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Original Article

The Effectiveness of Gamification in Students' Addiction Information Literacy

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Abstract

Background: Gamification refers to the use of game elements and game design techniques in non-game contexts. Using gamification in education makes educational materials available to learners in a new and attractive way. To this end, the present study sought to investigate the effectiveness of gamification in the field of addiction information literacy.

Methods: This applied study was conducted using a quasi-experimental method. The research population consisted of students at Shahid Bahonar University of Kerman in 2023. A total of 32 students were randomly selected as the participants using purposive sampling and were randomly placed in either a control or an intervention group. To conduct the study and collect data, a researcher-made game was used to teach addiction information literacy, and a researcher-made questionnaire was used to assess addiction in the participants. The collected data were analyzed with SPSS-21 software.

Findings: The data in this study revealed an average level of addiction information literacy in the students in the control group, who completed the questionnaire without playing the game, while a higher level of addiction information literacy was found in the students in the intervention group, who played the game and completed its stages.

Conclusion: The findings showed that the implementation of gamification positively affected the students' addiction to information literacy. Providing educational content in the field of addiction through games is more appealing to them and motivates them to pay attention and learn more about addiction. Besides, since students and young people are always busy with their phones, gamification can be implemented anywhere, transferring content to the audience more easily and quickly.

Keywords: Gamification, Information literacy, Addiction, Computer games, Educational games, Game applications

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Introduction

Modern technologies, such as computer games, are increasingly being recognized and utilized in both daily life and educational settings.[1] Computer games are played by millions of adolescents and adults worldwide, with over 40% of the US population playing three hours or more per week.[2] Computer games are used in the educational system to captivate the audience with their attractive and entertaining environment. Modern life has become digital, and education has been affected accordingly. Studies have revealed that students accept scientific materials better and more easily through technology-based methods, which is a challenge for the current educational system.

The term "eighth art" is currently used to refer to the art of game development. Many researchers have referred to contemporary technological developments, including video/computer games, as the "computer revolution."[3] Currently, computer games have become more sophisticated with advancements in science and technology, and their audience is now fully immersed in the games. Accordingly, learners' attitudes, who are now essentially digital, toward learning have greatly changed.[4] The use of game features and mechanisms in applications that are not games in nature is called gamification. Gamification can be used in various fields such as content marketing, e-commerce, education, health, and hygiene. The main goal of gamification in educational settings is to increase student motivation to achieve a specific goal by incorporating components related to game mechanics into the learning system. Gamification should also lead to changes in student's behavior.[5] The attractiveness and dynamism of gamification can be used to raise students' information on addiction.

Gamification presents educational materials to learners in a new and attractive way, increasing their motivation to learn. Education is a complex concept that requires students to understand and learn in new ways. Information literacy and the education process are closely related. An information-literate individual can locate, evaluate, and use information efficiently when needed. Information literacy is getting more attention in the modern world with the expansion of information and communication

technologies. Accordingly, information plays an essential role as a vital element for survival and having a healthy life. Therefore, it can be said that gamification strengthens the level of information literacy by increasing students' motivation to learn, which is a condition for survival in the digital world.

Previous studies have shown that, unfortunately, addiction among students is currently becoming a social crisis.[6] Addiction is a social disease that has physical and mental consequences, and without addressing the causes of addiction, physical and mental treatment will be temporary, and the person will relapse. Using new methods to improve public literacy about addiction can be effective, freeing people from this personal and social trap. Gamification can help to inform and raise students' information literacy about addiction by using an attractive environment and technological platforms that appeal to young people.[7] An educational game is a combination of game design, motivational psychology, behavioral economics, and user experience. Gamification, using the mechanism of games in treatment and health, provides solutions to encourage patients to promote health, prevention, or self-management behaviors of chronic diseases.[8]

Few studies have used the functions of computer games to address social and cultural issues in Iran, despite the high demand for gamification in the Iranian community. Most of the computer games developed have been used to teach scientific and educational content while many valuable moral and cultural concepts, such as the development and promotion of a culturally appropriate lifestyle, need further evaluation. According to previous studies, gamification has increased students' motivation, participation, attention, and learning outcomes.[9] Considering the use of this emerging method in health, this new phenomenon can effectively inform students about health and psychological issues, including addiction.

