

ORIGINAL ARTICLE

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Assessment of basic life support theoretical knowledge of football coaches after traditional and online education

¹Merve Yazla¹, ²Lukasz Szarpak², ³Abdullah Osman Kocak³,
⁴Murat Deveci⁴, ⁵Hakan Guner⁵, ⁶Evren Ekingen⁶, ⁷Burak Katipoglu¹

¹Ankara Etlik City Hospital, Department of Emergency, Ankara, Türkiye

²Maria Skłodowska-Curie Medical Academy, Warsaw, Poland

³Balıkesir Atatürk City Hospital, Department of Emergency, Balıkesir, Türkiye

⁴Ankara Etlik City Hospital, Department of Orthopedics and Traumatology, Ankara, Türkiye

⁵Ministry of Health General Directorate of Emergency Health Services, Ankara, Türkiye

⁶Antalya Provincial Health Directorate, Antalya, Türkiye

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Abstract

Athletes are at risk for cardiac arrest and arrhythmia due to high physical activity during intense training and matches. When such a situation occurs, it is crucial that those around the athlete are able to provide basic life support (BLS) to prevent death from out-of-hospital cardiac arrest. Therefore, in this study, football coaches were given both online and traditional face-to-face BLS training, and then it was aimed to investigate whether the training model affected the increase in BLS knowledge. The study was conducted between 21 April and 21 May. A pre-test measuring theoretical BLS knowledge was applied to 261 football coaches. Then the coaches chose voluntarily basis what type of BLS training (traditional or online) they would receive. After the training, the post-test was applied to the participants. The obtained results were evaluated and the score increases between the 2 groups were compared. The overall level of knowledge was significantly higher in both course models after education (64>86.5 for the Traditional group and 63.9>83.6 for the Online group). Results showed that the mean increase in post-test scores was higher in the traditional education group (22.5 points for the traditional group and 19.6 points for the online group, $p<0.001$). In conclusion, although traditional education seems to be more successful than online education in our study, there is no clear answer about the effectiveness of training models. Online BLS education may serve as an alternative to traditional education for groups that cannot participate in traditional education. Rather than choosing one over the other, an adaptive approach can be tailored to the needs of different groups.

Keywords: Basic life support, cardiopulmonary resuscitation, education, football coaches, online training, out-of-hospital cardiac arrest

Introduction

Cardiac arrest is an important public health problem, and the most important goal is to save lives and avoid negative outcomes. The survival rate of patients who receive immediate cardiopulmonary resuscitation (CPR) after out-of-hospital cardiac arrest (OHCA) is 2-4 times higher than that of those who receive CPR intervention later. However, only a small proportion of OHCA cases receive immediate CPR without wasting time after the arrest [1-4]. In order to prevent deaths from OHCA, it is important for bystanders, as well as healthcare professionals, to receive basic life support (BLS) training so that they can serve as

rescuers [1]. Emergency medical service 112 command control center, trained lay rescuers and the use of automatic external defibrillators (AED) are other important components that increase the chance of survival in OHCA. Defibrillation applied within the first 3-5 minutes of collapse maintains the survival rate at high levels, such as 49-75% [5,6].

The International Liaison Committee on Resuscitation (ILCOR) argues that BLS education is one of the three factors that will affect survival, along with the efficacy of treatment guidelines and a well-functioning local survival chain in cardiac arrest situations [7,8]. Educating high-quality CPR to the maximum

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Corresponding Author: Merve Yazla, Ankara Etlik City Hospital, Department of Emergency, Ankara, Türkiye
Email: merveyazla@gmail.com

number of people in a community with efficient training methods can increase the odds of performing CPR and the quality of CPR. Thus survival of cardiac arrest increases [9]. Therefore, it has long been advocated to target people most likely to be at the scene as lay responder to provide CPR training [10].

Athletes are at risk of heart attack and arrhythmia due to high physical activity during intense training and matches. Sudden cardiac death in athletes has an estimated incidence of 1 in 500 to 1 in 80,000 athletes per year. The common perception is that athletes represent the model of the healthy human being, so the sudden cardiac death of an athlete can evoke deep emotions and disbelief. For this reason, sudden athlete deaths are important because they affect not only the sports community but also the general society [11,12]. In our study, we chose coaches who were in close contact with the athletes.

The AHA 2020 guidelines emphasized the important impact of education on the outcome of cardiac arrest and highlighted new and updated recommendations. Some of these recommendations include self-training, alone or combined with instructor-led training, to improve lay rescuers' willingness and ability to perform CPR [2]. In our study, we aimed to compare instructor-led training with alone online training.

