Research Article

Reliability and Validity of the Turkish Version of the Simulation Effectiveness Tool–Modified*

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Abstract

AIM: The Simulation Effectiveness Tool—Modified aimed to evaluate students' perceptions about the effectiveness of learning within a simulation environment, to implement Simulation Effectiveness Tool-Modified to adapt to the Turkish language, and test for its reliability, validity, and psychometric properties.

METHOD: This study was conducted in a methodological manner. The data were collected from 235 students who participated in the simulation-based learning experience in the Faculty of Nursing of 2 public universities in Istanbul between January and June 2019. In the data analysis, descriptive statistics, exploratory factor analysis with varimax rotation, confirmatory factor analysis, item-total correlation, test-retest correlation, interclass correlation, Pearson correlation, Cronbach's alpha coefficient, and ceiling-floor effect analysis were conducted.

RESULTS: Four factors stated that 62.2% of the total variance was a result of factor analysis. The item-total correlations of the Turkish version of the measurement tool ranged from r=0.47 to r=0.69. The total Cronbach's alpha coefficient of the tool was found to be 0.92. Test-retest correlations were found to be statistically significant for the total measurement tool and subscales. The measurement tool did not have ceiling-floor effects.

CONCLUSION: The Turkish version of the Simulation Effectiveness Tool-Modified is a reliable and valid measurement tool that can be used to evaluate perceptions on the effectiveness of learning within a simulation environment.

Keywords: Nursing students, patient simulation, reliability and validity

Introduction

Simulation is an education strategy that recreates similar circumstances that may occur in a real-life situation. Simulation may contain one or more simulation modalities to support, improve, or validate a participant's performance (International Nursing Association for Clinical Simulation and Learning, 2016a).

Clinical simulations that are designed with "Standards of Best Practice" provide a controlled learning environment that reflects various real-life patient situations (International Nursing Association for Clinical Simulation and Learning, 2016b).

Simulated learning environment is an ideal platform for students to learn decision-making and psychomotor skills, as well as for health care professionals to prepare safely and effectively for practice (Broussard, 2008; Jeffries, 2005).

It is indicated that the simulation-based education improves self-efficacy (Kim & Choi, 2011) and effective teamwork (Kim et al., 2011) and increases the understanding of the interpersonal relationships, as well as communication skills, cooperation skills among a healthcare team, and ability to manage challenging situations (Norman, 2012). Reflective steps of thought during a debriefing support com-

munication skills and confidence in an effective way in health sciences education (Weaver, 2011).

Studies regarding learning with clinical simulation for students majoring in health sciences have significantly increased in recent years. With the increasing implementation of this teaching strategy, measurement tools for results and processes of clinical simulation experiences have been developed. Yet, it is observed that these measurement tools have not undergone an extended reliability and validity study (Ha & Lim, 2018; Kirkpatrick et al., 2018; Nagelkerk et al., 2014; Wang et al., 2015). Especially in our country, tools that measure reliability and validity of clinical simulation studies are limited. Clinical simulation studies in nursing education and practice emphasize on the importance of reliable and valid measurement tools for meticulous measurement (Doolen et al., 2016; Rutherford-Hemming & Alfes, 2017).

Therefore, this study was conducted to adapt the Simulation Effectiveness Tool–Modified (SET-M), which evaluates the students' perception regarding the effectiveness of learning in a simulation environment, into the Turkish language and to evaluate its reliability and validity.

This measurement tool would provide a clinical simulation design to professionals who apply clinical simulations that are suitable for the targeted learning outcomes and to determine the participants' perception regarding learning in a simulation environment.

Study Question
Is the Simulation Effectiveness Tool - Modified valid and reliable for nursing students?

Method

Study Design
This study was conducted in a methodological manner.

Sample
The population of this study was made up of nursing students from 2 public universities located in Istanbul. In both faculties, there were low, medium, and high-fidelity clinical simulations regarding the learning outcomes of the relevant curriculum. While determining the sample size in reliability and validity studies, the number of people involved in the study should be 5-10 times more than the items (Burns & Grove, 1997; Esin, 2015). In light of this information, we aimed to reach 190 nursing students for 19 items of the measurement tool, and the study was conducted with 235 nursing students who participated in the simulation-based learning experience.

Data Collection Tools

Personal Information Form
A form was created by the researchers, which consisted of 6 questions about age, gender, work done in the clinic disregarding internships, working hours, class, and which clinical simulation course a student has attended.