Few studies have used computer games to address social and cultural issues in Iran despite the high demand for gamification in the Iranian community. One of these issues is addiction, which is a serious problem that affects many young people and their families. Therefore, this quasi-experimental study aimed to investigate gamification's effectiveness in improving students' information literacy about addiction. Information literacy is locating, evaluating, and using information efficiently when needed. Gamification is the application of game features and mechanisms in non-game contexts. The study hypothesized that gamification would increase students' information literacy about addiction and reduce their addiction proneness by creating an attractive and engaging learning environment. The study addressed the following questions to test this hypothesis:

1. What is the level of addiction information literacy among the students in the control group?
2. What is the level of addiction information literacy in the students in the intervention group?
3. What is the difference in addiction information literacy among the students in the control and intervention groups?
4. What is the level of addiction proneness of the students in the control group?
5. What is the level of addiction proneness of the students in the intervention group?
6. What is the difference in addiction proneness between the students in the control and intervention groups?

A study by Oliveira et al[10] explored the effectiveness of different types of gamification in education and learning using suitable gamified systems. In another study, Rahayu et al[11] examined the adverse effects of gamification in the educational software of systematic mapping and practitioner perceptions and concluded that gamification, when used correctly, can have positive effects on the educational/learning software They developed an e-learning gamification model to increase user motivation and engagement against addiction based on elements of video games. Using an action research approach, Putz et al[12] examined if gamification can help improve education by investigating the potential of gamification to enhance knowledge. The results showed that gamification has a positive effect on knowledge retention and continuous increase in students' learning performance, indicating the usefulness of incorporating game principles into educational activities. Majuri et al[13] reviewed 128 empirical studies on the use of gamification in teaching and learning. The results showed that gamification studies in education aligned with general studies on gamification, focusing on the costs of its implementation and psychological consequences.

Kostenius et al[14] used a participatory approach to develop a serious game that promotes health and learning among schoolchildren. They found that gamification can improve student communication and physical activity. Moreover, Wintermeyer and Knautz[15] showed that implementing content through games greatly impacts personal skill and content mastery. The results also indicated that students more involved in these games had significantly better results in the final information literacy test.

Previous studies have confirmed the positive and effective role of gamification in education and learning activities. In line with previous studies, this research examines the effect of gamification on the level of information literacy of students in the field of addiction. By increasing students' motivation and participation, gamification keeps them engaged during educational programs and encourages them to continue working. Most researchers agree that gamification can improve learning if it is designed well and used correctly. Gamification reduces students' anxiety, worry, and psychological distress and increases their learning by creating a sense

of competition. Considering the use of gamification in healthcare, this new phenomenon can be effectively used to inform students about health and psychological issues, including addiction.

Methods

The study used a quasi-experimental design with a control and an intervention group. Experimental research is one of the most accurate and efficient research methods to test hypotheses. Experimental studies investigate the effect of stimuli, methods, or specific environmental conditions on subjects. In the real world of human sciences, there are limitations, such as the researcher's inability to choose participants and place them randomly in different conditions. Thus, as it is not possible to use a complete experimental design in human sciences, quasi-experimental designs are used.

The research population consisted of students of Shahid Bahonar University of Kerman in 2023. The study used purposive and convenience sampling to select 32 participants who met the study criteria. The participants were then randomly assigned to the control or intervention group. Thus, 32 students were selected according to their demographic characteristics and their self-reported drug addiction. The participants were then randomly divided into two groups of 16 people with homogeneous characteristics: the control group (answering the questionnaire without playing the game) and the intervention group (answering the questionnaire after finishing the game).

The study collected data using two instruments: a researcher-made questionnaire based on the Iranian addiction potential scale (IAPS) and the information literacy scale[16] and a researcher-made game named My Hero. The questionnaire contained 33 questions, 17 of which were related to addiction and the student's tendency towards addiction. Another 16 questions were related to addiction information literacy and measured the level of student literacy in the field of addiction. "Yes" and "No" options were used as question responses. In designing the questions for this questionnaire, the theories and statements from addiction experts were also used.

