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Comparison of High Fidelity And Low-Fidelity Simulator Training Methods In Basıc Lıfe Support Educatıon: Randomized Controlled Study Training Methods in Basic Life Support

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ABSTRACT

Objective: Inthisstudyouraimwas to comparetheof HighFidelity (HF) simulatorsandLow-Fidelity (LF) simulators on BLS training.

Design: Thisstudywasdesigned as a randomizedcontrolledexperimentalresearch.

Setting: One-hundred 2nd year nursing students werer an domly allocatedintot wo groups to participate in either HF or LF simulated BLS courses.

Methods: Subjective (question naires) and objective (performance statistics) metrics were analysed. Socio-demo graphic characteri stics of each group wereid entified before the courses. Pre-courseand post-course question naires were conducted to evaluate their basic knowlede and application skills on BLS.

Results: Therewas not any statistically significant difference between theme an total scores of the HF and LF groupsfor BLS knowledge levels in pre- coursetests ($p = 0.474$). However, in the post course tests the mean total scores of HF group were significant lyhigherthan the LF group ($p = 0.018$). From BLS application skills point of view, we could not find any statistical difference between two groups in thepre- course tests; but in the post-course tests the mean total scores of the HF group were significantly higher than the LF group ($p < 0.001$).

Conclusions: We have determined that the education given with HF methods has a moderate effect on the knowledge level of BLS whileit hada highlevel of effect on theability to apply BLS skills.

KEYWORDS: Basic cardiac life support, simulationtraining, highfi delity training, low-fidelity training, teaching methods, public health nursing.

I. INTRODUCTİONAND BACKGROUND

BL Sconsists of basic applications that increase survival rates after cardiacar rest without druguse.Itcovers life-supporting first aid applications such as early recognition of sudden cardia carrest, immediate activation of emergency response system, early Cardiopulmonary Resuscitation (CPR) and early defibrillation with Automatic External Defibrillator (AED) (Berg et al., 2010; Özdinç et al., 2014). Cardiovascular diseasesare one of them most important causes of mortality in many countries today. In 2015, 31% (17.7 million) of all deaths world wide were caused by cardio vascular diseases; of these, 6.7 million weredue to my ocardialin farction. Mortality due to cardiovascular diseases is expected to reach 22.2 million in 2030 (WHO, 2014; Dural and Cıtlık Sarıtas, 2017).Half of the deaths due to coronaryartery diseases come out as a sudden circulatory and respiratory arrest. BLS application sare highly important in there establishment of

Circulation And Respiration which reduce mortality and morbidity rates when applied effectively. If BLS is initiated in the first four minutes of arrest, the probable survival rate is about 29%, however,

after fourm inutes this probability decreases to 7% (Karahan et al., 2005). Them ost important factor sinfluenc in the survivalrates in non-hospital cardiac arrest cases are: there sponse time of health care officerandthe BLS application sinitiated by witnesses at the scene (Hollenberg et al., 2007). A direct unfavorable impact on survivalrates has been detected when the response time of health officersor BLS applications by witnesses at the sceneexceeds four minutes (Salari, Mohammad nejad, Vanaki, & Ahmadi, 2010). BLS training is mainly learning informational data and acquiring skills for reanimation which allin dividuals, especially the healthcare officers need to achieve. Today, besides classical teaching

, new different training methods are also used in BLS education.Due to the world wide technical development of hardand software,real-like high technology tools are replacing classical teaching modalities.New HF simulators mimic realistic physiological responses,where the trainees communicate and interact with the mannequin and the effectiveness of theproceduralskills can be estimated by providing realistic feedback foreach trainer. On theotherhand, in theclassicalmethods, themannequin shave limitedFunctionsthatmeetonlyselectedrequirementsforpracticingskillsanders referred as low-fidelity (LF)simulators (Uyanık, 2013; Massoth et al., 2019). Currentlyineffective BLS applications is an important problem in allovertheworld. Particularly, in variousstudies, it is concludedthat BLS training bra not effective unless they are repeated periodically (Sunal, 2013).In The Study Conducted By Kara et al. (2015) fromTurkiye, in order to determinetheup-to-dateknowledgelevelof workingnurseson BLS (n:100), themearn points were found to be 4.85 (48.0%) ± 2.04 (min: 0.00; max: 11.00) whichwerequitelowerthanexpected. Theauthorshavespecifiedthattheseresultsaredue to lack of periodical post-graduate BLS trainings(Kara, Yurdakul, Erdoğan, & Polat, 2015). It is highlyimportantthatnurses, whohave a substantial role amonghealthcareofficials, achieve BLS knowledgeandapplicationskillsduringtheirschoolyears.
Innursingeducationtheobjectivesaremainly,ensuringthem to bringtheoryandpracticetogether, to thinkcriticallyand to acquireeffective problem-solvingskills (Göriş, Bilgi, & Korkut-Bayındır, 2014). One of themosteffectiveteachingmethodsforgainingtheseskills is interactivetrainingthatenablesthestudents to activelyparticipate in thelearningprocess. Thismethodincludes,smallgroupstudies, groupdiscussions, casestudies, brainstorming, demonstration, role play, problem basedlearningandsimulationapplications (Rauen, 2004). It is knownthatsimulation, contributestowardsthedevelopment of bothcognitive and psychomotorskillsbyenablingstudents to experience a clinical situation in a realistic learning milieu (Alkhalaileh, Al-Hadi-Hasan, & Al-Rawajfah, 2017; Gör, Nevin, Korkut-Bayındır, 2014; Perkins, 2007; Mıdık, & Kartal, 2010; Ramm, Thomson, & Jackson, 2015; Sendir, & Doğan, 2015; Oztürk, Göral, Uslu, & Yücel, 2017). It is knownthattherearеconsiderable gaps in theintegration of theori and practice in nursing education, andcurrentlychanging trainingmethodsareleading to closethesegaps. Thereview of theliterature on nursing educationsupportstheneedfornovelandeffectiveapproaches to prepare better nurses for clinical practice (Karahan et al., 2005; Kardong-Edgrena, Oermann, Odom-Maryona, & Ha, 2010; Gör et al., 2014; Yılmaz-Güven, & Karabulut, 2018). It is obvious that using the most effective teaching modality in BLS courses before graduation canbe life-saving.On theotherhandBLS traininggivenbeforeandaftergraduationwillstrengthentheinterest, motivation and practical skills of thetraineesthatthey can apply BLS in a timely and effective manner during their professional lives.

