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DEVELOPMENT OF BASIC LIFE SUPPORT KNOWLEDGE LEVEL AND APPLICATION SKILLS ASSESSMENT FORMS: VALIDITY AND RELIABILITY STUDY

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ABSTRACT

Background: Basic Life Support (BLS) consists of a series of life-saving actions that improve survival after cardiac arrest. The most important factor that increases the chance of survival is early and correct intervention. Nurses constitute an important group among health personnel in increasing survival rate after cardiopulmonary arrest. **Purpose:** The aim of the study is to develop basic life support knowledge level and application skills assessment forms, and to investigate their validity and reliability. **Methods:** This is a methodological study. The population of the study consisted of 302 nursing students studying at Faculty of Nursing. "Content Validity Index (CGI)" and Kendall's W test were used for expert opinions. Kuder Richardson 20 coefficient was used for the reliability analysis of the forms. **Results:** The mean age of students participating in the study was 21.06 ± 1.20 years. 21.0% of the students were male and 79.0% were female. The content validity index of the basic life support knowledge level assessment form was above 0.90 and the expert opinions were significantly consistent with each other ($p = 0.001$). The content validity index of the basic life support application skills assessment form was found to be over 0.80 and the expert opinions were significantly consistent ($p = 0.029$). Kuder-Richardson 20 coefficient was over 0.80 and the forms was reliable (Kuder-Richardson 20 coefficient > 0.80). **Conclusions:** According to the results of the validity and reliability analyzes forms were found to be valid and reliable.

KEYWORDS: Basic life support; validity; reliability; public health.

INTRODUCTION

Basic Life Support (BLS) consists of a series of life-saving actions that improve survival after cardiac arrest (Birnbaum et al., 2005). The most important factor that increases the chance of survival is early and correct intervention (Sasson, Rogers, Dahl, & Kellermann, 2010).

The emergency medical dispatcher is an essential link in the chain of survival (Perkins et al., 2015). In addition to dispatching Emergency Medical Services (EMS) resources to medical emergencies, emergency medical dispatchers are increasingly being trained to recognize cardiac arrest, to assist bystanders in initiating resuscitation, and to support bystanders in optimizing resuscitation efforts (Travers et al., 2015; Soar et al., 2019).

Two studies involving 50 395 patients reported survival with favorable neurological outcome at time points from hospital discharge to 6 months after cardiac arrest (Takahashi et al., 2018; Olasveengen et al., 2019)

BLS training is a knowledge and skill training that all individuals, especially health personnel, should gain. The survival of human beings in an emergency depends on the correct and adequate application of BLS (American Heart Association, 2015). The number of people who have BLS training is low and people suffering from out-of-hospital cardiac arrest rarely have the chance to undergo cardiopulmonary resuscitation. Unused or rarely used BLS knowledge diminishes over time. BLS trainings should be designed to be easily remembered at the moment when they are used to save a life (Einspruch, Lynch, Aufderheide, Nichol, & Beckerd).

Nurses constitute an important group among health personnel in increasing survival rate after cardiopulmonary arrest. However, studies show that health personnel, nurses and nursing students in this

group are not sufficient in BLS applications (Türkan et al., 2007; Xanthos et al., 2012; Kara, Yurdakul, Erdogan, & Polat, 2016; Sangamesh, Vidya, Pathi, Singh, & 2017). The fact that BLS practices cannot be implemented permanently and effectively is an important problem all over the world. It is stated that BLS trainings cannot be effective unless they are periodically repeated (Sunal, 2013). In this respect, determining the current level of basic life support knowledge and application skills of health workers will help to determine the content of BLS trainings. The BLS steps that students have difficulty in performing should be identified and emphasized, and opportunities should be created for the students and they should be encouraged to practice more effectively and frequently.

The aim of the study is to develop basic life support knowledge level and application skills assessment forms, and to analyze their validity and reliability.

Methods Study Design
This is a methodological study. The study was carried out at Ege University Faculty of Nursing between 1 April 2017 and 14 June 2018. The population of the study consisted of second year nursing students (N = 302) studying in Ege University Faculty of Nursing in 2017-2018 academic year spring semester.

