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Original Article

Gamification in obstetrics and gynecology residency education: effects on resident engagement and satisfaction in a quasi-experimental study

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Abstract

Background & Objective: Most obstetrics and gynecology surgical residency training programs traditionally include periodic training sessions, lectures, and training in the operating room. Using engaging and effective teaching methods is very important for residents. The aim of this study was to investigate the effect of gamification of monthly training sessions on the engagement and satisfaction of obstetrics and gynecology residents.

Materials & Methods: This quasi-experimental within-subject study with a fixed intervention order was conducted among 34 obstetrics and gynecology residents at Yas Hospital Complex, Tehran, Iran. All residents participated in 10 gamified and 10 traditional lecture-based training sessions. Engagement was assessed using the 23-item Student Course Engagement Questionnaire, and satisfaction was assessed using a researcher-developed 12-item questionnaire. Paired-samples t-tests were used to compare engagement and satisfaction scores between the two training formats.

Results: Thirty-one residents completed the engagement questionnaire and 30 completed the satisfaction questionnaire. Engagement scores were higher following gamified training than traditional training (96.58 ± 12.08 vs. 75.77 ± 21.42; mean difference = 20.80, $p < 0.001$, Cohen's d = 0.971). Similarly, satisfaction scores were higher following gamified training than traditional training (52.03 ± 6.39 vs. 44.36 ± 11.56; mean difference = 7.66, $p = 0.001$, Cohen's d = 0.66). No significant differences in the magnitude of change in engagement or satisfaction were observed across residency years ($p > 0.05$).

Conclusion: Gamified training was associated with higher self-reported engagement and satisfaction than traditional lecture-based training among obstetrics and gynecology residents. Gamification may therefore be a useful complementary approach for residency education, although the fixed intervention order and differences in session topics warrant cautious interpretation of the findings.

Keywords: obstetrics and gynecology department, hospital; gamification; internship and residency; learning; personal satisfaction

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Introduction

The problems of learning, engagement, and satisfaction of learners are known as important educational obstacles in various educational scenarios, the scope of which has also reached university degrees [1]. Therefore, a professional look at the category of education is very necessary due to the increasing growth of technical knowledge in the field of medical education [2]. Today, teaching medical students with advanced technologies and emerging multimedia actively encourages them to gain a better understanding of the disease and adapt to new information [3, 4]. The use of active engagement and game-making methods allows learners to discover important educational concepts and understand them better [5]. Also, these approaches can increase their confidence and improve their performance [6]. One of the strategies to improve learning and active engagement is gamification [7, 8]. Gamification refers to the use of game design elements in non-game contexts, which can be useful by increasing motivation, attractiveness and maintaining interaction with educational content, and have a positive effect on learners' satisfaction [9]. As an effective educational tool, this method increases the quality of education and creates a sense of competition in the target society by creating enthusiasm in the learners [10]. It also has the potential to transform knowledge and educational content into personalized knowledge to enable users to solve problems actively or interactively. In this way, the compatibility of games with active and effective methods has gradually caused the increasing interest of learners to use gamification in education [11]. Often, due to the time gap between the education of medical students and the beginning of the residency, a large part of the knowledge is forgotten and many residents start clinical training in this field with a limited understanding in advance [12]. Most of the training programs of the residency period also include retraining through periodic training classes, lectures and training in the operating room. Therefore, the time limit and maintaining the safety of the patient often limit the provision of adequate training in the operating room; because a complete and comprehensive understanding of obstetrics and gynecology surgery requires adequate time and a lot of experience [13]. On the other hand, it seems that with the use of traditional educational methods in the residency period, educational motivation among learners has decreased [14]. For this purpose, in order to create an efficient and effective connection between theoretical learning and clinical medicine in these residents, today it has been tried to use new educational methods such as using group, interactive or gamification methods [15]. Studies have been conducted with the aim of investigating the effectiveness of various gamification methods in medical science training. In a review study conducted by Neubacher et al. to investigate the improvement of medical education with the gamification method, they identified a diverse set of studies that confirmed the use of gamification in medical training. These studies demonstrated the potential of game-based learning to increase knowledge retention, practical skills, and learner engagement at various educational levels, from medical students to practicing physicians [16]. In Iran, the method of gamification was also evaluated in the study of Shahri et al.. In this study, gamification was considered as a combination of entertainment aspects and concepts in a formal environment in order to engage people and improve the recall of specific knowledge. This research showed that game-based approaches have the potential to be used both as an educational tool and as summative or formative assessment in education [17]. However, a review of the existing literature shows that gamification-based training has not been implemented at the educational level of medical science residents, nor has training using game elements such as clinical education with the help of photos and videos, earning points, rewards, comparison with peers, and a relative sense of competition between residents. On the other hand, replacing traditional educational methods with gamification methods still faces many challenges in different countries due to economic and cultural considerations. Therefore, this research gap prompted us to fill the knowledge gap in the existing literature by applying game elements to a group of specialized residents in the clinical field of obstetrics and gynecology and examining its effectiveness compared to traditional educational methods. In addition, conducting this research can provide us and the research community with very useful information about the effectiveness of this educational method on learners with specialized education levels. The present study examines the hypothesis that game-based training can improve the engagement and satisfaction of obstetricians and gynecologists because this method is derived from employing all the components of a game and entertainment environment and incorporating it into real-world teaching and learning. The most important question raised in this study is what effect gamification training has on the engagement and satisfaction of