PurposeandAıms : In This Study Our Aim Was to comparethe HF and LF teaching methodsfor BLS training and detect if the outcomes are inaccordance with the literature supporting the of HF methods.

II. METHODS

DesignandSample : Thisstudywasdesigned as a randomized controlled experimental research and was carried out at Ege University, Faculty of Nursing Among Second Year Students Between 1 April 2017 and 14 June 2018,duringthe BLS training course.The students selected for the study were determined by poweranalysisout of 280 students, at 95% confidence level and 80% power, where at least 50 students were included in twogroups. Byusing simple random sampling method, 100 students were selected for the study. Then 50 students were distributed to the HF groupand 50 intothe LF groupbased on Permuted Block Randomizationmethodwith a

blockcount of 4. The Randomization Steps Were Performed Using The R 3.3.1 software (Kim, &Shin, 2014) (Figure 1).

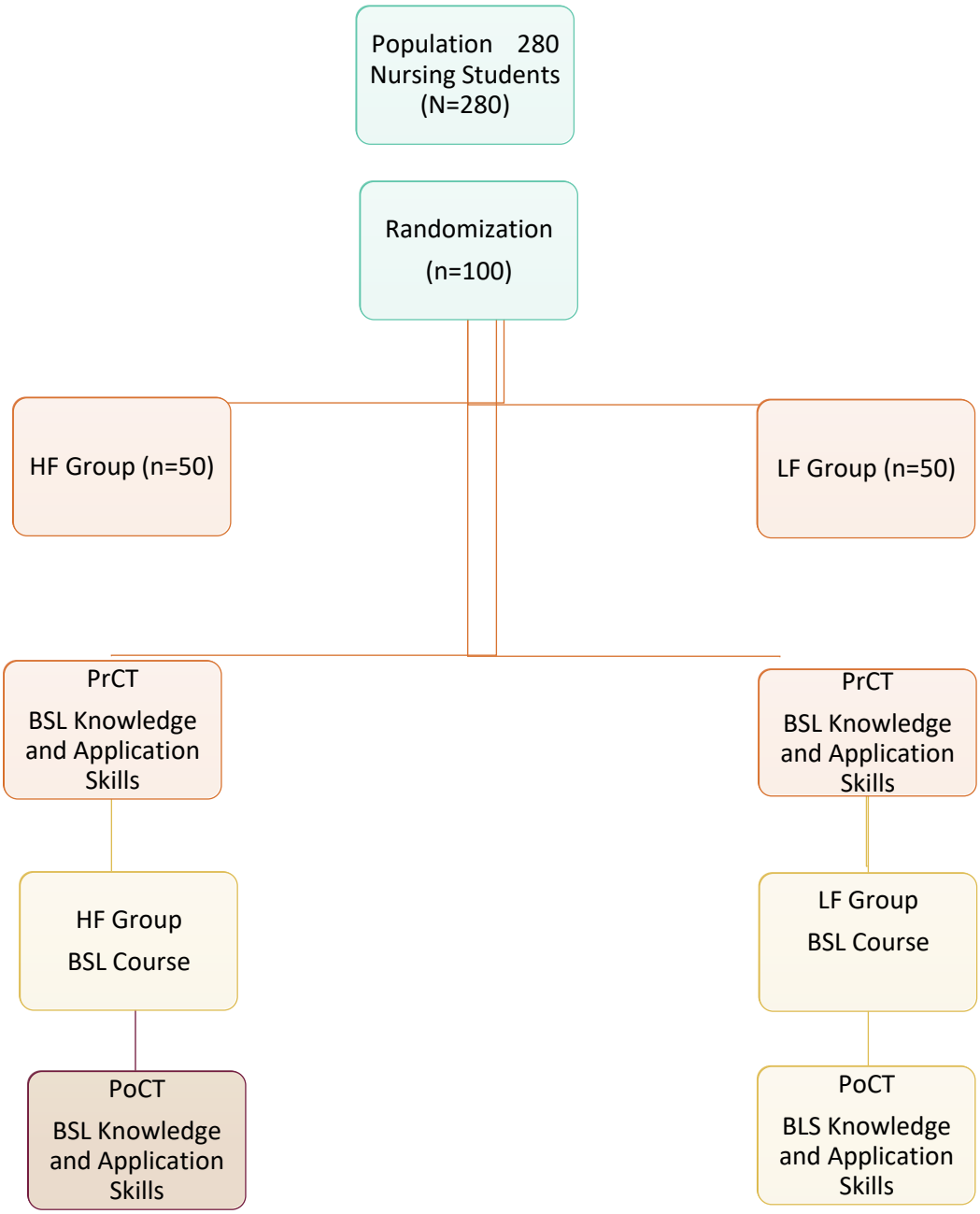


Figure 1. Research Design

III. DATA COLLECTİON TOOLS

Descriptive Information Form: This formconsisted of 9 questions on socio-demographic characteristics.

Self-Assessment Test (SAT): This test wasprepared to evaluate the theoretical knowledge level of theparticipants BLS before and after the courses for both groups. Itconsisted of 14 questions set by the researchers after reviewing the literature (Tintinalli, Stapczynski, Cline, Cydulka, &Meckler, 2012; AHA, 2015).

Basic Life Support Application Skills Evaluation Test (ASET): This test wasprepared on thebasis of "Adult Basic Life SupportAlgorithm" and "Summary of High QualityCardiopulmonaryResuscitation Components for Basic Life Support Providers" andmiscellaneousinformationwhichtookplace in 2015 AmericanHeartAssociation

(AHA)Guidelines. The form consisted of 11 criteriawhichevaluatedapplicationskills of theparticipantson BLS andwasgivenbeforeandafterthecourses to bothgroups (AHA, 2015; Ozel, Akbuğa-Ozel, &Ozcan, 2016).
SimulaidsCardiopulmonaryResuscitation Recorder SimulationMannequin*:*This HF mannequin has theability to givefeedback on thequality of BLS application. The Mentioned Simulation device has beenprefferedforitscapability of automaticallyrecordingthe BLS applicationsforeachparticipantsothattheresults can be objectively evaluated (Simulaids No. 4004 CPR RecordingManikin, 2014 New York). LeardalClassical Training Mannequin:This LF Leardal CPR Training Mannequin is a basicplastic adult half -size mannequin with accurate human anatomy that has beenused in BLS training for years. The LF group was trained with that standard simulator (Laerdal Medical GmbH Puchheim), which can display stimulated spontaneous breathing and presence of airway access.