Traditional BLS courses are organized in a face-to-face classroom environment under instructor leadership and in accordance with the guidelines of the latest literature. But online learning methods have started to be implemented with the COVID-19 pandemic. Today, online BLS training is used alongside or instead of traditional methods. However, the effects of providing only online education on BLS are not yet fully known. This study aimed to evaluate and compare the effectiveness of BLS training using online or traditional methods for football coaches who are likely to be near at-risk football players.

Material and Methods

The study was conducted between 21 April and 21 May. The study was approved by the Ethics Committee of the Balıkesir Atatürk City Hospital (E-30041352-514.19.99-213992246) and conducted in accordance with the guidelines of the Declaration of Helsinki. Written informed consent was obtained from all football coaches before enrollment into the study. Before answering the questions, each coach provided informed consent (under the scope of Personal Data Protection Authority).

Our study was conducted in four stages

In the first stage, the coaches were divided into two groups according to their preferences for the type of training model (Group 1: those who chose face-to-face training; Group 2: those who chose online training).

1. Participants chose one of the two training groups on a voluntary basis.
2. In the second stage, a pre-test was conducted to measure

the knowledge of all coaches about BLS and AED (in both Group 1 and Group 2).

3. In the third stage, BLS and AED courses were given to the coaches. Group 1 received traditional face-to-face training (which all participants in Group 1 attended at the same time in a classroom setting), while Group 2 watched the lessons online for seven days from any device with internet access.
4. In the fourth stage, immediately after the course, the same post-test was repeated for both groups.

Description of courses, instructors and exams

The course was designed for professional soccer coaches. It was organized by a team of instructors who are authorized to provide the BLS training that is required for the Union of European Football Associations coaching licences. The traditional face-to-face course lasted 14 hours. All participants in Group 1 received the training in a multicenter classroom setting. Group 2 completed the course by accessing the recorded videos for 7 days. Participants in the online course had the flexibility to complete the training at home, at work, or in any location with internet access. During the viewing process, an alert appeared on the screen every 5 minutes, and participants had to click on it within 10 seconds. Failure to clicking that alert resulted in the cancellation of the viewing, and the video had to be restarted from the beginning. Similarly, if the video was fast-forwarded, the course was considered incomplete, and the participant had to start over. The videos could not be sped up.

Like AHA's BLS course, this course trained participants to immediately recognize various life-threatening emergencies, perform high-quality chest compressions, provide appropriate ventilation, and use an early AED.

What did this course teach?

- High-quality CPR for adults, children, and infants,
- AHA Chain of Survival, particularly BLS components,
- Early use of an AED,
- Effective ventilation using a barrier,
- The importance of teams in multiple rescuer resuscitation and effective team member performance during multiple rescuer CPR,
- Removal of foreign body airway obstruction (choking) for adults and infants,
- Approach to life-threatening trauma (especially head and spinal trauma).

Three emergency medicine specialists on the instructional team provided a theoretical lesson to coaches on the principles of BLS and AED in accordance with the AHA 2020 guidelines. For both in-person face-to-face training and online training, the same instructors taught the lesson. To ensure standardization, the same

instructors delivered the same lesson with the same slides for both traditional and online training.

The exams were also conducted by the same team. The exam questions were in line with AHA and BLS guidelines. The exam consisted of 40 questions, with each question having four options and participants being able to get a maximum of 100 points. The order of the exam questions and choices was applied differently for each participant. But the evaluation was based on a question-by-question basis. The exam was only allowed to be taken on a computer and in front of a camera. During the process of solving the questions, the participant's camera was open and monitored to prevent cheating. Only one session was allowed per participant. A participant could only have one session at the same time, and the system did not allow multiple sessions to be opened at the same time. If someone tried to access the system from another location with the same username and password, the system would automatically log them out. When the exam system was opened, access to the participant's computer was provided to check whether any other sites were opened or if any cheating was attempted. With the open camera, eye tracking was done to provide information on where the participant looked on the screen for how long and how many times, and their current and past levels of attention, their intention, and mental state. The test was recorded with the camera during the test period.

Sample

The minimum sample size was calculated using the G*Power® software (v.3.1.9.4). Based on the estimated effect size (d) of 0.5, $\alpha=0.05$, and power of 0.95, the minimum sample size per group was 54 individuals. The sample in the entire study consisted of 261 volunteer football coaches who participated in traditional or online BLS training during a predetermined period of time. These individuals had not received any BLS training in the past two years and were free to choose which model of BLS training to receive.