Data Collection Tools
Basic Life Support Knowledge Level Assessment Form: This is a 14-question form which was created after reviewing the literature in order to evaluate the knowledge level of participants on the basic life support theoretical education to be given by the researcher (Tintinalli, Stapczynski, Cline, Cydulka, Meckler, & 2012; American Heart Association, 2015; Özel, Akbuğa Özel, Özcan, & 2016).

Basic Life Support Application Skills Assessment Form: This is an assessment form containing 11 criteria developed by the researcher in order to evaluate the basic life support application skills of participants based on information in the 2015 American Heart Association (AHA) Guidelines, as well as the "*Adult Basic Life Support Algorithm*".

Statistical Analysis
Consultancy was taken from Ege University Biostatistics Department for data analysis. Statistical Package for Social Sciences (SPSS) version 25.0 was used for statistical analysis of the data obtained. In the validity analysis of the forms developed within the scope of the research, expert opinions were taken to evaluate the content validity and pilot application was performed. Content Validity Index (CVI) and Kendall's W test were used for expert opinions. Kuder Richardson 20 test was used for the reliability analysis. The legibility and comprehensibility of the forms were evaluated according to the Flesch formula.

Descriptive findings were expressed as percentage, mean, standard deviation and median when evaluating the study data.

Ethical Considerations
Ethical permission was obtained from Ege University Scientific Research and Publication Ethics (EGEBAYEK) Committee in order to conduct the research. The purpose of the study was explained to the participating students and written consent was obtained for their participation.

This study, TREND is written in accordance with the checklist of substances that should be included in the reports of observational studies.

RESULTS

Descriptive Characteristics of the Students
The socio-demographic characteristics of the students participating in the study are as follows. The mean age of all students was 21.06 ± 1.20 years. 73.0% of the students were in the 19-21 age group, 25.0% were in the 22-24 age group, and 2.02% were in the 25-27 age group. 21.0% of the students were male and 79.0% were female.

Validity and Reliability Analyses of Basic Life Support Knowledge Level and Application Skills Assessment Forms
As part of the validity analysis, expert opinions and Kendall's Coefficient of Concordance were examined within content validity. For expert opinions, *"Basic Life Support Knowledge Level Assessment Form"* and *"Basic Life Support Application Skills Assessment Form"* were sent to a total of 11 experts in nursing and emergency medicine education.

CVI was used to evaluate the content and scope validity of the forms. The CVI value was calculated as the ratio of the sum of all CVRs to the number of items. Questions/items with a CVI value below 0.80 were excluded from the evaluation form.

Statistical concordance between expert opinions was examined by calculating "Kendall's Coefficient of Concordance".

Validity and Reliability Analysis Results of Basic Life Support Knowledge Level Assessment Form
According to the expert opinions of the basic life support knowledge level assessment form, CVRs were calculated for each item and content validity index was calculated as 0.98.

Kendall's Coefficient of Concordance was calculated for expert opinions and content validity of the form was analyzed. Opinions of 11 experts regarding the applicability and comprehensibility of the questions in Basic Life Support Knowledge Level Assessment Form were found to be statistically consistent (n = 11,

Kendall's W = 0.145, Df = 69, p = 0.001).

Kuder-Richardson 20 coefficient was calculated for the internal consistency of the "Basic Life Support Knowledge Level Assessment Form". KR 20 coefficient was over 0.80 and the form was found to be reliable (Table 1).

Table 1: Kuder richardson 20 coefficient of the basic life support knowledge level assessment form.