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obstetrics and gynecology residents in monthly training sessions. Therefore, the present study aimed to investigate the effect of gamification of monthly training sessions on the level of engagement and satisfaction of a group of specialized residents in the clinical field of obstetrics and gynecology surgery, compared to traditional training methods.

Materials & Methods

Design and setting(s)

The present study was a quasi-experimental within-subject repeated-measures study with a fixed intervention order design, which was conducted from September 01, 2024 to July 01, 2025 on obstetrics and gynecology residents at Yas Hospital Complex in Iran.

Participants and sampling

Participants in this study were residents in obstetrics and gynecology surgery in 4 residency courses (first to fourth year). Inclusion criteria included individuals who were studying in a 4-year residency in obstetrics and gynecology surgery and participated in the study with informed consent.

The exclusion criteria were unwillingness to continue participating in the study and failure to participate in evaluations at any stage of the study. Since the total number of residents studying in this hospital complex was 40 (first year: 12, second year: 8, third year: 10, fourth year: 10). Of these, 34 (85%) participated in this study, and sampling was done using the census method (**Figure 1)**.

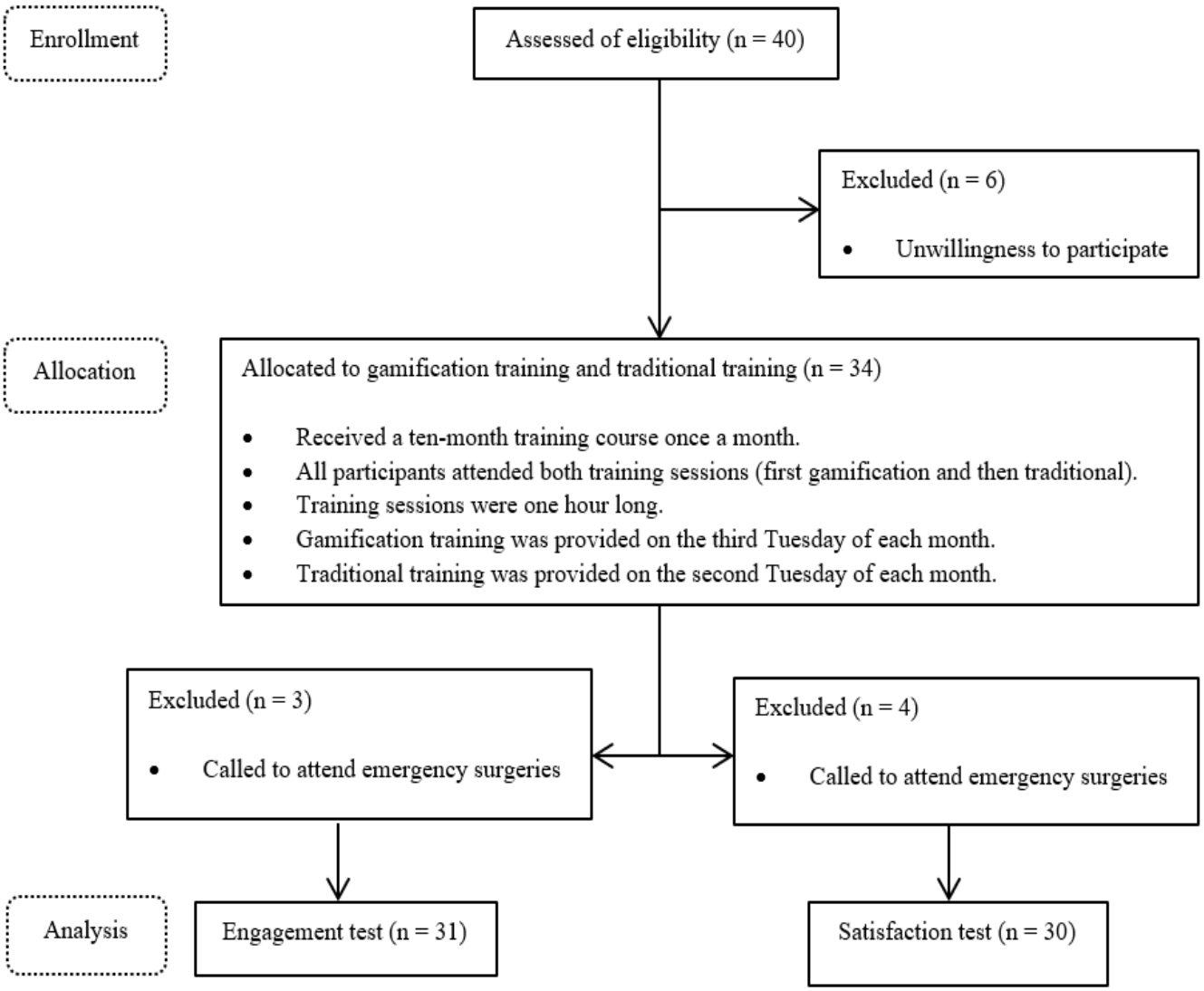

Figure 1. Flowchart diagram of the study

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Tools/Instruments

Two questionnaires were used to assess residents' engagement and satisfaction with the gamified and traditional training sessions. Both questionnaires were administered at the end of the study, and participants rated each training format separately.

1. Engagement measurement tool: The Student Course Engagement Questionnaire (SCEQ), originally developed by Handelsman et al., was used to assess residents' engagement. The questionnaire asks respondents to indicate the extent to which the behaviors, thoughts, and feelings described in each item reflect their own experience. The 23-item questionnaire is rated on a 5-point scale ranging from "very low" to "very high" and covers four dimensions: skills engagement (Cronbach's $\alpha = 0.82$), emotional engagement (Cronbach's $\alpha = 0.82$), participation/interaction engagement (Cronbach's $\alpha = 0.79$), and performance engagement (Cronbach's $\alpha = 0.75$). The original study also reported correlations between the four dimensions ranging from 0.23 to 0.44, supporting their discriminant validity [18].