Inclusion criteria

1. Being a professional football coach,
2. Football coaches who consented to participate in the study,
3. Football coaches who completed the traditional or online BLS training during the predetermined period of time and participated in all tests,
4. Over 18 years.

Exclusion criteria

1. Not being a professional football coach,
2. Football coaches who did not consent to participate in the study,
3. Football coaches who did not complete the traditional or online BLS training during the predetermined period of time or did not participate in any of the tests.

The study design is shown in Figure 1.

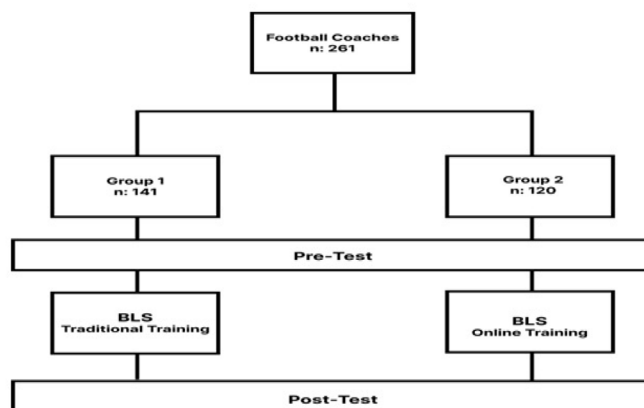


Figure 1. Flow chart

Measuring instrument

The first section presents demographic information (age, gender, and education level). The second section is a validated knowledge test consisting of 40 multiple-choice questions about BLS and AED before and immediately after training (both traditional and online). Each question has four possible choices with only one being correct.

Each question is worth 2.5 points, and the success score is 80 points. Coaches can receive a maximum of 100 points. The same questions were used in both the pre-training (Part 2) and post-training (Part 4) tests.

Practical skill test

No practical skill assessment was conducted for the coaches.

Statistical analyses

The statistical analysis was performed using the Statistical Package of Social Science software (SPSS Inc., Chicago, IL, USA). Categorical variables were presented as numbers and percentages, while continuous variables were presented as means±standard deviations for normally distributed data and as medians (minimum, maximum) for non-normally distributed data. The normality of continuous variables was evaluated using visual (histograms and probability plots) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). The statistical significance of the median differences in test scores before and after training in Groups 1 and 2 was calculated using the sign test. Post-training score increases between the two groups were compared using the Mann-Whitney U test. A p-value of <0.05 was considered statistically significant in this study.

Results

Baseline characteristics

For baseline characteristics, see Table 1. The median age of Group 1 was 36 (min-max 26-52). The median age of Group 2 was 36 (min-max 28-52). Group 1 had 131 males and 10 females, while

Group 2 had 114 males and 6 females. Of the coaches in group 1, 11 had completed high school, 122 had completed college, and 8 had completed master degrees. Of the coaches in group 2, 6 had completed high school, 105 had completed college, and 9 had completed master degrees.

Table 1. Baseline characteristics

		Traditional training Group 1 (n=141)	Online training Group 2 (n=120)	
Age-median (IQR)		36 (32-41)	36 (32-42)	0.848
Sex, n (%)	Female	10 (7.1%)	6 (5%)	0.493
	Male	131 (92.9%)	114 (95%)	
Educational level n(%)	High school	11 (7.8%)	6 (5%)	0.571
	College	122 (86.5%)	105 (87.5%)	
	Master degree	8 (5.7%)	9 (7.5%)	

Theoretical test results

The pre-test medians of both groups were similar (63 for Group 1 and 64 for Group 2). The increase in knowledge in both traditional and online education immediately after the BLS and AED courses was statistically significant (63>88 for Group 1 and 64>83 for Group 2). The overall level of knowledge was significantly higher in both course models after education (88 for

Group 1 and 83 for Group 2). Results showed that the median increase in post-test scores was higher in the traditional education group (22 points for Group 1 and 20 points for Group 2, p<0.001). The comparative results for Theoretical Test are shown in Table 2 and Figure 2.