Questions	Mean Form Score If There Is A Deleted Question	Form Variance If There Is A Deleted Question	Total Correction Corrected Questions of	Multiple Correlation Coefficient (R-Squared)	Kuder Richardson 20 Coefficient
Question 1	12.440	3.257	0.743	0.584	0.89
Question 2	12.440	3.257	0.743	0.812	0.89
Question 3	12.440	3.423	0.500	0.727	0.90
Question 4	12.440	3.423	0.500	0.594	0.90
Question 5	12.440	3.423	0.500	0.571	0.90
Question 6	12.440	3.257	0.743	0.507	0.89
Question 7	12.440	3.257	0.743	0.574	0.89
Question 8	12.440	3.423	0.500	0.648	0.90
Question 9	12.440	3.257	0.743	0.356	0.89
Question 10	12.440	3.257	0.743	0.646	0.89
Question 11	12.440	3.423	0.500	0.658	0.90
Question 12	12.480	3.423	0.322	0.631	0.91
Question 13	12.440	3.257	0.743	0.733	0.89
Question 14	12.440	3.257	0.743	0.736	0.89

The final version of the Basic Life Support Knowledge Level Assessment Form is given in Table 2.

Table 2: Basic life support knowledge level assessment form.

Basic Life Support Theoretical Training Evaluation Form	True	False
1. How is the consciousness of an adult patient evaluated?		
2. Where is pulse check performed in basic life support for adults?		
3. How do we tell if there is no respiration?		
4. What should be the maximum duration for evaluating respiration and circulation?		
5. Where is cardiac massage performed in basic life support in adults?		
6. What is the "compression/ventilation ratio" ratio in an adult patient who needs basic life support?		
7. At what rate should cardiac massage be performed in adult basic life support?		
8. What should be the compression depth for effective cardiac massage in adult basic life support?		
9. How do you keep the airway open in a patient with trauma?		
10. In adult basic life support, what should be the frequency of a rescue breath in a patient with pulse but not normal respiration?		
11. In which emergency situation should defibrillation (shock) be performed?		
12. What should be the frequency of pulse control "cycle/time" in basic life support?		
13. In a conscious patient with complete airway obstruction (who cannot breathe or speak), which of the following is performed first?		
14. If the patient is unconscious, breathing, and has pulse, which rescue position is assumed?		

Validity and Reliability Analysis Results of Basic Life Support Application Skills Assessment Form

According to the expert opinions of the basic life support knowledge level assessment form, CVRs were calculated for each item and content validity index was calculated as 1.00.

Kendall's Coefficient of Concordance was calculated for expert opinions and content validity of the form was analyzed. Opinions of 11 experts regarding the applicability and comprehensibility of the items in Basic Life Support Application Skills Assessment Form were found to be statistically consistent (n = 11, Kendall's W = 0.182, Df = 10, p = 0.029).

Kuder-Richardson 20 coefficient was calculated for the

internal consistency of the "Basic.

Life Support Application Skills Assessment Form". KR 20 coefficient was over 0.80 and the form was found to be reliable (Table 3).

Table 3: Kuder richardson 20 coefficient of basic life support application skills assessment form.

Criteria	Mean Form Score If There Is A Deleted Item	Form Variance If There Is A Deleted Item	Total Correction of Corrected Items	Multiple Correlation Coefficient (R-Squared)	Kuder Richardson 20 Coefficient
Item 1	9.60	2.00	0.530	0.912	0.88
Item 2	9.60	2.00	0.530	0.963	0.88
Item 3	9.60	1.91	0.692	0.876	0.87
Item 4	9.60	1.91	0.692	0.874	0.87
Item 5	9.60	2.00	0.530	0.469	0.88
Item 6	9.60	1.91	0.692	0.878	0.87
Item 7	9.60	2.00	0.530	0.852	0.88
Item 8	9.60	1.91	0.692	0.913	0.87
Item 9	9.60	2.00	0.530	0.341	0.88
Item 10	9.60	1.91	0.692	0.621	0.87
Item 11	9.60	1.91	0.692	0.536	0.87

The final version of the Adult Basic Life Support Application Training Evaluation Form is given below (Table 4).

Table 4: Adult basic life support application skills assessment form.