The second tool was a researcher-made game called My Hero, which could be run on smartphones and given to the intervention group participants. This game is in the platformer genre and has different stages. The main character of this game is a knight who defeats creatures and monsters with his sword and earns points. Each stage has been developed according to the research objectives and game features have been designed according to gamification protocols. After completing each level of the game, the gamer sees statements about addiction. These statements are written based on the statements of experts in the field of addiction and also the statements of people with addiction. The game aimed to inform the gamer about the harms and consequences of drug abuse.

The researchers assessed the reliability of the questionnaire using Cronbach's alpha, with a coefficient of 0.878. They also assessed the validity of the questionnaire by asking three psychologists to review its items and provide feedback. Furthermore, the responses to all items were unambiguous, confirming the content and construct validity of the questionnaire. Moreover, six computer programmers and software engineers confirmed the developed game's reliability and content validity. The game app "My Hero" is available at https://cafebazaar.ir/app/com.al1.gameone.

In order to conduct this research, the researchers presented the questionnaire to the control group subjects and asked them to complete the questionnaire. However, the intervention group first presented the designed game and asked the subjects to install it on their phone within two weeks, play it every day, and complete the game's stages. After two weeks, the designed questionnaire was provided for them to answer.

The researchers analyzed the data using SPSS-21 software. The data were summarized using descriptive statistics (e.g., mean, standard deviation, frequency, percentage, histograms, and box and bar graphs), and the research hypotheses were tested using inferential statistics including one-sample and paired-sample *t* tests,

Results

Addiction information literacy

Table 1 shows the descriptive statistics for addiction information literacy in both groups, with scores ranging from 0 to 16. The participants in the intervention group scored higher (mean = 12.88) than the participants in the control group (mean = 9.43) in addiction information literacy. The median for the control and intervention groups was 10 and 13, respectively. The standard deviation for addiction information literacy was 4.8 in the control group and 2.9 in the intervention group. The minimum score for addiction information literacy was 0 in the control group and 6 in the intervention group, and the maximum score was 16. The skewness for addiction information literacy was -0.181 in the control group and -0.608 in the intervention group, indicating a negative

Table 1. The descriptive statistics for addiction information literacy

Addiction information literacy	Mean	Median	Mode	Variance	SD	Range	Min	Max	Skewness	Kurtosis
Control group	9.43	10	10	23.196	4.8	16	0	16	-0.181	-0.608
Intervention group	12.88	13	16	8.48	2.9	10	6	16	-0.608	0.123

skewness and, thus, confirming a high level of addiction information literacy for most participants. The kurtosis values for addiction information literacy in the control and intervention groups were -0.608 and 0.123, respectively. This statistic shows a significant difference between the two groups regarding the level of information literacy; the intervention group, which used the game, had a higher level of information literacy than the control group. The subjects of the intervention group acquired educational information on addiction by playing the game, which shows the effectiveness of gamification on the level of information literacy.

Addiction proneness

The researchers calculated a single score for each participant in the control and intervention groups by summing up the scores of all the items in the questionnaire. Table 2 shows the descriptive statistics for addiction proneness in the control and intervention groups. As can be seen, most of the participants in the control group scored 5, and the participants in the intervention group scored 4 in terms of addiction proneness. The median for addiction proneness in the control and intervention groups were 7 and 6, respectively. The standard deviation for addiction proneness was 3.33 in the control group and 3.08 in the intervention group. The minimum score for addiction proneness was 0, and the maximum scores in the control and intervention groups were 13 and 12, respectively. The skewness for addiction proneness was -0.159 in the control group and -0.189 in the intervention group. Furthermore, kurtosis values for addiction proneness in the control and intervention groups were 0.384 and 0.044, indicating the accumulation of scores around the center and the formation of a peak in this area.

Testing the research questions

1. What is the level of addiction information literacy among the students in the control group?

Table 3 shows the one-sample *t* test results for addiction information literacy in the control group.

The researchers rejected the null hypothesis because the *P* value was 0.251, which indicates a moderate level of addiction information literacy in the control group (Figure 1).

2. What is the level of addiction information literacy in the students in the intervention group?

A one-sample *t* test was run to answer this question, as shown in Table 4.

As can be seen, the *P* value for addiction information literacy among the students in the intervention group was smaller than 0.05 ($P<0.05$). Thus, the null hypothesis is rejected, indicating a high level of addiction information literacy in the students in the intervention group as displayed in Figure 2.

3. Is there any significant difference in addiction information literacy of the students in the control and intervention groups?