Table 2. Theoretical test results

	Traditional training Group 1	Online training Group 2	p-value
Pre-test (median, IQR)	63 (63-88)	64 (61.25-68)	p=0.831
Post-test (median, IQR)	88 (85-88)	83 (80-85)	p<0.001
Post-training increase (median, IQR)	22 (20-25)	20 (15-25)	p<0.001

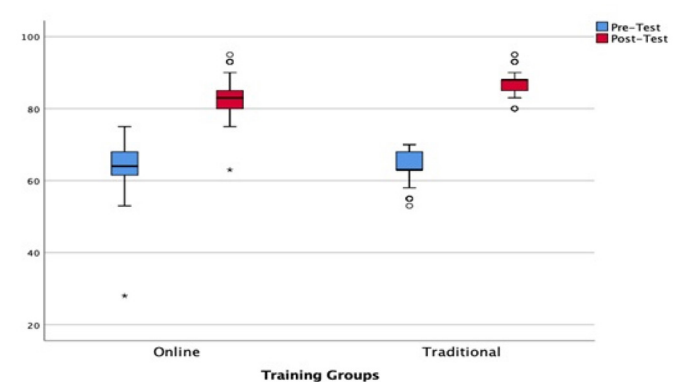


Figure 2. Theoretical test results

Discussion

This study aimed to evaluate the effectiveness of BLS education for soccer coaches using both online and traditional methods, and to compare their efficacy. Overall, both educational models were found to be successful. Our study results are consistent with previous literature comparing the efficacy of different educational models [13]. In a randomized controlled study comparing traditional and hybrid CPR training, the mean score on the post-training

theoretical test was 89.2 in traditional training, and 88.3 in hybrid training. In this study, the average change in post-training exam scores compared to baseline was 18.2 in traditional training and 17.4 in hybrid training. While the post-training scores in our study appeared lower than in this study, the increase in scores was greater. In our study, post-training scores were 88 in traditional training and 83 in online training. The increase in test scores after training was 22 in traditional training and 20 in online training [14]. Our study has found that online training provides benefits to individuals. This also demonstrates that self-taught training in vital topics such as CPR can be useful in emergency situations. In our study, there was no instructor variability, which is a limitation in previous studies [15]. This is a unique aspect of our article. Both in traditional and online education, the same instructors covered the same topics. The content of the course was predetermined according to the AHA 2020 BLS guidelines. All education was provided by emergency medicine specialists who followed the latest resuscitation guidelines. Therefore, it is believed that there was no variability among the education groups as a result. However, there is no practical training experience or social interaction provided by traditional education in online BLS education. Practical training is important in BLS education

because students need to receive practical training and master these skills to effectively perform CPR in emergency situations. Without practical training and active practice, students may not have enough confidence to apply these skills in real-life emergency situations.

In our study, we found statistically significant that traditional education provided more information than online education. There are many studies in the literature comparing the effectiveness of online and traditional BLS training. Some studies have shown that online BLS education can be a useful supplement to traditional education but should not be used as a replacement. Some other studies have found that combining online and traditional BLS training is more effective than using either method alone. In general, it is suggested that a hybrid approach combining online and traditional education may be the most appropriate approach to provide effective BLS education [13]. Additionally, considering that people who are likely to be at the scene are targeted for this training; As seen in our study, online education can be an option for football coaches, who are the people most likely to be near risk groups, such as athletes, and who cannot participate in face-to-face training due to busy working conditions.

Sudden cardiac arrest remains a tragic event on the football field. When a popular player suddenly collapses and dies during a game, the incident becomes known worldwide. When the European Resuscitation Council 2015 Resuscitation Guide was first published, the subject of 'cardiac arrest during sports activities' was included in the guide and the importance of cardiac arrest was emphasized. This article reviews four areas: recognition, intervention, resuscitation, and removal from the play area. Immediate initiation of chest compressions and early defibrillation in the field is the most critical area where immediate implementation of these simple recommendations will result in many athletes' lives being saved [16-18]. For this reason, BLS trainings have been organized for football coaches who are more likely to be near at-risk football players. Teaching more people high-quality CPR through more efficient training methods can improve CPR rates and quality in cardiac arrest cases in the field and help save more lives. To our knowledge, this is the first study in which football coaches' basic life support theoretical knowledge was evaluated after traditional and online training.

Limitations

Our study did not include randomization. Practical training and practical exams were not conducted. Confidence levels and satisfaction with the training of the football coaches before and after the training were not measured.

Conclusion

Although the results of traditional training in our study were better than online training, as a result, there is no clear answer about the effectiveness of online first aid and CPR training compared to traditional training. It is clear that the most effective

approach will likely involve the integration of both models rather than choosing one over the other. Online first aid and CPR training can serve as an alternative for groups who cannot attend traditional training. Rather than choosing one over the other, a personalized and adaptable approach can be tailored to the needs of different groups and educators.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

The study was approved by the Ethics Committee of the Balıkesir Atatürk City Hospital (E-30041352-514.19.99-213992246) and conducted in accordance with the guidelines of the Declaration of Helsinki. Written informed consent was obtained from all football coaches before enrollment into the study. Before answering the questions, each coach provided informed consent (under the scope of Personal Data Protection Authority).

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