Adult Basic Life Support Application Training Evaluation Form (Single Rescuer)		Adequate	Inadequate
1	**Correct Hand Position** • Finding the location for heart compression (correct placement of the hand): placing two hands on the lower half of the sternum		
2	**Number of Compressions** • 100-120 rhythmic compressions per minute		
3	**Compression Depth** • Compression should be at least 5 cm (2 inches) and at most 6 cm (2.4 inches)		
4	**Decompression allowance percentage** • Allowing for enough decompression after compression		
5	**Number of ventilations** • 10-12 ventilations per minutes		
6	**Ventilation volume** • Must be 400-700 ml		
7	**Number of cycles (30 compressions/ 2 ventilations) every 2 minutes:** • Must be 5 cycles every 2 minutes		
8	**Fraction flow score (%)** • Below 60% is insufficient		
9	**Compression success rate** • Below 50% is insufficient		
10	**Ventilation success rate** • Below 50% is insufficient		
11	**CPR success rate** • Below 50% is insufficient		

DISCUSSION

The mean age of the students participating in the study was 21.06 ± 1.20 years. 21.0% of the students were male and 79.0% were female. The fact that the majority of the students participating in the research are female can be explained by gender orientations for the nursing profession in the past.

According to the expert opinions, CVRs were calculated for basic life support knowledge level assessment form and content validity index was calculated as 0.98. Similarly, CVRs were calculated for basic life support application skills assessment form and content validity index was calculated as 1.00. CVI value should be at least 0.80 (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003; Tavsancıl, 2014; Alpar, 2018; Karagöz, 2018). Thus, it can be said that the developed forms have content

validity (Karagöz, 2018; Ulutas, Akın, & Ayhan, 2016).

After obtaining the expert opinios, Kendall's Coefficient of Concordance was calculated and content validity of the forms was analyzed. Opinions of 11 experts regarding the applicability and comprehensibility of the questions in Basic Life Support Knowledge Level Assessment Form were found to be statistically consistent (n = 11, Kendall's W = 0.145, Df = 69, p = 0.001). Similarly, opinions of 11 experts regarding the applicability and comprehensibility of the items in Basic Life Support Application Skills Assessment Form were found to be statistically consistent (n = 11, Kendall's W = 0.182, Df = 10, p = 0.029).

In another study conducted by Tanya et al. to analyze the validity and reliability of forms evaluating novel cancer drugs, the forms were found to be valid (Kendall's W = 0.703, p = 0.006) (Tanya, 2017).

Kuder-Richardson 20 coefficient was calculated to analyze the internal consistency of the Basic Life Support Knowledge Level Assessment Form and Basic Life Support Application Skills Assessment Form (Table 2, Table 4). KR 20 coefficients of both forms were above 0.80 and both forms were found to be reliable. Similarly, in the literature, Phyllis et al. revised the Osteoporosis Knowledge Test (OKT) and evaluated its reliability and validity and found that the revised form was reliable (Kuder-Richardson-20 = 0.85) (Gendler, 2015).

In order to determine whether a scale/form is tima-invariant, the obtained correlation must be positive and strong, and the coefficient must be above 0.70 (15). A coefficient of $0.80 < \alpha < 1.00$ is interpreted as highly reliable (Karagöz, 2018; Ozdamar, 2018).

Authors Contribution
Detail of the each author's contribution in this paper is as under.

Types of contribution	**Name of the authors**
Contribution of Authors	***Contribution of Authors***
Research conception and design	TG,
Collection and/or assembly of data	TG, MA
Data analysis and interpretation	TG
Writing the article/ drafting of the article	TG, MA
Critical revision of the article	TG

TG conceived, designed and did statistical analysis & editing of manuscript. TG & MA did data collection and manuscript writing.

TG did review and final approval of manuscript.

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Availability of data: The datasets generated and/or analysed during the current study are available from [e.g. repository or corresponding author].

Human rights: The study was prepared in accordance with the universal declaration of human rights. The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institution's human research committee.

CONCLUSION

In the present study, validity analysis according to expert opinions and Kendall's coefficient of concordance revealed that "Basic Life Support Knowledge Level Assessment Form" was a valid form. According to the KR 20 coefficient calculation for internal consistency, "Basic Life Support Knowledge Level Assessment Form" was found to be reliable.

Similarly, validity analysis according to expert opinions and Kendall's coefficient of concordance revealed that "Basic Life Support Application Skills Assessment Form" was a valid form. According to the KR 20 coefficient calculation for internal consistency, "Basic Life Support Application Skills Assessment Form" was found to be reliable.

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