


## Learning Medical Pharmacology through Role-Playing Method

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Article Type	ABSTRACT
Research Paper	<p><b>Background and Objective:</b> Traditional methods of medical education, despite being easy to implement, do not have long-lasting efficiency. The main aim of this study is to use the help of the learners to teach parts of the medical pharmacology course using role-playing pedagogy. This was done for the first time in Babol University of Medical Sciences with the cooperation of medical students who entered the university in 2016.</p> <p><b>Methods:</b> Students were divided into 5 groups and a group leader was introduced for each group. Five topics were selected and corresponding scenarios were written. There were three to seven people in each group. The physician together with the hypothetical resident or student examined the patient's problems and prescribed medicine and gave them the necessary recommendations. All participants were given a pre-test and a post-test, and then the findings were statistically analyzed.</p> <p><b>Findings:</b> 101 students (49 girls and 52 boys) with a mean age of <math>21.43 \pm 1.14</math> years participated in the study. Except for the topic of poisoning, the mean difference in pre- and post-test scores of female students was lower than that of male students. For example, this difference was observed in the topic of Parkinsonism (<math>p &lt; 0.0001</math>). All students involved in the performance obtained better grades in the same topics compared to other students (88.15 vs. 59.71 out of 100). 74% of female students and 79% of male students expressed satisfaction with the implementation of this method.</p> <p><b>Conclusion:</b> According to the findings, this method has increased the motivation to learn the medical pharmacology course and stabilize the course topics. Therefore, its implementation in difficult courses with diverse and voluminous content not only helps them to learn better, but also helps them maintain their enthusiasm and increase motivation to learn more and consolidate what they have learned.</p> <p><b>Keywords:</b> <i>Medical Pharmacology, Role-Playing Pedagogy, Student-Centered Learning, Learning Consolidation, Effective Learning, Mastery Learning.</i></p>

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## Introduction

So far, various methods have been introduced for teaching medical sciences and learning related subjects. Traditional methods are most often used in medical education (1, 2). In these methods, which are known as Teacher-Centered Learning Methods, the teacher or lecturer, as an active participant, prepares topics and course materials based on approved frameworks and regularly presents them to the learners with his/her own personal teaching method. Depending on the degree of scientific mastery, enthusiasm, experience and interest, his/her teaching is rated in terms of quality (3, 4). This method has advantages such as the possibility of training a significant number of students in a relatively short time, benefiting from the noteworthy experiences of lecturers and teachers with experience in this field, the possibility of presenting the latest clinical findings in a short time and low cost (2). However, the common method of medical education has issues compared to some other methods. One of the most important points in this case is that usually the quality of learning is influenced by the effort of both the teacher and the learner (5).

In traditional methods, since only the teacher is the active person, there is not much motivation left for students to learn more effectively (4, 6, 7). Although the most important goal, especially in the field of medicine, is comprehensive learning of this field at mastery level (8-13), most of the teachers in this field do not spend the necessary effort to create mastery in learning. On the other hand, learners mostly play the role of passive listeners and they become lively only in the days before the final exam. Most of these learners get the material from non-standard sources and after the exam, they quickly forget the material they learned for the exam (14, 15). On the other hand, the joy of learning and passion for learning are not experienced. Since the application of learned material in the field of medicine is inevitable, therefore, choosing the method for teaching related materials, in a way that leaves a lasting impression on a person's memory, can be an effective step in educational success of students. Accordingly, methods that are mainly developed and designed according to a student-centered approach (Student-Centered Learning Methods) have been introduced (16, 17).

One of the student-centered methods is role-playing pedagogy. In this method, first, a topic is specified for implementation. The basis of learning in this method is problem solving, that is, patient management (18, 19). Some researchers have used this method to teach courses related to their specialty and have emphasized its effectiveness in improving learning (20, 21). The pharmacology course is one of the most important courses in general medicine, which is one of the most widely used courses compared to other courses (22, 23). On the other hand, due to the large volume of materials and their great variety, the breadth and difficulty of the subjects, it is very difficult to learn it at the level of mastery for the student based on the conventional methods. For this reason, the adoption of student-centered methods, including the role-playing method, can create an environment for easier learning, and also lead to the student's enthusiasm in his/her own education process (24, 25).