Simulation Effectiveness Tool–Modified
This measurement tool was adapted from Leighton et al. in 2015, with the English modification of the SET-M developed by Elfrink-Cordi et al. in 2012. The measurement tool for the students' perception on the effectiveness of learning in a simulation environment was designed in accordance with a self-report. This measurement tool consisted of 19 items and had 4 subscales. The subscales of the measurement tool are as follows: prebriefing, learning, confidence, and debriefing. The prebriefing subscale consisted of 2 items, learning subscale consisted of 6 items, confidence subscale consisted of 6 items, and debriefing subscale consisted of 5 items. These subscales were 3-point Likert-type scales in which the items were scored from 1 to 3 (1 - do not agree, 2 - somewhat agree, and 3 - strongly agree). Cronbach's alpha coefficient of the measurement tool was 0.93; the Cronbach's alpha coefficients of the subscales were 0.83, 0.85, 0.91, and 0.90 for prebriefing, learning, confidence, and debriefing, respectively. There was no item that scored in reverse. Total score was obtained from the total of all the subscale scores (Elfrink-Cordi et al., 2012; Leighton et al., 2015).

Language Validity of the Tool
For the language validity of the SET-M, a measurement tool was translated from English to Turkish by researchers and 2 translation experts who had good knowledge of both the languages. Reverse translation was done by 2 different translation experts who had good knowledge of both the languages. Later, along with the researchers and translation experts, the Turkish and English items were reviewed, and final editing was conducted.

Content Validity of the Tool

SET-M in Turkish, with translation and reverse translations completed, was presented to 10 experts who were working on clinical simulation in nursing for content validity. In the analysis of experts' opinions, content validity index was used, in which the criteria were as follows: 1 - not relevant, 2 - somewhat relevant, 3 - quite relevant, 4 - highly relevant (Burns & Grove, 1997; Esin, 2015). According to experts' opinions, the content validity index of the items was 0.95.

The Turkish form of the measurement tool was revised following the experts' opinions, and a pilot study was executed with 10 nursing students who were not included in the sample size. The measurement tool was not edited after the pilot study.

Data Collection

The data were collected between January and June 2019 from 235 nursing students of 2 different public universities, who agreed to participate in the study and attend the clinical simulation. The measurement tool was applied for a second time to 195 students for a retest. Retest period was determined as 2 weeks (Esin, 2015).

Statistical Analysis

For the data analysis, a licensed Statistical Package for Social Sciences 21.0 (IBM SPSS Corp.; Armonk, NY, USA) package program was used. Results were evaluated with confidence interval of 95%, and the significance level was $p < 0.05$.

Descriptive statistics, varimax rotation with exploratory factor analysis (EFA), confirmatory factor analysis (CFA), item-total correlation, test-retest correlation, interclass correlation, Pearson correlation, Cronbach's alpha coefficient, and ceiling-floor effect analysis were used for data analysis.

Ethical Considerations

For the adaptation of SET-M into Turkish language and the evaluation of its reliability and validity, written permission was received from the original writer of the measurement tool. Permission was sought from the ethical board (14.11.2018/638) to conduct the study. For the institution permits, written permissions from both universities were received. The aim of the study and data collection processes were explained to the nursing students who participated in the study, and their verbal and written consents were obtained.

Results

Sample Characteristics

The average age of the participants was 20.83±1.17 years, and 87.2% (n=205) of them were women; 17.1% of the students (n=40) were first-year students, 27.2% (n=64) were sophomores, and 55.7% (n=131) were juniors. Of the participants, 29.8% (n=70) were students of Mental Health and Psychiatric Nursing, 27.2% (n=64) Internal Diseases Nursing, 26% (n=61) Pediatric Nursing, and 17% (n=40) Fundamentals of Nursing clinical simulation.

Validity Analysis of the Measurement Tool

To determine the validity of the measurement tool, factor structure validity was used. According to Kaiser-Meyer-Olkin (KMO) value and Barlett's test value (KMO=0.919; p<0.01), the sample size was identified as adequate. A KMO value under 0.50 indicates the sample size is not in its terminal level for validity analysis (Esin, 2015).

EFA results, which are conducted to determine the subscales of the measurement tools, showed that the measurement tool consisted of 4-factor construct, and this construct explained 62.2% of the total variance of the measurement tool. It was determined that EFA of this study explained the biggest part of the total variance with the first factor explaining 21.03%, the second factor 15.97%, the third factor 14.59%, and the fourth factor 10.60%. Factor correlations differed from 0.41–0.81; and for all the items, the reference value of EFA was found above 0.40 (Nunnally & Bernstein, 1994).