Table 5 shows the paired-samples *t*-test results for addiction information literacy in the two groups.

As can be seen, the researchers rejected the null hypothesis because the *P* value was 0.018, which indicates a significant difference in addiction information literacy between the two groups. As shown in Figure 3, the level of addiction information literacy is higher in the students in the intervention group compared to the students in the control group.

4. What is the level of addiction proneness among the students in the control group?

A one-sample *t* test was run to answer this question, as shown in Table 6.

The *P* value for addiction proneness in the students in the control group was 0.279. Thus, the null hypothesis is

Figure 1. The box plot for addiction information literacy in the students in the control group

Table 2. The descriptive statistics for addiction proneness

Addiction proneness	Mean	Median	Mode	Variance	SD	Range	Min	Max	Skewness	Kurtosis
Control group	6.94	7	5	11.129	3.33	13	0	13	-0.159	0.384
Intervention group	6	6	4	9.5	3.08	12	0	12	0.189	0.044

Table 3. One-sample *t* test for addiction information literacy in the control group

One-sample *t* test results	
Statistic	-1.194
df	15
P value	0.251

*Significant at $P<0.05$

Table 4. One-sample *t*-test for addiction information literacy in the intervention group

One-sample *t* test results	
Statistic	-6.911
df	15
P value	<0.05

*Significant at $P<0.05$.

rejected, indicating a low level of addiction proneness in the students in the control group as displayed in Figure 4.

5. What is the level of addiction proneness in the students in the intervention group?

Table 7 shows the one-sample *t* test results for addiction proneness in the intervention group.

As can be seen, The researchers did not reject the null hypothesis because the *P* value was 0.513, which indicates a low level of addiction proneness in the intervention group (Figure 5).

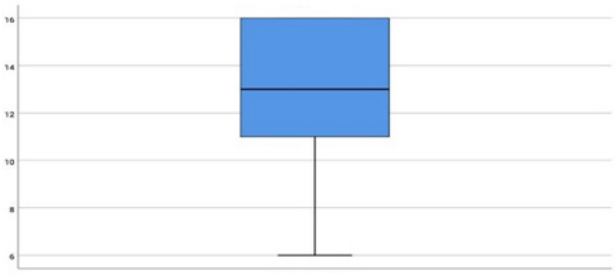

Figure 2. The box plot for addiction information literacy in the students in the intervention group

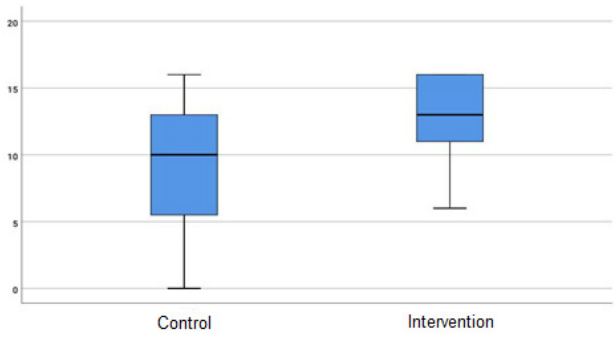

Figure 3. The box plot for addiction information literacy in the two groups

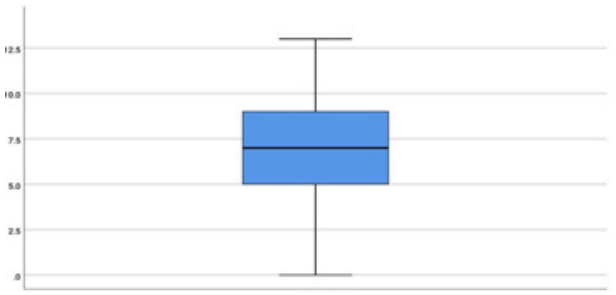

Figure 1. The box plot for addiction proneness in the students in the control group

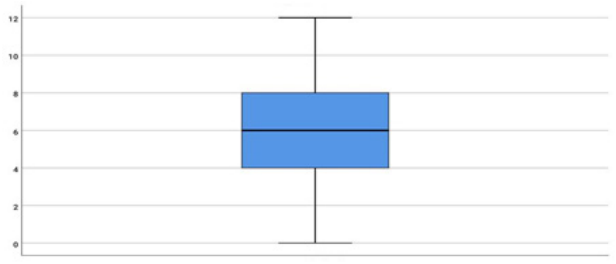

Figure 5. The box plot for addiction proneness in the students in the intervention group

6. Is there any significant difference in the addiction proneness of the students in the control and intervention groups?