Limited studies have been conducted in this case, which have shown the role of this method in learning the pharmacology course (26). In this method, the student is responsible for his/her own education and spends all his/her efforts to fulfill the role as best as possible. Based on the subject, the student may play the role of a patient, a patient's companion, or a doctor who learns information at any level. The difference between learning in this method and the traditional method is that, learning is usually at the level of mastery if it is done under the supervision of an experienced instructor. At the same time, it is accompanied by passion and pleasure. But in the traditional method, it is not possible to reach this level with this ease. Therefore, according to the needs of this field for effective learning and also the disadvantages of the traditional methods of teaching this field, the present study has been conducted to investigate the effect of the role-playing pedagogy compared to the traditional method. It is expected that due to the difficulty of the

material and the abundance of details of learning the medical pharmacology course, the use of attractive methods in addition to the conventional method can create a movement in students that will improve the process of learning the material. For the first time ever, this study was designed in five subjects of medical pharmacology course and implemented in Babol University of Medical Sciences.

## Methods

In this interventional study in medical education, all students of Babol University of Medical Sciences who entered in 2016 (n=101), participated in the 2nd course of physiopathology (introduction to clinical practice), and selected medical pharmacology course were included. The study was conducted from September 2019 to January 2020. After hearing the major explanations about this method and providing the initial justifications by the instructor, the students signed the informed consent form and entered the research. The study consisted of two parts: implementation and evaluation. In the implementation stage, first, the students of the class were divided into 5 relatively equal groups (the number of each group was at least 20 people) and a class representative was determined for each group. In each student group, some were selected as role players by the group's own choice. The instructor was in contact with the rest through the class representative. Each group appointed a minimum of 3 and a maximum of 7 people to perform the roles. The main roles included a patient, a student and a doctor. Then 5 topics from the normal teaching topics were specified and introduced to the groups. Each group chose one of the topics according to their interest and the performing members each chose one of the roles depending on their ability and interest. The rest of the group played the role of trainee students and on the day of the performance, they were placed in the front row of the audience so that they could participate in the discussion if they were addressed by the main performers of their group. A detailed scenario was written for each performance. Each of the students, in the role they chose, studied all the tasks assigned to that role in advance and tried to learn its details and subtleties.

Students used any method that helped to collect clinical data. They were free to consult with experienced professors and even see real patients in order to make the performance more natural. Among them, some of the clinical professors helped a lot. Due to numerous practice sessions and making arrangements with the instructor, they reached a relatively acceptable level of skill in performing the show. Before the performance, they practiced their role several times and fixed the related problems as much as possible. A day before the main event, each group gathered and performed their practice show in the presence of the instructor. The issues that needed to be corrected were pointed out to them and suggestions were made to make the performances better and more attractive, which were welcomed by the students. The practice of the students continued even on the day of the performance, before the start of the programs, to eliminate any deficiencies. In order to have a relatively accurate evaluation of the effectiveness of this method, 5 questions were designed from each topic and given to the students as a pre-test 15 minutes before the start of the program. Furthermore, to evaluate the effect of the performances, a post-test was given to the students after the last performance, and the findings were analyzed. The questions were extracted from the topics proposed in the performances. In order for the confounding factors to have the least effect on the actors, the matters related to the performance such as announcing the program, making arrangements with the command room, delivering and collecting questions, and logistics were assigned to other students. Previously, performing students also used some students outside this circle who had a theatrical background, including working in the theater, or had any artistic taste. All the programs started at the exact determined time.