The 4 subscales that occurred as a result of the factor analysis were identified as first subscale being prebriefing, second - learning, third - confidence, and fourth - debriefing. There were;

- 1 and 2 items in the first subscale,
- 3, 4, 5, 6, and 7 items in the second subscale,
- 8, 9, 10, 11, 12, 13, and 14 items in the third subscale, and
- 15, 16, 17, 18, and 19 items in the fourth subscale.

Flow diagram regarding factor loading between relevant items and factors (subscales) obtained after factor analysis is shown in Figure 1.

In the process of testing, the construct that occurred as a result of EFA with CFA, relationship between

factors and relevant items of statistical value were being tested. Calculated factor loadings as a result of CFA are presented in Table 1.

To determine whether the factorial construct, which was obtained as a result of EFA, was confirmed or not and to find out at which level it should be adjusted are presented with results from the model and controlled fit index criteria are shown in Table 2.

Coefficients that showed the relationship between observable variables, which demonstrated the factorial construct of this measurement tool, and factors were examined, and it was determined that all the coefficients were at a sufficient level. When fit indices that were obtained from the analysis with CFA were evaluated, and fit indices that were calculated with CFA were taken into consideration, it was noted that the previous construct of the measurement tool was highly adjustable with collected data.

Reliability Analysis of the Measurement Tool
The reliability of the measurement tool, which consisted of 19 items in total, was evaluated by using the item-total correlation, test-retest correlation, interclass correlation, and Cronbach's alpha coefficient. It was identified that the item-total correlation of the Turkish version of the SET-M ranged between r=0.47 and r=0.69 (Table 3).

Table 1
Factor Loadings Obtained after Confirmatory Factor Analysis

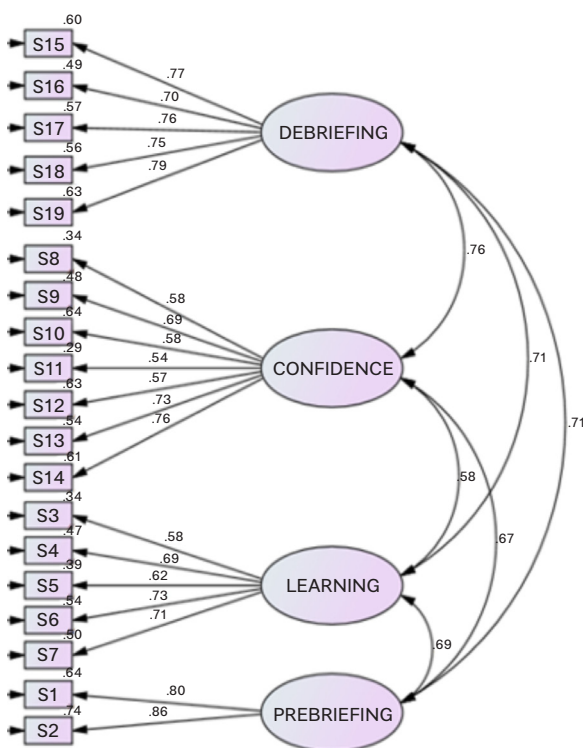| Items	Factor loadings
Factor 1: Prebriefing	
1. Prebriefing increased my confidence.	0.80
2. Prebriefing was beneficial to my learning.	0.86
Factor 2: Learning	
3. I am better prepared to respond to changes in my patient's condition.	0.57
4. I developed a better understanding of the pathophysiology.	0.68
5. I am more confident of my assessment skills.	0.62
6. I felt empowered to make clinical decisions.	0.73
7. I developed a better understanding of medications.	0.70
Factor 3: Confidence	
8. I had the opportunity to practice my clinical decision making skills.	0.58
9. I am more confident in my ability to prioritize care and interventions.	0.69
10. I am more confident in communicating with my patient.	0.58
11. I am more confident in my ability to teach patients about their illness and interventions.	0.54
12. I am more confident in my ability to report information to health care team.	0.57
13. I am more confident in providing interventions that foster patient safety.	0.73
14. I am more confident in using evidence-based practice to provide care.	0.77
Factor 4: Debriefing	
15. Debriefing contributed to my learning.	0.77
16. Debriefing allowed me to verbalize my feelings before focusing on the scenario.	0.70
17. Debriefing was valuable in helping me improve my clinical judgment.	0.75
18. Debriefing provided opportunities to self-reflect on my performance during simulation.	0.74
19. Debriefing was a constructive evaluation of the simulation.	0.79

Figure 1
Factor Loadings Between the Subscales and The Items of the Measurement Tool

Table 2

Fit Indexes Calculated as A Result of Confirmatory Factor Analysis of the Measurement Tool