EthicsandApproval : Ethical approval was obtained from the Scientific Research and Publication Ethics Board of Ege University (approvalnumber/id: 141-2017). This work was supported by the Scientific and Technological Research Council of Turkey (TUBITAK), grantnumber 217S208.

Statistical Analyses : Expert Opinion was taken to evaluatecontent validity of thetestsand a pilot applicationwasconducted. “Content Validity Index” (CGI) andKendall's W test wereusedforexpertopinions. Forthereliabilityanalysis of thetests, KuderRichardson 20 methodwasused. Readabilityandcomprehensibilitywereevaluatedaccording to Fleschformula.Descriptive Findingswere Expressed as percentage, mean, standard deviation and median. Shapiro-Wilk test wasused to checkthe normal distribution of pre- coursetests, post- coursetests, and total score averages of HF and LF groups. Pearson's Chi-square test was used to compare demographic variables and other qualitative data to checkforsimilarity of distributions in nominal variablesbetween HF and LF groups. IndependentSamples t-Test wasusedforcomparison of numerical data betweentwogroups. McNemar test wasused to comparethescoresobtained in thepre- coursetestsandpost-coursetestswithinthegroups, whilePearsonChi-square test wasused to comparethecorrectanswersandskillproficiencyscores. Varianceanalysis (RepeatedMeasures ANOVA) wasperformed to compare BLS knowledgelevelandapplicationskillscoresbeforeandafterthecoursesand to determineeffectiveness of training. Significancelevelwastaken as 0.05, and $p < 0.05$ wasconsidered to be statisticallysignificant.

Data Collection : Afterstudentswererandonly separated intotwogroups; HF group (n:50) and LF group (n:50), both groups were evaluated with SAT and ASET forms before and after the sessions. Inorder to increasetheobjectivity of the data obtained, ASET wereperformedwith “AdultCPR Recorder: SimulationMannequin”. Theresearchdesign is shown in Figure 1.

IV. RESULTS

DescriptiveCharacteristics of Students : The data related to thesocio-demographiccharacteristics of students in HF and LF groupsareshown in Table 1.