The paired-samples *t*-test was run to answer this question, as shown in Table 8.

As can be seen, the *P* value for addiction proneness reported by the students in the two groups is 0.408 ($P > 0.05$). Thus, the null hypothesis is rejected, indicating no significant difference in addiction proneness between the students in the two groups as shown in Figure 6.

Discussion and Conclusion

Technology has transformed many aspects of education and learning, such as introducing new modes of delivery and engagement. One of the emerging technologies in education is gamification, which has made teaching and

Table 5. Paired-samples *t* test for addiction information literacy in the two groups

Paired-samples *t* test	
Statistic	-2.504
df	31
P value	<0.018

*Significant at $P < 0.05$.

Table 6. One-sample *t* test for addiction proneness in the control group

One-sample *t* test	
Statistic	1.124
df	15
P value	0.279

*Significant at $P < 0.05$.

Table 7. One-sample *t* test for addiction proneness in the intervention group

one-sample *t* test	
Statistic	-0.669
df	15
P-value	<0.513

*Significant at $P < 0.05$.

Table 8. Paired samples *t* test for addiction proneness in the two groups

Paired samples *t* test	
Statistic	0.839
df	30
P value	<0.408

*Significant at $P < 0.05$.

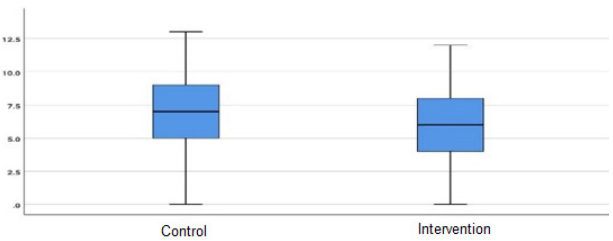

Figure 6. The box plot for addiction proneness in the two groups

learning easier and more attractive. Gamification creates an entertaining environment for presenting educational content to learners. This emerging technology has been used in many fields, including health. To this end, the present study examined the effectiveness of gamification in improving the addiction information literacy of two groups of university students. The students in the intervention group played a mobile game that provided some instructions about addiction. The level of addiction information literacy in the two groups was measured using a questionnaire. According to Table 3, the students in the control group had a moderate level of addiction information literacy. However, this level of information literacy is insufficient, as low awareness of addiction increases the risk of substance abuse. Students may obtain information about addiction from various sources, such as media, social networks, and cultural and educational events. However, this level of information is not adequate for various reasons, including the absence of attractive awareness-raising programs and techniques, students' low motivation to pay attention to educational materials about addiction, and the failure of relevant authorities to provide timely and correct information about addiction.

Furthermore, environmental factors, economic conditions, and family and friends can affect students' awareness of the adverse effects of addiction. Therefore, professionals and authorities need to adopt new strategies to enhance students' awareness and information literacy on addiction. Similarly, Khoie et al[17] stated that people's addiction information literacy should be raised with precise planning and comprehensive education on addiction to encourage people to avoid turning to addiction. This shows that the high level of information in the field of addiction reduces the risk of students falling into this trap to a significant extent. The new generation better accepts the use of new educational methods based on technological equipment. Therefore, educational methods should be in accordance with the features of the new generation.

Table 4 shows that the students in the intervention group had a high level of addiction information literacy after playing the game with addiction-related content. Accordingly, it can be argued that students better accept new educational methods and learn educational materials faster and more efficiently when developed based on technology. Smartphones are an attractive and convenient way to deliver educational content, as students spend most of their time on them. Furthermore, as students were interested in the game and its story, providing instructions about addiction indirectly during the game was unexpected and interesting for them. Thus, they paid attention to these instructions. Therefore, gamification is an effective tool for educating students and improving their information literacy. Furthermore, educational authorities and other related professionals should take advantage of this technology to provide educational services as reported in previous studies.[18]