The topics for this study included drug treatments for hyperlipidemia, parkinsonism, epilepsy, substance abuse and poisoning. Due to the incompleteness of the data on the topic of hyperlipidemia, some of the data analyses of this section are not included in the findings. All these topics were first taught by the instructor in a normal way in the respective classes, and then they were implemented by the students using the role-playing method. In stage design, students were completely free to perform and use any device that helped them learn (including passive electroshock device, examination bed, stethoscope and sphygmomanometer, IV stand, spraying equipment, etc.). Before each session in both methods, a number of questions were given to all participating students as a pre-test and after the teaching or performance, the same number of questions as a post-test. Furthermore, approximately one month after the last performance, at the same time as the final exam, the role-playing and memory level of the students were evaluated. The questions were moderate and high in terms of difficulty level and differentiation strength. In the last class, students were surveyed using the standard evaluation form of this method. 86 students (43 girls and 43 boys) participated in this survey. Fifteen people from the whole class were not present on the last day of class for some reasons. The findings obtained in areas such as remembering the material or memorizing the material were compared while a comparison was done between the grades before and after the conventional teaching and the role-playing pedagogy based on mean  $\pm$  standard deviation of the grades and relative frequency (%) in the tables. Comparison of grades was done between conventional teaching method and role-playing method before and after the experiment, as well as the data in both genders. The findings were analyzed with the help of paired T-Test and Chi-Square method, and  $p < 0.05$  was considered significant.

## Results

A total of 101 medical students who entered in 2016 (49 female and 52 male students with an average age of  $21.43 \pm 1.14$  years in the second semester of the physiopathology course) participated in this study. The data for all students were recorded in the last evaluation. In some stages of this study, a small number of students were not present for various reasons and the data were recorded in the relevant tables based on the number of people present in each stage.

The findings obtained on the day of implementation as well as the results of the evaluation and survey in the next stages are shown below. Table 1 shows the pre-test and post-test scores related to conventional teaching and role-playing teaching in the subjects assigned to the students, and Table 2 shows the same information based on the gender of students.

According to Table 1, the difference between the data of the pre- and post-tests, both in the conventional method and in the role-playing method, showed a significant difference in the anti-parkinsonism, anti-epileptic and poisoning groups. But it did not show a significant difference in drug abuse groups. However, no significant difference can be seen in the comparison between the mean difference of data before and after the final exam in the two methods. For better inference of the findings, the difference between the scores before and after the test was considered.

Moreover, no difference can be seen between the data of male and female students in the normal teaching method in any of the subjects. On the other hand, the findings of the role-playing group between girls and boys, except for the drug abuse group, showed a significant difference in the rest of the groups (Table 2).

Table 3 shows data analysis related to the students directly involved in the performance in the role-playing method and the students who participated as listeners in the performance sessions, separately for each subject. According to the findings in all cases, the students performing the roles got better grades than the rest of the students, and their difference was statistically significant in all groups except the anti-parkinsonism drugs group. The scores of students in the group of hyperlipidemia drugs and anti-epileptic

drugs were 100% even after more than one month and were not less than 83% in other cases, which is a sign of high memory level in this method. Furthermore, the analysis of the overall scores in 5 topics also showed that all the students involved in the role of hypothetical patient, student or doctor got better scores than the rest of the students in the same topics (88.15 vs. 59.71 out of 100). In other words, all role-playing students showed higher memorization and responsiveness compared to other students (Table 3). The results of survey among students also yielded important data (Table 4).

**Table 1. Comparison of the mean difference in scores before and after conventional teaching method and role-playing pedagogy according to desired subjects and the final exam in all subjects**

Study group	The difference between scores before and after the conventional method Mean±SD	The difference between scores before and after the role-playing method Mean±SD	p-value*
Antiparkinsonism	3.16±1.23	1.84±1.19	0.0001
anti-epileptic	3.01±1.21	1.74±1.23	0.0001
Drug abuse	2.86±1.08	3.06±1.22	0.304
Poisonings	2.89±2.46	2.46±1.05	0.015
Final exam in all the subjects	3.25±0.61	3.23±0.83	0.828

\*T-Test

**Table 2. Comparison of the mean difference of scores before and after conventional teaching and role-playing pedagogy according to gender of the students participating in the study**

Study group and gender	The difference between scores before and after the conventional method Mean±SD	The difference between scores before and after the role-playing method Mean±SD	p-value (Intragroup T-test comparison between two learning methods)	p-value (T-test comparison of the conventional method according to gender)	p-value (T-test comparison of the role-playing method according to gender)
<b>Antiparkinsonism</b>					
Female	3.11±1.22	1.46±0.73	0.00001	0.738	0.0009
Male	3.20±1.25	2.25±1.44	0.0032		
<b>Anti-epileptic</b>					
Female	2.98±1.23	1.21±0.69	0.00001	0.816	0.00001
Male	3.05±1.22	2.31±1.43	0.0032		
<b>Drug abuse</b>					
Female	2.75±1.01	2.99±1.09	0.308	0.393	0.629
Male	2.98±1.16	3.12±1.36	0.653		
<b>Poisonings</b>					
Female	2.71±1.20	2.81±1.06	0.697	0.171	0.001
Male	3.08±0.090	2.09±0.92	0.0001		