Table 1. Distribution of HF and LF traininggroupsstudentsaccording to sociodemographiccharacteristics

Sociodemographiccharacteristics		HF Group		LF Group		Total		Significance Test*
		n	%	n	%	N	%	X^2, p
Age	**19-21 years**	39	78.0	34	68.0	73	73.0	
	22-24 years	11	22.0	14	28.0	25	25.0	$X^2 = 2.702$
	25-27 years	0	0.0	2	4.0	2	2.0	p=.259
Gender	**Male**	10	20.0	11	22.0	21	21.0	
	Female	40	80.0	39	78.0	79	79.0	$X^2 = .060$ p=.806
Graduated High School	**Vocational School of Health**	1	2.0	2	4.0	3	3.0	
	Other High Schools	49	98.0	48	96.0	97	97.0	$X^2 = 1.010$ p=.315
EmploymentStatus	**Employed**	1	2.0	2	4.0	3	3.0	
	Unemployed	49	98.0	48	96.0	97	97.0	$X^2 = .344$ p=.558

Total	**50**	**100**	**50**	**100**	**100**	**100**

Note. "" χ2: PearsonChi-square test.*

Therewere not anystatisticallysignificantdifferencesbetweentwogroups in terms of age (X^2 = 2.702, p = .259), gender (X^2 = 2.702, p = .259), graduatedhighschools (X^2 = 1.010, p = .315) oremploymentstatus (X^2 = .344, p = .558) either.

TheOutcomes of BLS Knowledge Levelsand Application Skills oftheGroups:

BLS Knowledge Tests : Table 2 showsthecomparison of pre-course post-course test resultsand total averagescoresfor BLS knowledgelevelandapplicationskills of HF and LF groups. Itwasfoundthatthemean BLS knowledgelevel of students in the HF groupwas 7.60 ± 2.08points in thepre-course test, hichsignificantlyraisedto 12.68 ± 1.40afterthecourse. Inthe LF group, themean BLS knowledgelevelwas 7.90 ± 2.09 in thepre-course test, and it increased to 11.96 ± 1.57 in the post-coursetests. Therewas notanystatisticallysignificantdifferencebetweenthemean BLS knowledgelevel of the HF and LF groups in pre-coursetests(p = .474). However,themeanpoints of HF groupweresignificantlyhigherthanthe LFgroup in post-coursetests (p = .018).

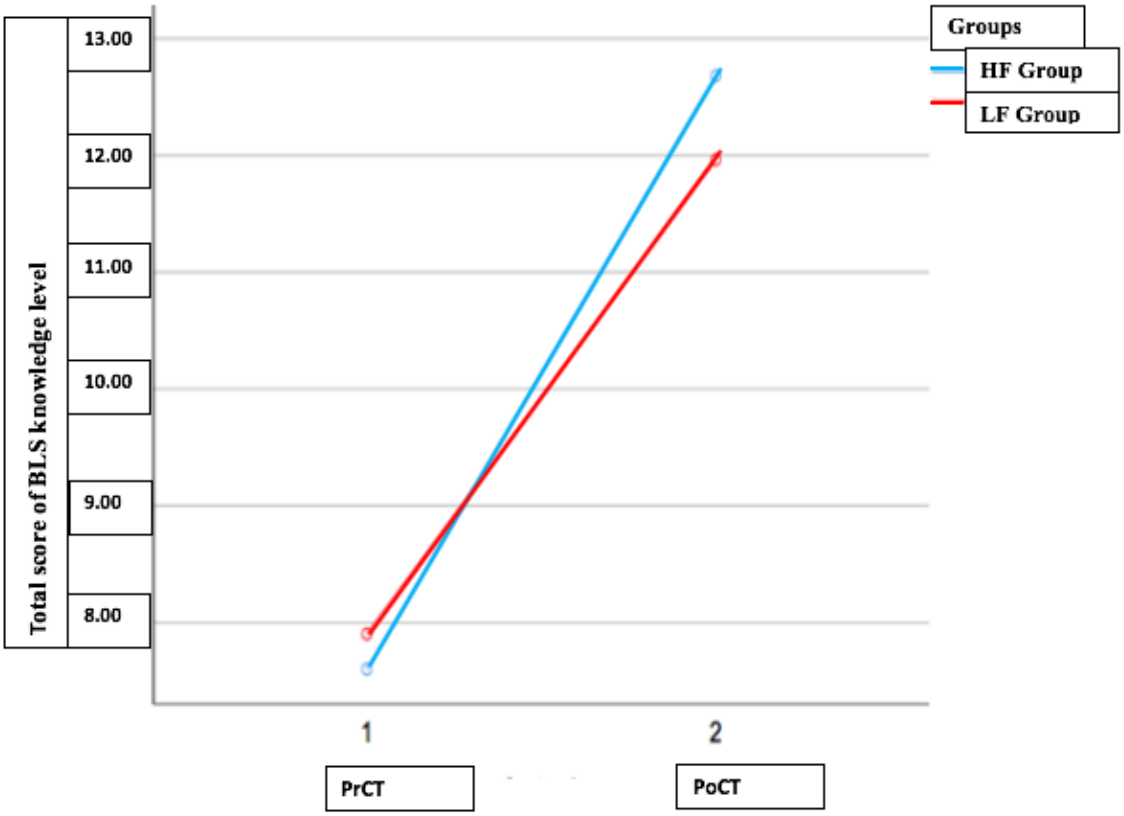
Table 2. Comparison of PrCTandPoCT total scoreaverages of BLS knowledgelevelandapplicationskillsbetween HF and LF traininggroups

BLS Knowledge Level and Applications Skills Total ScoreAverage	***Group***	***PrCT***			***PoCT***		
		Mean±SD	***F***	***t, p***	***Mean±SD***	***F***	***t*, p***
BLS Knowledge Level Total ScoreAverage	HF	7.60±2.08	.414	-.719 **p=.474**	12.68±1.40	1.315	2.409 **p=.018**
	LF	7.90±2.09			11.96±1.57		
BLS Application Skills Total ScoreAverage	HF	4.58±1.94	6.999	-1.479 **p=.142**	10.46±1.07	3.366	9.010 **p=.000**
	LF	5.08±.19			8.14±1.47		

Note. "" t: IndependentSamples Test*.