Fit indexes	Good fit indexes	Acceptable fit indexes	CFA fit values
RMSEA	0<RMSEA<0.05	0.05<RMSEA<0.10	0.05
GFI	0.95<GFI<1	0.90<GFI<0.95	0.90
AGFI	0.90<AGFI<1	0.85<AGFI<0.90	0.85
CFI	0.95<CFI<1	0.90<CFI<0.95	0.95
χ^2/df	χ^2/df<3	3<χ^2/df<5	1.58

Note. RMSEA: Root mean square error of approximation, GFI: Goodness of fit index, AGFI: Adjusted goodness of fit index, CFI: Comparative fit index, χ^2/df: Chi-square/ degree of freedom

Table 3

Item-Total Correlations of the Measurement Tool (n=235)

Items	Item-total correlations
Item 1	0.60
Item 2	0.62
Item 3	0.47
Item 4	0.58
Item 5	0.53
Item 6	0.67
Item 7	0.65
Item 8	0.57
Item 9	0.65
Item 10	0.52
Item 11	0.50
Item 12	0.51
Item 13	0.66
Item 14	0.69
Item 15	0.64
Item 16	0.60
Item 17	0.65
Item 18	0.63
Item 19	0.63

The Cronbach's alpha value of the measurement tool is shown in Table 4. According to this, the measurement tool's total Cronbach's alpha value was determined as 0.92, and it was found that the measurement tool was extremely reliable. When the

Table 4

Cronbach's Alpha, Correlation, and Mean Scores for the Total Measurement Tool and Subscales

Subscales	Cronbach's alpha	Correlation of total measurement tool and subscales	Mean±SD (min–max)
Prebriefing	0.81	0.72	8.29±1.18 (5–10)
Learning	0.80	0.85	19.93±2.64 (13–25)
Confidence	0.83	0.90	28.39±3.30 (20–35)
Debriefing	0.86	0.84	21.05±2.56 (15–25)
Total measurement tool	0.92	–	77.56±8.25 (61–95)

Note. SD: Standard deviation

Cronbach's alpha internal consistency coefficient of the subscales was examined, the coefficients were detected as 0.81 for prebriefing, 0.80 for learning, 0.83 for confidence, and 0.86 for debriefing.

In addition, the total measurement tool and subscale item mean scores were evaluated. It was determined that the total item mean score of the measurement tool was 77.56±8.25, prebriefing subscale mean score was 8.29±1.18, learning subscale mean score was 19.93±2.64, confidence subscale mean score was 28.39±3.30, and debriefing subscale mean score was 21.05±2.56 (Table 4).

Stability reliability of the Turkish version of the SET-M was evaluated with the test-retest correlation and interclass correlation. It was determined that the test-retest correlations were positive, strong, and statistically significant for the total measurement tool (r=0.92) and the subscales (r=0.84–0.90; p<0.001). Interclass correlations were identified as 0.92 for total measurement tool, 0.90 for prebriefing subscale, 0.85 for learning subscale, 0.89 for confidence subscale, and 0.84 for debriefing subscale (p<0.001).

When the ceiling-floor effect analysis of the measurement tool was examined, it was discovered that 1 participant scored the lowest point in the measurement tool at 0.5%, and 7 participants scored the highest points at 3.6%. Because these findings were below the defined limits (5%–20%) it can be said that there is no ceiling-floor effect in the measurement tool (Alpar, 2018).

Discussion

Validity is the degree of measuring a variable or purpose for which it is prepared with the intention of measurement of a measurement tool. In order for a measuring tool to be valid, the first condition is reliability; however, reliability never guarantees its validity (Gözüm & Aksayan, 2003). Therefore, the validity of a measurement tool is evaluated with content validity and factor structure validity. The content validity of this measurement tool was identified as 0.95. This value shows that the content validity of the Turkish form of SET-M as a measurement tool is appropriate. The EFA results were similar to the original study; the measurement tool consisted of 4 factors, which explains the 62.2% total variance. In the original measurement tool study, the eighth item was loaded on as ("I had the opportunity to practice my clinical decision-making skills"). "Confidence" and "Learning" factors equally, and loadings were reasonable for both factors. Because the relevant item did not mention confidence, the original writers of the study decided to stream it with the "Learning" subscale. However, the result of the EFA of the eighth item was identified within the "Confidence" subscale. This situation suggests that this item is included within the "Confidence" subscale because it is answered by students regarding self-assessment of competence rather than the knowledge and skills gained from clinical simulation experience. Within this study, structures which were presented in accordance with EFA were identified and examined by first-order CFA. CFA aims "to detect to what extent a factorial model, which consists of the factors that occurred by many variables (latent variables), accord with real data." The model to be analyzed identifies structures that are fictionalized with a specific theory or based on the data of empirical study (Sümer, 2000). The CFA results obtained in this study show that the fit indices of the measurement tool were satisfactory.