**Table 3. Comparison of the percentage of response (memory) of the five topics between role-playing students and other students in the final exams**

Subject	Response percentage by subject	
	Normal students	Performing students
Hyperlipidemia	62.5	100
parkinsonism	74.6	91.07
epilepsy	68.75	100
Drug abuse	56.73	83.33
poisonings	42.31	75
Total	59.71	88.15

76.74% of the students were generally satisfied with the implementation of this method and were willing to use this method for their education in the future. About 85% of these students said that this idea is useful for increasing medical skills. Moreover, 90.59% of the students agreed with the increase in personal efficiency such as self-learning in this method and the ability to organize and cooperate in group work. Based on the findings, 74% of the female students and 79% of the male students expressed satisfaction with the implementation of this method by their classmates (Tables 4, 5 and 6).

**Table 4. Overall evaluation of students' opinions about the role-playing program in learning medical pharmacology (n=86)**

Statements	Agree Number(%)	No idea Number(%)	Disagree Number(%)
The concept of role playing is new and attractive.	78(90.70)	3(3.49)	5(5.81)
By learning how to play a role, the students get a sense of satisfaction.	66(76.74)	13(15.12)	7(8.14)
Useful for learning medical skills.	73(85.88)	9(10.59)	3(3.53)
Increase the number of training sessions in this way.	47(54.65)	25(29.07)	14(16.28)
The role-playing method should be included in the medical pharmacology training program.	63(74.12)	16(18.82)	6(7.06)
I prefer the idea of using new methods of pharmacology education.	72(83.72)	10(11.63)	4(4.65)
I feel that the role-playing method has a serious effect on improving the level of education.	52(61.90)	25(29.76)	7(8.33)
I am interested in participating in this teaching method for pharmacology.	49(59.76)	25(30.49)	8(9.76)

**Table 5. Overall evaluation of female students' opinions about the role-playing program in learning medical pharmacology (n=43)**

Statements	Agree Number(%)	No idea Number(%)	Disagree Number(%)
The concept of role playing is new and attractive.	39(90.70)	3(6.98)	1(2.33)
By learning how to play a role, the students get a sense of satisfaction.	32(74.42)	8(18.60)	3(6.98)
Useful for learning medical skills.	38(88.37)	4(9.30)	1(2.33)
Increase the number of training sessions in this way.	24(55.81)	14(32.56)	5(11.63)
The role-playing method should be included in the medical pharmacology training program.	34(79.07)	8(18.60)	1(2.33)
I prefer the idea of using new methods of pharmacology education.	37(86.05)	6(13.95)	0(0.00)
I feel that the role-playing method has a serious effect on improving the level of education.	26(63.41)	12(29.27)	3(7.32)
I am interested in participating in this teaching method for pharmacology.	22(55.00)	15(37.50)	3(7.50)

**Table 6. Overall evaluation of male students' opinions about the role-playing program in learning medical pharmacology (n=43)**

Statements	Agree Number(%)	No idea Number(%)	Disagree Number(%)
The concept of role playing is new and attractive.	39(90.70)	0(0.00)	4(9.30)
By learning how to play a role, the students get a sense of satisfaction.	34(79.07)	5(11.63)	4(9.30)
Useful for learning medical skills.	35(83.33)	5(11.90)	2(4.76)
Increase the number of training sessions in this way.	23(53.49)	11(25.58)	9(20.93)
The role-playing method should be included in the medical pharmacology training program.	29(69.05)	8(19.05)	5(11.90)
I prefer the idea of using new methods of pharmacology education.	35(81.40)	4(9.30)	4(9.30)
I feel that the role-playing method has a serious effect on improving the level of education.	26(60.47)	13(30.23)	4(9.30)
I am interested in participating in this teaching method for pharmacology.	27(64.29)	10(23.81)	5(11.90)

The students' views on the features of this method, including improving the learning of the theoretical science of pharmacology, increasing their learning skills and their future application, increasing intimacy between classmates, etc., were also evaluated. Table 7 summarizes the opinions of all students participating in the survey about the characteristics of this method.

