The effect of game-based learning technique on the knowledge of health-volunteers in 2017

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ABSTRACT

Background: One of the most demanding and innovative educational methods is game-based learning. In medical education, games can be used to strengthen learning, especially for undergraduate students. This method can furnish chances for learners to do services as team supervisors, team-mates and mentors, as well as encourage interaction among them and enhance their motivation; moreover, they can facilitate learning process. Objectives: In this research, it was aimed to assess learning through games in health-volunteers, because, this population had an excessive desire for such methods; and to the extent of the authors' knowledge, no study has been carried out in the mentioned population yet. Material and Methods: This study was a Randomized Control Trial, and the method of data collection was quasi-experimental. The research population was health-volunteers in the Health Deputy of Shiraz University of Medical Sciences in 2017. Using the Cochran formula, the sample size with a five percent error was 111 people. To compare teaching methods based on lecture and game, the research samples were divided into two groups of 55 controls (teaching through lectures) and 56 cases (game-based learning) using a random allocation table. In this research, the EOP (Emergency Operations Plan) was selected as a subject of instruction. Also, a valid and reliable satisfaction questionnaire was prepared based on published articles in the field of game-based learning. Also, pre rest and posttest were designed for measuring the knowledge before and after the intervention. Results: From 111 participants included in the study, 43 individuals were males (38.7%), and 68 individuals were females (61.3%). With ascertaining the mean of the EOP samples' knowledge scores in the two groups of game and lecture methods, pre-test and post-test were conducted. Based on the results, there was a significant promotion in their knowledge level after the test in the game-based technique (p<0.001). Based on the results of the satisfaction questionnaire, the model was useful and it increased the joy of teaching and active engagement. Conclusion: Considering the effectiveness of the game-based learning method in reducing time and costs, this new method could be considered as one of the best alternatives for traditional teaching techniques such as lectures. According to the results of this research, active learning strategies such as game-based learning would lead to the improved knowledge and a better understanding of concepts in an attractive environment. In this regard, it is recommended that teachers integrate their teaching practices with interactive games.

Keywords: Medical Education, Emergency Operations Plan, Health Volunteer, Game-Based Learning.

Introduction

One of the most challenging and innovative educational methods is game-based learning. In medical education, games can be used to strengthen learning, especially for undergraduate students. This method can furnish chances for learners to do services as team supervisors, team-mates and mentors, as well as encouraging interaction among them and enhancing their motivation; moreover, they can facilitate learning procedure [1]. Significant interest may be elevated regarding the use of video games for rehabilitation and education as well as mental fitness training, so that behavioral gains would be associated with learning based on simulations [2].

There have been some tips for maximizing the effectiveness of game-based learning in which many recommendations are given to enhance the educators' academic achievements; Some of these tips are: "don't memorize, make memories", "challenge minds, not nerves", "use what already works", "remember the objectives", "take action seriously ", " let the contestants do the teaching", " learn while teaching"[3].

Some authors declared that games had the same effect compared to more traditional educational methods such as teaching through lectures; nevertheless, game-based learning has not yet been formally assessed [1]. Although, there is an increased appeal

among students towards the game-based learning method, the results of some studies demonstrated that the knowledge content and the participants' incentives in the game-based learning method have been needed to be more progressed to meet the contributors' requirements [4].

Some researchers asserted that games could not replace traditional equipment in medical teaching, although the researchers took them into account as supportive devices. Also, public access to games in the medical domain has been restricted [5]. In the research conducted by Hazavehei et al. in 2007, researchers compared three teaching strategies which they were teaching based on games, teaching through lectures and teaching through role-playing [6]. In 2011, Arbabi and Haghani studied the impact of games on oncology teaching [7]. In these two studies, the researchers concluded that games would enhance learning in students [6, 7]. In the research performed by Boeker et al. in the field of training urinalysis, the researchers inferred that game-based electronic learning had a higher motivational effect on the learning process than a script-based method, and could be advantageous for self-instruction [8].