Definition of reliability is, "a measurement tool that can give sensitive, consistent, and stable measurement results" (Gözüm & Aksayan, 2003; Esin, 2015). To evaluate the reliability of the measurement tool in this study, internal consistency and stability reliability were examined. Internal consistency was evaluated with item analysis and Cronbach's alpha coefficient. In the item reliability analysis, the correlation coefficient for each item was expected to be greater than 0.2. The total item correlation coefficient was between 0.47–0.69 which shows that the items were in the reliability level.

In the original study of the measurement tool, the Cronbach's alpha coefficient was determined as 0.93 for the total measurement tool (Leighton et al., 2015). In this study, Cronbach's alpha coefficient was determined as 0.92 for the total measurement tool. When the internal consistency coefficient of the subscales and the total measurement tool were examined, it was discovered that the Turkish version of the SET-M had high reliability (Esin, 2015).

Another method to evaluate the confidence of the measurement tool was to evaluate its stability reliability. In the original study of the measurement tool, stability reliability was not evaluated and for future researchers, the test-retest method was suggested (Leighton et al., 2015). Within our study, it was determined that the two-week test-retest correlations were positive, strong, and statistically significant for the total measurement tool (r=0.92) and subscales (r=0.84–0.90) (p<0.001). According to this, the stability reliability of the Turkish version of the SET-M was adequate.

In the first study that was developed by the measurement tool, the 5-point Likert scale was transformed into a 3-point Likert scale as there was no difference in terms of reliability, and it was mentioned that for the future studies, reliability may be examined at the 5-point Likert scale (Elfrink-Cordi et al., 2012). In the original study, results that were obtained from the participants focused on specific options, and measurement tools which were planned to be a 5-point Likert scale were transformed into a 3-point Likert scale and analyzed. In this study, it was deemed appropriate to use the 5-point Likert results because the responses of the participants varied.

At the same time, it was observed that in the original study, 8.3% of the participants did not fill in the seventh item ("I developed a better understanding of medications."). This situation was interpreted as a result of clinical simulation not including drug administration or participants feeling uncertain about this item as they did not respond even if the simulation included drug administration. Therefore, in the original study of the measurement tool, it was suggested that if the clinical simulation does not include drug administration, participants should blank the relevant item, and the item should be recorded into the

data set as "0" (Leighton et al., 2015). Similarly, the same procedure was followed because there was no drug administration in the clinical simulation experiences in which the first-year students participated. Taking into consideration that there might not always be drug administration in clinical simulation learning outcomes, if there was no drug administration in this study, it was suggested that participants not fill in the relevant item and the mentioned item be recorded into the data set as "0." The total points of the measurement tool were obtained by the total of all the subscale points, and achieving a high point meant that the student's perception regarding learning in a simulation environment was positive.

Conclusion and Recommendations

The results of this study demonstrate that the Turkish version of the SET-M is a reliable and valid measurement tool that can be used in clinical simulation in our country. Professionals who work in clinical simulation can use this measurement tool to evaluate the perception of students regarding the effectiveness of learning in a simulation environment.

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Appendix

Dear participant,
After completing a simulated clinical experience, please respond to the following statements by circling your response.

Subjects	Strongly Disagree	Somewhat Disagree	Undecided	Somewhat Agree	Strongly Agree
1.	Prebriefing increased my confidence.				
2.	Prebriefing was beneficial to my learning.				
3.	I am better prepared to respond to changes in my patient's condition.				
4.	I developed a better understanding of the pathophysiology.				
5.	I am more confident of my assessment skills.				
6.	I felt empowered to make clinical decisions.				
7.	I developed a better understanding of medications. (Leave blank if no medications in scenario)				
8.	I had the opportunity to practice my clinical decision making skills.				
9.	I am more confident in my ability to prioritize care and interventions.				
10.	I am more confident in communicating with my patient.				
11.	I am more confident in my ability to teach patients about their illness and interventions.				
12.	I am more confident in my ability to report information to health care team.				
13.	I am more confident in providing interventions that foster patient safety.				
14.	I am more confident in using evidence-based practice to provide care.				
15.	Debriefing contributed to my learning.				
16.	Debriefing allowed me to verbalize my feelings before focusing on the scenario.				
17.	Debriefing was valuable in helping me improve my clinical judgment.				
18.	Debriefing provided opportunities to self-reflect on my performance during simulation.				
19.	Debriefing was a constructive evaluation of the simulation.				

What else would you like to say about today's simulated clinical experience?