Table 5 shows a significant difference in addiction information literacy between the control and intervention groups. The intervention group had higher addiction information literacy than the control group. These results indicated that the students who received instructions on addiction through the game learned the instructional materials better than other students. Gamification is more effective than traditional methods for students' learning, as it enhances their motivation and interest. Perhaps the low level of information literacy in the students in the control group compared to the intervention group was their low motivation. Students' lives are intertwined with technology and their lives are affected by technological changes. They accept these changes well and like to adapt their lifestyles to new technologies. Thus, they tend to accept instructions mixed with new technologies more effectively. Thus, the attractiveness of computer games and their entertainment made students pay more attention to the content presented with the game, and it is better imprinted in their minds. Gamification is effective as a new method in raising students' information literacy about addiction. Lopes et al[9] also found that students preferred gamification to traditional courses for learning. Motivation is the main factor in achieving meaningful learning, and this model creates interest in active learning and grants more independence to students.

Tables 6 and 7 show that both groups had a low level of addiction proneness. Table 8 and Figure 6 show that there was no significant difference in addiction proneness between the two groups. This suggests that students are less prone to addiction because of their environmental, economic, personal, and social factors, as well as their awareness of the risks of addiction or their strong willpower. However, all aspects must be taken into consideration, and relevant officials and psychologists must keep students in good condition intellectually and spiritually with effective education and solutions so that they do not turn to addiction. Accordingly, Kutty[8] suggested that extrinsic motivation and individual and social factors play a significant role in an individual's tendency to addiction.

The findings of this study suggest that students prefer new educational methods that use modern tools like smartphones. They need motivation to have focus and passion for learning. Thus, gamification enhances their motivation and facilitates the learning process. The results of the study also indicated that students do not pay enough attention to instructions on addiction provided in various other ways such as classroom, educational videos, internet, social networks, etc. Instead, they tend to learn the same instructions more effectively through games. Thus, games have become an essential element in young people's and students' lives, and instructions

provided through games become more attractive to them. Previous studies[2,5,8,15,19] found that gamification increases students' motivation and participation, and helps them stay engaged and continue learning because the game is appealing and enjoyable. Thus, they are more likely to pay attention to the instructions. Gamification has been more effective in informing people than traditional education about healthcare services, and games have become a tool to help change people's behavior.

This study showed that gamification can improve students' addiction information literacy and make them more literate than other students who learned about addiction in other ways. The reason for the high level of information literacy in the students who played computer games compared to other students is the more attractive presentation of information and instructions, motivating them to pay attention to the educational materials and instructions. Since students and young people are always busy with their phones, they can install and play games at any time, and gamification transfers content to the audience more easily and quickly. Gamification has been used for various purposes in various fields and countries, demonstrating its potential and effectiveness. However, gamification has not received much attention in Iran, and educational authorities have not used its benefits for educational activities. Thus, working on this new method can provide new educational solutions and techniques and change learning methods from static to dynamic. Gamification can be used to make students aware of various issues, such as addiction, to protect them against this social evil.

Implications

Following the results of the study, the following suggestions are offered:

- As students who learned about addiction in other ways had average information literacy, educational authorities and experts should use new and effective methods to increase students' motivation and awareness about addiction and help them avoid it.
- As gamification improved students' addiction to information literacy, computer specialists could develop more appealing games with better graphics and effects. Games with better graphical features and interesting stories attract the audience and immerse them in the game; thus, instructions will be presented to the students in the best way.
- We found that gamification was effective in enhancing students' addiction information literacy. Thus, computer specialists can use new psychological findings and methods to create educational games that greatly affect students' minds.
- Considering the effectiveness of gamification in the field of addiction information literacy, specialists and doctors can use this emerging and attractive method to facilitate the process of treating students' depression.

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Conceptualization: Oranus Tajedini.
Data curation: Ali Farrokhi.
Formal analysis: Oranus Tajedini, Ali Farrokhi.
Investigation: Oranus Tajedini, Ali Farrokhi.
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Project administration: Oranus Tajedini.
Resources: Ali Farrokhi.
Software: Ali Farrokhi.
Validation: Oranus Tajedini, Ali Farrokhi.
Visualization: Oranus Tajedini.
Writing–original draft: Oranus Tajedini.
Writing–review & editing: Oranus Tajedini.

Ethical Approval

This study was approved by Research Ethics Committees of Kerman University of Medical Sciences (ethic code: IR.KMU.REC.1404.193).

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