Among the benefits of learning through educational games, the learning process and performance would be enhanced in addition to gaining practical profits from the mentioned approach. However, there would be disadvantages in these methods such as impediments in teaching and learning procedures as well as barriers in the administration of educational games [9]. In the study which was carried out by Middeke et al., in 2018, two methodologies of teaching clinical reasoning were compared; which were learning through serious games and problem-based learning in small-groups. Researchers of the study declared that further research should be conducted to explore the methods in which games could improve clinical reasoning and investigate how they could be used in postgraduate and undergraduate medical education in a more effective way [10].

This study aimed to evaluate the learning through games in health-volunteers because this population had an excessive desire for such methods.

Materials and Methods:

Study Design:

The present study was a Randomized Control Trial.

Participants:

The research population included 162 health-volunteers in the Health Deputy of Shiraz University of Medical Sciences in 2017. Using the Cochran formula, the sample size with a five percent error was 111 people.

Allocation concealment:

For reducing sampling bias, the volunteers were chosen by using a random allocation table, and each of them was given a number through the mentioned method.

55 volunteers were assigned to the lecture group, and 56 volunteers were selected as the game-based learning group. In this study, it was tried to employ the tips of increasing the efficacy of game-based learning by Pitt et al., to enhance the academic achievements in learners [3].

Data Collection Procedure:
The EOP (Emergency Operations Plan) was selected as a subject of instruction. The data collection tool was a valid and reliable questionnaire in which one part was about demographic information (gender, age, work experience, educational degree), and the other part was about the contents of the EOP with 27 questions. The questionnaire was in the 5 points Likert scale; the "absolute opposition" scale was equivalent to the "one" point and "absolute agreement" was equivalent to the "five" point. The minimum grade was 27, and the maximum degree was 135.

Another valid and reliable satisfaction questionnaire was prepared based on published researches in the field of game-based learning in which researchers discussed the critical factors of satisfaction in this new method.

Statistical Analyses:

To analyze the data and to find out the existence of significant relationships between independent and dependent variables, the correlation analysis method was employed using the Pearson correlation. To find out the indirect effects between independent and dependent variables, path analysis test was used. Also, independent T-test was applied among the variables in each of the groups as well as the paired t-test in comparing two variables in both experimental groups. Statistical analysis of data was done using SPSS software version 18.0. Other tests used in this research were Cronbach's alpha, T-test and, Chi-square.

Results:

In this study, the sample size was 111 volunteers that were divided into two subgroups of 55 (learning through lecture) and 56 (game-based learning) participants. In this research, four demographic variables including gender, age, work experience and, educational degree were analyzed as well as 27 EOP subjects of the area. Further details of demographic characteristics have been presented in table 1.

Table 1: Demographic characteristics of volunteers

variables		Lecture group		Game-Based learning group		Total	
		N	%	N	%	N	%
Gender	Male	19	34.5	24	42.8	43	38.7
	Female	36	65.5	32	57.2	68	61.3
Age	20-30	5	9	6	12.4	11	10.7
	31-40	22	40	21	43.8	43	41.7
	>40	28	51	21	43.8	49	47.6
Work Experience	≤ 5	5	9.1	5	8.8	10	9
	6-10	22	40	18	32.2	40	36

(Years)	11-20	25	45.5	31	55.4	56	50.5
	>21	3	5.4	2	3.6	5	4.5
Educational Degree	Diploma	13	23.6	13	23.2	26	23.4
	Associate's degree	14	25.5	16	28.6	30	27
	Bachelor's degree and higher	28	50.9	27	48.2	55	49.6

According to the findings, age distribution, educational degree, work experience and, gender distribution had no significant difference in two educational groups (p=0.065, p=0.051, p=0.11, p=0.87 respectively); therefore, it can be asserted that these two groups were heterogeneous, and the impact of other variables was minimized in the intervention.

With ascertaining the mean of the EOP samples' knowledge scores in the two groups of game and lecture methods, pre-test and post-test were conducted. Based on the results, there was a significant promotion in their knowledge level after the test in the game-based method (p<0.001). The mean of knowledge scores in the first group was 96.82 before the intervention (learning through lecture), and this value was increased after the intervention.