**Table 7. The opinions of all students about the characteristics of the role-playing method in teaching pharmacology course (n=86)**

Statements	Agree Number(%)	No idea Number(%)	Disagree Number(%)
Improving the learning of the theoretical science of pharmacology	63(73.26)	14(16.28)	9(10.47)
Increasing skill and efficiency in future professional experiences in the field of drug therapy	69(80.23)	14(16.28)	3(3.49)
Increasing intimacy between classmates and faculty cooperation	68(79.07)	15(17.44)	3(3.49)
Increasing personal efficiency such as self-learning, organizational ability, increasing cooperation in group work, etc.	77(90.59)	7(8.24)	1(1.18)
Successful implementation strengthens morale and motivates to continue working.	69(80.23)	14(16.28)	3(3.49)
Role playing is a practical method of learning in adults.	54(64.29)	28(33.33)	2(2.38)
This method facilitates communication between lecturers and students.	66(76.74)	13(15.12)	7(8.14)

The study groups used interesting examples to enhance the appeal of their topics. The students used a hypothetical patient (74-year-old retired teacher) as the beginning of their demonstration to show the on-off phenomenon, due to the change in response to levodopa in long-term use, which was well executed. The subject continued with other cases, including a case of falling in an elderly patient who took levodopa and had tuberculosis at the same time and took isoniazid (INH) and vitamin B6 drugs, which in its own way was an important case of drug interaction in parkinsonism. Holding a meeting of the medical commission to examine the condition of a 48-year-old mining engineer patient with symptoms of Parkinson's disease, performing a grand round with the presence of students wearing gowns of the relevant group and asking a number of students were part of the demonstration program of the group of anti-parkinsonism drugs. To have a greater impact, the students ended their topic with a beautiful clip of Muhammad Ali, the late boxing champion of the world, who was suffering from Parkinsonism, which was very effective. The use of special artistic effects, such as playing the sound of a real emergency department when presenting the cases, would have helped the viewer to pay more attention to the real atmosphere of the hospital. Moreover, in the case of pesticide poisoning, to make the scene look natural, the students used pesticide spraying tools and newly pruned shrubs of the university's horticulture department, which attracted the attention of the audience. In order to define the effects of drugs effective in cardiovascular shock, the students presented a case of suicide poisoning with narcotics and psychoactive agents, in which the victim experienced a cardiac shock with severe dysrhythmias. Code 99 was announced and at the same time irregular heartbeat graph and then asystole was shown on the screen. The use of an electroshock device and the injection of resuscitation drugs are demonstrated.

Obstacles and problems usually arise in the implementation of new teaching methods. The students participating in the survey were asked about the hindering factors or problems and obstacles to the implementation of this method, the findings of which are briefly shown in Table 8.

**Table 8. Impeding factors or implementation problems regarding the implementation of medical pharmacology education by role-playing method according to students (n=86)**

Statements	Agree Number(%)	No idea Number(%)	Disagree Number(%)
I got used to the traditional teaching method.	44(52.38)	19(22.62)	21(25.00)
There is no proper planning to play the role.	30(35.29)	28(32.94)	27(31.76)
The implementation of this method is time-consuming.	42(50.00)	23(27.38)	19(22.62)
Role playing makes me anxious.	26(30.59)	24(28.24)	35(41.18)
It is hard to organize in this way (role playing).	33(39.29)	22(26.19)	29(34.52)
Although I am personally interested in this method, my classmates do not show enthusiasm to accompany me in this method.	17(20.48)	34(40.96)	32(38.55)
The role – playing method in education is a waste of time.	9(10.47)	24(27.91)	53(61.63)

At the end, to make the study more interesting, the students of the class were asked to introduce the best in each of the roles, and based on the students' votes, the best role of the patient was awarded to anti-parkinsonism drugs, poisoning and drug abuse groups. In addition, the best role of student and assistant was presented from the group of anti-parkinsonism, hyperlipidemia drugs and drug abuse group, and the best role of doctor was jointly awarded to the groups of anti-epileptic drugs and drug abuse. Finally, the students of the class introduced the group of anti-parkinsonism drugs as the group that had the greatest impact on



learning the relevant topic, and in total, the performance of the drug abuse group was identified as the best performance of all 5 groups.