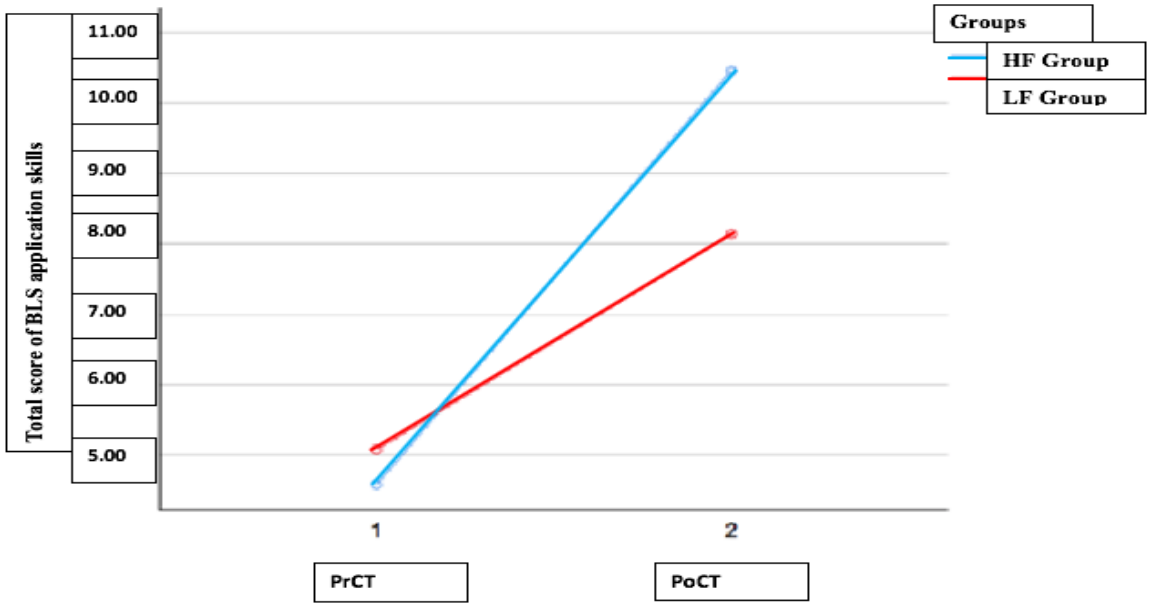
BLS Application Skills Evaluation Tests : For BLS applicationskills, thepre-coursemeanpoints of HF groupwas 4.58 ± 1.94 whichdid not significantlydifferfromthe LF group. However, aftertraining, it wasfoundout to be 10.46 ± 1.07 in the post-coursetests. Inthe LF group, meanpointswere 5.08 ± .19 in thepre-coursetestsand8.14 ± 1.47 in thepost-coursetests. Althoughanystatisticaldifferencecould not be foundbetweentwogroups in terms of BLS applicationskills in pre-coursetests(p = .142), in the post-coursetestsmeanpoints of the HF groupwerehighenough to showupthestatisticallysignificantdifference(p < .001).

TheEffects of HF and LF on BLS Knowledge Level : Itwasdeterminedthatthetrainingprovidedbythe HF method had a moderateeffect on BLS knowledgelevel (Effect Size: 0.058, P <.016). As a result,HFtrainigmethod is moreeffective on BLS knowledgelevelswhencomparedwithLF (Graph 1).



Graph 1. Theeffects of HF and LF trainingmethodson BLS knowledgelevel of students

TheEffects of HF and LF trainingmethods on BLS Application Skills : Itwasdeterminedthatthetrainingwithhightechnologytoolshad a strongeffect on BLS applicationskills (Effect Size: 0.315, P <.001). As a result, it can be mentionedthat, HFtrainingmethod is moreeffectivethan LFmethod (Graph 2).



Graph 2. Theeffects of HF and LF trainingmethods on BLS applicationskills of students.

