value is considered adequate (Nunnally and Bernstein, 1994) and is greater than the value obtained by Rivers Livsey (2016) of 0.776, although it is lower than that obtained by Adamson et al. (Adamson et al.) of 0.979. The inter-observer concordance was only analysed in some studies. The original validation study showed inter-observer concordance above 0.80 in each of the components. However, the inter-observer concordance was analysed exclusively using the concordance rate observed and the Kappa coefficient was not calculated. In our study, the intraclass correlation coefficient for the tool as a whole was 0.936, very similar to the value obtained in the study conducted by Adamson et al. (2011), which showed an intraclass correlation coefficient of 0.952.

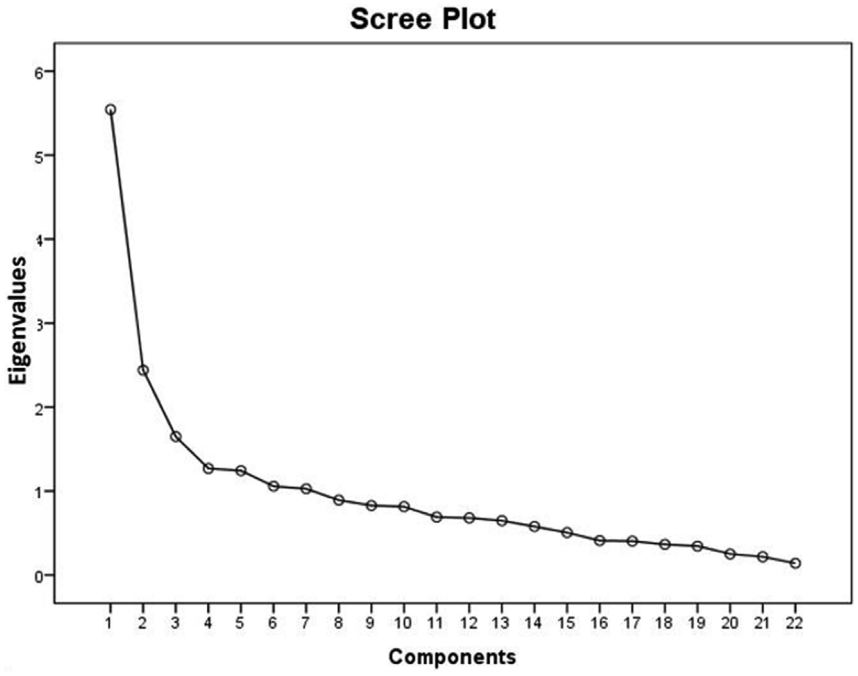

Fig. 2. Scree plot of the C-SEI-sp.

The kappa coefficient of each item was above 0.80 for all items, except for items 6 (Communicates Effectively with Patient and S. O.), item 8 (Responds to Abnormal Findings Appropriately) and item 17 (Reflects on Simulation Experience). As regards items 6, 8 and 17, it is more difficult to reach an agreement since they are subjective items and can be open to interpretation. However, it must be borne in mind that concordance was high.

In order for the tool to be used, it is important that the evaluators receive training in advance. This is consistent with the recommendations of the original author of the tool, Dr Martha Todd. However, this advanced training does not require much time and is easy to perform.

An exploratory factor analysis has not been performed in any previous validation study of the C-SEI tool. Only psychometric properties have been analysed in terms of reliability and content validity (Adamson et al., 2011; Rivers Livsey, 2016; Todd et al., 2008). In our study, the EFA shows that the majority of the items correspond to the dimensions identified in the original version, with the exception of five items. For this reason, future research should include a confirmatory factor analysis. This would enable us to check with the EFA whether the model proposed in the original version is sufficiently suited to the four

Table 4
Exploratory factor analysis of the C-SEI-sp, principal components with a varimax rotation structure matrix.

Items		Commonality	Factor 1	Factor 2	Factor 3	Factor 4
Assessment						
Item 1	Obtains Pertinent Subjective Data	0.603	0.647			
Item 2	Obtains Pertinent Objective Data	0.576	0.576			
Item 3	Performs Follow-Up Assessments as Needed	0.512	0.487			
Item 4	Assesses in a Systematic & Orderly Manner Using the Correct Technique	0.402	0.517			
Communication						
Item 5	Communicates Effectively w/Providers (delegation, medical terms, SBAR, WRBO)	0.293		0.395		
Item 6	Communicates Effectively with Patient and S. O. (verbal, nonverbal, teaching)	0.258		0.385		
Item 7	Writes Documentation Clearly, Concisely, & Accurately	0.378		0.518		
Item 8	Responds to Abnormal Findings Appropriately	0.573			0.692	
Item 9	Promotes Realism/Professionalism	0.376				0.480
Critical thinking						
Item 10	Interprets Vital Signs (T, P, R, BP, Pain)	0.525			0.455	
Item 11	Interprets Lab Results	0.552				0.728
Item 12	Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0.303			0.514	
Item 13	Formulates Measurable Priority Outcomes	0.655			0.794	
Item 14	Performs Outcome-Driven Interventions	0.567			0.712	
Item 15	Provides Specific Rationale for Interventions	0.640			0.775	
Item 16	Evaluates Interventions and Outcomes	0.696			0.825	
Item 17	Reflects on Simulation Experience	0.492	0.689			
Technical Skills						
Item 18	Uses Patient Identifiers	0.481		0.638		
Item 19	Utilizes Standard Precautions Including Hand Washing	0.374				0.420
Item 20	Administers Medications Safely	0.547				0.639
Item 21	Manages Equipment, Tubes, & Drains Therapeutically	0.505				0.682
Item 22	Performs Procedures Correctly	0.594				0.724
Percentage of variance explained			10.2	8.7	18.7	11.7
Total variance explained			**49.5**			

proposed factors.

7. Limitations

Our study has certain limitations. One limitation is that this study has been conducted in a private university environment and should therefore be applied in other university environments. Another limitation is that it should also be tested in other clinical simulation scenarios and even in real clinical scenarios to check whether the same results are actually produced with respect to the psychometric properties found in the Spanish version.

8. Conclusion

The results of this study show that the C-SEI-sp tool is a valid and reliable tool that is easy to apply in the monitoring of student performance in clinical simulation scenarios.

Future studies should examine the psychometric properties of this instrument in relation to other scenarios and in other educational settings.

Ethical considerations

The study was approved by the Clinical Investigation Ethics Committee of the San Joan de Déu Foundation. The participants were informed about the authorship and purpose of the investigation and were assured that all the data obtained would remain anonymous and confidential.

Conflicts of interest

The authors report no current or potential conflicts of interest.

Funding

This study was funded by the Col·legi Oficial Infermeria de Barcelona (Spain) PR 1923-14.

Acknowledgment

We would like to thank all of the nursing students who participated in the study.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.nepr.2018.12.007.

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