## Discussion

The findings of this study showed that role-playing pedagogy was able to attract the attention of students in a significant way. In this method, students showed more enthusiasm to participate in educational programs. This method showed a greater effect especially in the students who were directly involved in the performance, and obviously they obtained higher grades compared to other students in the final exams of the same subjects.

After so many years since the beginning of medical education, the traditional methods of medical education have still maintained their position (2). Nevertheless, despite the possible benefits of these methods, its efficiency, especially in the long term, has been questioned for years (7, 17). One of the main goals of the medical field is skill enhancement, which may not be achieved easily during the study of this field with traditional methods of education. For this reason, since the past years, the approach of educators and authorities of medical education has been directed towards flipped learning methods, including student-centered learning methods (9, 27). The implementation of these methods increases the enthusiasm of learning in the learner (16, 18, 19, 28). One of these student-centered methods, for which a lot of efficiency has been expressed, is role-playing pedagogy model. The present study, for the first time in the country, has examined and challenged the role-playing method in teaching medical pharmacology topics. For the successful implementation of this method, important points should be noted. First, learners should be well explained about this matter and its importance. This task was fully explained to all participants at the beginning of the implementation of this method in this study. The next important thing is to choose a subject that is suitable for this work. In other words, since playing a role is a kind of stepping in the field of acting, therefore, subjects should have enough ability to act. The next thing is to write a complete scenario of execution methods in a step-by-step manner so that the participant can perform all the steps well. In this study, a complete scenario was written for each subject by the role-playing students themselves. Another important and essential point is the high enthusiasm of the students themselves. In the present study, it has been determined that the satisfaction for the implementation of these methods among students is generally more than 76%. In other studies, a high level of enthusiasm and satisfaction in the implementation of this method has been reported by the learners (29-31). A significant part of clinical medical education is the acquisition of therapeutic skills. More than 85% of the students participating in this study admitted that implementing this method increases their skills. This finding is in line with the findings of other studies (32, 33). Despite the fact that the students in the final evaluation wanted to include such training programs in the medical education curriculum (74.12%), but less than 55% wanted to increase these training sessions and use them instead of traditional methods. Perhaps the main reason for this is that since in this process, students are directly involved in their education, preparation for the implementation of the method is a difficult, expensive and time-consuming task from their point of view. But, in comparison, traditional methods are much easier and less expensive to implement. However, a significant percentage of students (83.72%) preferred this new idea for learning lessons.

In this study, the comparison of pre- and post-test findings of topics such as anti-parkinsonism drugs, anti-epileptic drugs and poisoning showed a significant difference. Despite the attractiveness of the dramatic nuances of substance abuse, this significant difference was not seen. To interpret this, it may be helpful to note that topics such as epilepsy or parkinsonism are more interesting for memorizing their information due to the variety in action, or perhaps the way the respective role-players play is more memorable to students.

For example, in the group of anti-parkinsonism drugs, the show started with a typical case of on-off phenomenon caused by long-term use of levodopa (L-dopa) (34). Furthermore, in other groups, special video and audio effects were used. These tricks were attractive in their own way and made the audience focus more on the performance. In the surveys, these items attracted the attention of the audience. Such show tricks were often chosen and performed by the students themselves, which in fact, methods such as role-playing, facilitate the emergence of their individual and group creativity. According to the above cases and examples, the effectiveness of the subjects that are accompanied by these dramatic effects will definitely increase.

The factor of gender was also considered in this study. No significant difference was observed in the comparison of the normal test scores between girls and boys in any of the selected subjects. But this comparison showed a significant difference between female students and male students in the rest of the subjects, except for substance abuse. The mean score of the role-playing method among girls was higher than that of boys in the subject of poisonings, and boys scored higher in anti-parkinsonism and anti-epileptic drugs. Perhaps this can be explained by the fact that subjects like epilepsy and Parkinsonism are basically associated with more action and usually boys look for more excitement than girls. Maybe for this reason, the change in the above scores was seen.