V. DİSCUSSİON

Inthisexperimentalstudy, in order to compare HF and LFteachingmodalitiesforBLS training, wediscussedthe data underthelight of theliterature.Whenthesociodemographiccharacteristics of thestudentswereexamined, it wasfoundthatthemeanage ofallstudentswas 21.06 ± 1.20.The 20.0% of the HF groupwasmaleand 80.0% wasfemale; whereas 22.0% of the LF groupwasmaleand 78.0% wasfemale. Inthe HF group, 2.0% of thestudentsweregraduatedfromhealthvocationalhighschoolwhile in the LF group it was 4.0%, therewas not anystatisticaldifferencebetweenthetwogroups. Theunemploymentstatuswere 98.0% and 96.0% in HF and LF groupsrespectivelyandtherewas not anystatisticaldifferencebetweenthetwogroupseither.Wehaveconcludedthatbothgroupsweresimilar in terms of students' personalinformation (age, gender, graduatedhighschool, employmentstatus, firstaidcoursegrade) ($p > .05$) (Table 1). Similarly, in thestudybyTurkmen et al. (2009),wheretheywanted to findoutthesuccess, expectationandsatisfactionlevelof nursingandhealthvocationalstudentsattendingthe BLS course, themeanage of theparticipantswas 22.1±1.9 years, the5.6% of thestudentswerevocationalhighschoolgraduates, while94.4% weregraduatedfromotherhighschools, and 88.0% wereunemployed at the time of thestudy (Türkmen et al., 2009). Inanotherstudyconductedby Tuna et al. (2017) in order to determinetheknowledgelevelandpracticeskills of healthvocationalschoolstudentsreceiving BLS training, themeanage of studentswasnearlythesame 20.07±2.33 (Tuna et al., 2017). Furthermore, in thestudy of Yılmaz Güven and Karabulut (2018) fromTurkiye, 93.5% of thenurseswerefemaleand 6.7% weremale, 85-97% of thestudentsweregraduatedfromregularhighschoolsratherthanhealthvocationalhighschools, and 4-12% of thestudentswereemployed at the time of thestudy.

Thereforethe data aboutsociodemographiccharacteristicsof theparticipants in ourstudyshowedthatthegroups hadprovided optimal homogeneitythat isin accordancewiththeliterature. Thelowpercentage of malestudents in nursingschoolsmay be explainedas nursing has beenperceived as a woman'sprofessionuntilrecentyears. Thelownumber of healthvocationalhighschoolgraduatedstudentsmustprobably bebecause of theireasyemployments in thehealthsectorimmediatelyaftergraduation. Inourstudy, a statisticallysignificantdifferencewasfoundbetweenthemeanpoints ofknowledgelevelsandapplicationskilllevelsof HFand LF groups in thepost-coursetests($p<.001$) (Table 2). Based on thesefindings, it cameoutthat BLS knowledgelevelandapplicationskillscoreswerehigher in the HFgroup.Similarly, Kardong-Edgren et al. (2010) comparedperformance-basedmeasures of CPR skillsfromtwotypes of courses: a computer-basedcourse (HeartCode BLS) withvoiceadvisorymannequinand an instructor-ledtrainingwithtraditional mannequin. According to theresults of thisstudy, theuse of voice-advisoryHeartCode BLS mannequinwasmoreeffective in CPR training of nursing students which are supporting our research.Compatible With The Results of ourtrial, Alkhalaileh et al. (2017)studied with nursing students to compare the effectiveness of clinical simulation and instructional video training on knowledgeabout CPR;in pre-coursetestsbthe meanscores of the instructional video training group and thesimulationgroup were similar.In the post-course tests, the mean score of clinical simulation group wa ssignificantly higher than the video traininggroup.On theotherhand, theauthorsestablishedthattheknowledgelevelscore of theclinicalsimulationgroupwashigher in thepost coursetests($p = 0.006$). King et al (2011) studiedwithnursingstudents, to compare HF and LF teachingmethods,wheretheydeterminedthattheknowledgelevels of bothgroupsdid not differfromeachotheraftertrainingsessions. However,HF groupachievedsignificantlybetterresultswithrespect to performanceskills in post coursetests[26].

Similarly, Coolen et al. (2012),comparingtwogroups of fourth-yearmedicalstudents (HF $n = 15$, LF $n = 14$) could not findanydifferencebetweentheknowledgelevelsof HF and LF groupsaftertraining ($p = 0.48$).Conversely, theimprovedskillperformanceof HF groupwassignificantwhencomparedwith LF group in the post trainingtests ($p < 0.05$). Rodgers et al (2009) in theirstudyconcludedthatthetraininggivenbythesimulationmethods had a moderateeffect on BLS knowledgelevelsbuttheyobtainedsignificantlyhighskillperformancelevels in the HF groupcomparedwiththe LF group.As mentionedabove,despitevariousauthorsascertainedthesuperiority of hightechniqueteachingmethods to classical teaching systems,some of theresearcherscould not findanydifferencebetweenthetwomodalities.In 2009 Hoadley et al. conducted a studywithmiscellaneoushealthprofessionalswheretheycompared HF and LF teaching modalities for advanced cardiac life support education and they concluded thatHF methodsdid not made any significant difference on knowledge or skill proficiency levels when compared with LF methods. Finan et al (2012) studied with neonatal fellows for teaching neonatal resuscitation, to compareHF and LF teachingtools; aftertrainingthey could not find any difference between two groups on skill performance scores. Ki Min et al. (2016) compared an instructor-ledtrainingwitha voice-advisory mannequin training for resuscitation skill acquisition on 82 emergency medical

technician students in Korea.Theresults of thestudyindicatedthattherewas not anysignificantdifferencebetweentheperformancescales of thetwogroups.