In the game-based learning group, the mean of this variable was enhanced to 116.21 (from 96.63). Detailed information has been given in table 2.

Table 2: The comparison of game-based learning and lecturing

	Pre-test mean	Post-test mean	Standard deviation	Value of paired t-test	P-value
Lecture method	96.82	109.36	8.02	14.02	P<0.001
Game-based learning	96.63	116.82	13.55	10.12	

Based on table 2, it seemed that game-based learning would enhance the knowledge in health-volunteers at Shiraz University of Medical Sciences.

This assumption was approved by the use of paired t-test and the existence of a notable difference between the knowledge scores before and after the intervention. The results of the satisfaction questionnaire about game-based learning have been shown in table 3.

Table 3: Satisfaction items in game-based learning method

Game-based learning benefits	Agreement Number (%)
1. Provide prompt feedbacks	55(%98)
2. Present an attractive learning environment	55(%98)
3. Present an effective method for adult learning	52(%93)
4. strengthen critical thinking	52(%93)
5. Strenghten educational process	56(%100)
6. Present an increased opportunity for trainers to discuss teaching contents	50(%89)
7. Present learning possibilities outside the curriculum	47(%84)
8. Is learner-centered	56(%100)
9. Is time-saving	5(%8.92)
10. Is a cheaper method compared to traditional teaching strategies	50(%89)
11. Provide possibilities to intensify knowledge, attitude and, practice in learners	51(%91)
12. Strengthen learning, collaboration and, partnership	56(%100)
13. Provide joy in the classroom	56(%100)
14. Enable trainers and trainees to share concepts and ideas	46(%82)
15. Leads to stress management	47(%84)
16. Enhance problem-solving and investigation among trainees	52(%93)

Discussion:

The results indicated that game-based learning was more efficient than learning through the lecture in facilitating learning the EOP in a sample of volunteers. The research study on using a game for teaching substantial concepts of neonatology showed similar results [11]. The results of a systematic review about the efficacy of game-based learning showed that due to the unreliable results, the evidence could not recommend the use of games in medical education. However, owing to the advantages of game-based learning according to some published research papers, medical teachers could use games when other educational interventions like lectures had limited effectiveness. The authors recommended that additional data and more researches would be necessary. They also ascertained that for deciding on when to use the educational game for educational intervention, medical educators might consider the benefits of the game in contrast to its costs, and the time and energy required for its implementation [12]. The results of the satisfaction questionnaire showed that most of the students believed that game-based learning was student-centered and an effective educational strategy. The students also reported that this model led to active and deep learning. The most crucial problem of game-based learning was its time-consuming nature. The findings of a study revealed that the benefits of educational games could be classified as learning practice and performance improvement, facilitating adaptive learning and motivating learners. The disadvantages of educational games consisted of learning process obstacles and the logistics of games [9]. The essential nature of game-based learning is immediate feedback. Feedback is a crucial part of the knowledge transfer process in many areas, especially in the education domain. Feedback can afford direction on how students achieve their educational objectives [13]. A study about feedback in game-based learning showed that feedback in game-based learning was typically based on the students' performance. According to how the students acted, some information was processed, and the report was given back to the students, however, too much feedback in game-based learning was not useful, and it discouraged

cooperation [14]. Another essential characteristic of game-based learning was the improvement of critical thinking ability. Critical thinking was helpful for appropriate decision-making ability in healthcare personnel, so using the educational methods that improve this ability has been necessary [15]. The strength of this research was its interventional nature and appropriate sample size. The limitation of this research was that it was impossible to observe the behavior of participants after the intervention; therefore, future longitudinal studies for measuring the long term effect of game-based learning have been recommended.

Conclusion:

According to the results of the current research, active learning strategies such as game-based learning would lead to improved learning and understanding concepts in an attractive environment. In this regard, it has been suggested that teachers integrate their teaching practices with interactive games.

Conflict of interest: None declared.

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