One of the important points in this study is that people who were directly involved in the performance showed a higher level of memorization of the topics. After about a month after the performances, people directly participating in the performance showed more than 88% memory, while this number was 59.71% in other participants. This finding shows that engaging in role playing or immersing in the assigned role can stabilize the lesson in the mind to some extent. Other studies also presented similar reports in this case (35-37). In the final evaluation, more than 90% of the students agreed with the increase in personal efficiency such as self-learning in this method and the ability to organize and cooperate in group work. Naturally, when a person learns a subject to teach, learning is more effective (38-41). This issue itself is a reason for the claim that for better performance, students are required to self-study, and this can be another reason for the effectiveness of the role-playing method. In various components, there were minor differences between the opinions of male and female students, none of which were statistically significant. For example, the final level of satisfaction with the implementation of this method was 74% in girls and 79% in boys, which again, the difference was not significant. In other words, regarding the level of satisfaction with this method, both genders almost had the same opinions. More than 73% of all students participating in the final evaluation of this study found this method effective in improving the theoretical science of pharmacology. This finding regarding the impact on learning has been emphasized before (42, 43).

In addition, nearly 80% of the students considered the implementation of this method, which requires interactions between them, to be effective in increasing the intimacy between classmates. It is natural that in the conditions of lack of educational motivation which our educational system is affected by, the existence of such programs can be effective in creating enthusiasm for cooperation and increasing the exchange of information and conflict of scientific opinions. This issue was seen many times in the rehearsals before the performance, in which the students discussed with great passion and excitement and had a sincere conversation with each other to present a better performance. In this case, previous studies also approve this (27). Perhaps one of the most important problems today is the lack of proper communication between the instructor or lecturer on the one hand and the students or learners on the other hand. These methods can improve these relationships. The result of the evaluation is a proof for this claim and more than 76% of the students admitted that this method can improve this communication.

Naturally, any method will face problems. The biggest obstacle in this case is the existence of traditional education systems, which is a big barrier against any educational reform, especially in medical sciences.

Many students and teachers are used to old traditional methods that have low efficiency and productivity, and it is hard for them to separate from that environment. On the other hand, the annual increase in the number of students in the fields of medical sciences, whose order is communicated by higher departments, is further explained in this regard. Maybe the new methods of medical education can be implemented well with a quarter of the current capacity, but with a large number of students, their implementation will actually be delayed and expecting any changes in education in a short period will be futile. Basically, these methods require high accuracy and patience from teachers and people who are interested in implementing them. These methods are time-consuming and costly. Students should spend enough time and be diligent in this way. But it should also be noted that if these methods become part of medical education curricula, or at least part of the subjects taught with such methods, they will definitely prove their effectiveness. Considering that clinical courses of medical education have potentially enough conditions to play the role, the impact of this training method can be high. Studies such as the present study and similar studies have well proven the effectiveness of such methods. Especially, the influence of the role-playing method among other student-centered educational methods in consolidating the instructed information of clinical medical sciences has been found to be at its highest level.

In this study, it was found that the implementation of the role-playing method to teach topics of medical pharmacology has a positive effect on learning. Furthermore, this method increases students' desire to learn and confirms their efforts to acquire skills in related clinical fields. It should be noted that real transformation in medical education is necessary and should be based on the needs of society. Teaching by role-playing method by the learners themselves and with the guidance of an experienced trainer or instructor increases the motivation for their learning and is one of the most effective methods of learning and it improves consolidation. Especially in difficult courses with high content variety, voluminous and widely used for professional activities including pharmacology, the implementation of such methods not only helps them learn better, but also encourages them to maintain enthusiasm and increase motivation to learn more and consolidate what they have learned. It is suggested that the development of regulations for teaching clinical courses in medical sciences using new methods such as role-playing pedagogy should be taken into consideration by the authorities of medical education. The professional and main task of all of us is to facilitate and follow up to stabilize such methods in teaching medical science courses, so that students can participate in their education process with great enthusiasm along with better learning of materials and skills. **Conflict of interest:** The authors declare that there was no conflict of interest in the implementation and publication of the findings of this research.

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