VI. CONCLUSİONS

Inconclusion, the HF methodresulted in a moderate improvement in the BLS knowledge level stand a large improvement in the application skills of the students compared to the LF method.It was determined that the HFmethod is moreeff ective than the LF method on BLS training.Inorder to bringthe BLS knowledgelevelandpracticeskills of nursingstudents to thedesiredlevel, therequirementsfor BLS trainingshould be determined,thecoursesneed to be morefrequentandcarried to postgraduatelevel. Besidesthenecessity of theCPR courses to be updatedaccording to thelatestguidelinesandstandards, theupdatedknowledgemustbe announcedthroughseminarsandconferences.

ImplıcatıonsforFutureResearch: Thepresentstudyshould be repeated inDifferentgroupswithmanymore participants. Furtherresearch is required to explorethegeneralizability of scripted debriefing. Finally, satisfaction levels of students receiving simulation trainingandclassicaltraining need to be measured in a widerange in future studies.

StudyLimitatıons: For practical reasons, we limited the study only with the nursing students.Similar studies may be conducted with various students such as medical, paramedic,primary care providers etc. toobtainmorereliableresults. According to ouropinion, same type researches with the same modalities may be carried out with post garduate health care professionals also. In this study the number of the trainees was limited with 50 for each group, obviously more objective results may be achieved with larger groups. Another limitation for our research is the lack of follow up the students' knowledege levels and application skills persistance after the courses, which could be performed after 6 or 12 months.

Availability of data andmaterial: The data of thestudy can be shared.

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REFERENCES

1. Alkhalaileh, M., Al-Hadi-Hasan, A., & Al-Rawajfah, O., 2017. Evaluate the effectiveness of clinical simulation and ınstructional video training on the nursing students' knowledge about cardio-pulmonaryresus citation: comparative study, AmericanJournal of Educational Research, 5 (2), 172-178.AmericanHeartAssociation (AHA), 2015. Guide to cardiopulmonaryresuscitationandthescience of emergencycardiaccare. Chapter 5: Basic life support. Retrievedfromhttps://www.ahajournals.org/doi/10.1161/CIR.0000000000000259
2. Berg, R.A., Hemphill, R., Abella, B.S., Aufderheide, T.P., Cave, D.M., Hazinski, M.F., Lerner, E.B., Rea, T.D., Sayre, M.R., &Swor, R.A., 2010. Part 5: Adult basic life support: 2010 American hear tassociation guidelines for cardio pulmonary resusciation and emergency cardiovascular care. Circulation, 122 (18), 685-705.
3. Coolen, E.H.A.J., Draaisma, J.M.T., Hogeveen, M., Antonius, T.A.J., Lommen, C.M.L., &Loeffen, J.L., 2012. Effectiveness of high fidelity video-assisted real-time simulation: a comparison of three training methods for acutepediatricem ergencies. Int J Pediatr, 2012, 709569- 709583.Dural, G.,& Çıtlık Sarıtaş, S., 2017. Home-basededucationandquality of life in myocardialinfarction, Journal of CardiovascularNursing, 8 (17), 86-94.
4. Finan, E., Bismilla, Z., Whyte, H.E., Leblanc, V.,& Mc Namara, P.J., 2012. High-fidelity simulator technology may not be superior to tradition allow-fidelity equipment for neonatal resuscitation training.J Perinatol.32 (4), 287-92.
5. Gör, S., Nevin, B., Korkut-Bayındır, S., 2014. Use of Simulation in NursingEducation. DuzceUniversityJournal of theInstitute of HealthSciences, 4 (2), 25-29.
6. Göris, S., Bilgi, N., & Korkut-Bayındır, S., 2014. Theuse of simulation in nursingeducation, DuzceUniversityJournal of theInstitute of HealthSciences, 4 (2), 25-29.
7. Hoadley, T.A., 2009. Learning advancedcardiac life support: a comparisonstudy of theeffects of low- and high-fidelity simulation.NursEducPerspect.30 (2), 91-5.

8. Hollenberg, J., Bang, A., Lindqvist, J., Herlıtz, J., Nordlander, R.Sevensson, L., &Rosenqvist, M., 2007. Difference in survivalafterout-of-hospitalcardiacarrestbetweenthetwolargestcities in Sweden: a matter of time? Journal of InternalMedicine, 257 (3), 247-54.
9. Karahan, A., Cerit, B., Ak, B., Çıtak, N., Şahin, S., & Ayhan, F., 2005. Evaluation of knowledgeandskillslevels of nursingstudentsimmediatelyandthreemonthsafterbasic life supporteducation. TurkeyEmergencyMedicineJournal, 5(1), 22-27.
10. Kara, F., Yurdakul, A., Erdoğan, B., & Polat, E., 2015. Evaluation of Current Basic Life Support Information of NursesWorking in a StateHospital. Mehmet Akif Ersoy UniversityJournal of HealthSciencesInstitute, 3 (1), 17-26.
11. Kardong-Edgrena, S.E., Oermann, M.H., Odom-Maryona, T., & Ha, Y., 2010. Comparison of twoinstructionalmodalitiesfornursingstudent CPR skillacquisition. Resuscitation, 80, 1019–1024.
12. Ki-Min, M., Yeom, R.S., Ryu, J.H., Kim, Y.I., Park, Y.M., Han, S.K., Lee, S.H., Park, S.W., & Park, S.C., 2016. Comparisonbetween an instructor-ledcourseandtrainingusing a voiceadvisorymanikin in initialcardiopulmonaryresuscitationskillacquisition. ClinExpEmergMed, 3 (3),158-164.
13. Kim J., Shin W., 2014. How to do randomallocation (randomization). Clinics in orthopedicsurgery, 6 (1), 103-109, (R software, version 3.3.1, package: base, R Foundation for Statistical Computing, Vienna, Austria; http://r-project.org).
14. King, J.M.1., &Reising, D.L., 2011. Teachingadvancedcardiac life supportprotocols: theeffectiveness of staticversus high-fidelity simulation.NurseEduc., 36(2), 62-5.
15. Massoth, C., Röder, H., Ohlenburg, H., Hessler, M., Zarbock, A., Pöpping, D.M., &Wenk, M., 2019. High-fidelity is not superior to low-fidelitysimulation but leads to overconfidence in medicalstudents. BMC MedicalEducation, 19 (29), 2-8, https://link.springer.com/article/10.1186/s12909-019-1464-7
16. Mıdık, Ö., & Kartal, M. (2010). Simülasyona dayalı tıp eğitimi. Marmara MedicalJournal, 23(3), 389-99.
17. Ozdinç, Ş., Şensoy, N., Aktaş, R., Keskin, G., Tunç, D., & Tüfek, Y.E., 2014. To determinethelevel of knowledgeaboutbasic life support of Afyonkarahisar policevocationalschoolstudents. Kocatepe MedicalJournal, 15 (3), 246-50.
18. Ozel, G., Akbuğa-Ozel, B., &Ozcan, C., 2016. First andemergencyaidtechnicianparamedic; clinicalissues, professionalskills, operationalapplicationsbook. Ed. Ozel G., 1st Edition. Ankara: GünesMedicalBookstores.
19. Oztürk, D., Göral, A., Uslu, S., & Yücel, O., 2017. Theeffect of theeducation in theambulancesimulationlaboratory on thebasicskilllevel of thefirstandemergencystudents. Journal of HealthSciencesandProfessions, 4 (1), 25-31.
20. Perkins, G.D., 2007. Simulation in resuscitationtraining. Resuscitation, 73, 202-211.
21. Ramm, D., Thomson, A., & Jackson, A., 2015. Learning clinicalskills in thesimulationsuite: thelivedexperiences of studentnursesinvolved in peerteachingandpeerassessment. NurseEducToday, 35 (6), 823-7.
22. Rauen, CA., 2004. Simulation as a teachingstrategyfornursingeducationandorientation in cardiacsurgery. Critical CareNurse, 24(3), 46-51.
23. Rodgers, D.L., Securro, S.J., Pauley, R.D., 2009. TheEffect of High-Fidelity Simulation on EducationalOutcomes in an Advanced Cardiovascular Life Support Course.Simulation in Healthcare, 4 (4), 200-206.
24. Salari, A., Mohammadnejad, E., Vanaki, Z., &Ahmadi F., 2010. Survival rate andoutcomes of cardiopulmonaryresuscitation. IranianJournal of Critical CareNursing, 3 (2), 45-49.
25. Sendir, M., & Doğan, P., 2015. Use of simulation in nursingeducation: Systematicreview. FlorenceNightingaleNursingJournal, 23 (1), 49-56.
26. Sunal, N., 2013. The role of simulation in nursingeducation, Journal of HealthThoughtandMedicalCulture, 27, 20-21.
27. Tintinalli, J.E., Stapczynski, J.S., Cline, D.M., Cydulka, R.K., &Meckler, G.D., 2012. (TranslationEds. Çete, Y., Denisbaşı, A., Çevik, A.A., Oktay, C., & Atilla, R.). Tintinalliemergencymedicine is a comprehensivestudyguide. İstanbul: Nobel MedicalBookstores.
28. Turkmen, E., Işık, I., Balcı, S., Topçu, S.A., Abalı, S., & Karaçay, P., 2009. Achievement, ExpectationsandSatisfaction of Nursing / Health School Students in Basic Life Support Course. Journal of IntensiveCareNursing, 13 (2), 55-62.
29. Tuna, A., Celebi, I., Silahcılar, A., Sezgin, H., Sıpkın, S., Karatutlu, C., Sener, A., &Dedeköy, S., 2017. CardiopulmonaryResuscitation (Basic Life Support) EducationThe Knowledge andSkillLevels of Health School Students: Six-MonthFollow-upResults, Journal of Human andSocialStudiesResearch, 6 (3), 1842-1848.

30. Uyanık, A., 2013. Comparison of theeffects of video educationandtraditionaleducation on learningskills in thebasic life supportcourse. Master Thesıs. Institute of HealthSciences, Denizli, Turkey, http://hdl.handle.net/11499/445
31. World HealthOrganization (WHO), 2014. Global statusreport on noncommunicablediseases. pps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf
32. Yılmaz-Güven, D., & Karabulut, N., 2018. TheEffect of CardiopulmonaryResuscitation Training on Nurses' Knowledge Level. Journal of HealthSciencesandProfessions, 5 (2), 161-168.