2. Researcher-made satisfaction questionnaire: A researcher-made 12-item questionnaire was used to assess residents' satisfaction with the educational sessions. The questionnaire addressed different aspects of the sessions, including the appropriateness of information provided about session times, the way the sessions were conducted, the variety of topics presented, additional explanations provided by professors, the compatibility of the presented materials with the relevant references, the perceived impact of the sessions on clinical performance, the relevance of the materials to the scientific level of the training course, the appropriateness of the time allocated to the sessions, residents' interest in participating in the sessions, the way residents presented the topics, the contribution of the sessions to improving the quality of education, and residents' willingness to use the educational method in future educational planning.

Each item was scored on a 5-point scale ranging from 1 to 5 (1 = very low, 2 = low, 3 = moderate, 4 = high, and 5 = very high). The total score was calculated by summing the scores of all 12 items, with higher scores indicating greater satisfaction with the educational sessions. The psychometric properties of the researcher-made questionnaire were evaluated before its use. For qualitative content validity, the items were reviewed by three obstetricians and gynecologists, who provided comments on the content, grammar, and sentence structure. Quantitative content validity was assessed using the Content Validity Ratio (CVR) and Content Validity Index (CVI). Test–retest reliability was assessed by administering the questionnaire to 12 residents on two occasions with a 10-day interval between administrations. The test–retest correlation was $r = 0.825$ ($p < 0.001$). Internal consistency was assessed using Cronbach's alpha, which was 0.798 for the questionnaire. These findings indicated acceptable reliability of the researcher-made questionnaire for assessing residents' satisfaction with the educational sessions.

Data collection methods

At the beginning of the study, in a meeting, the researcher explained the purpose and procedure of the study to the residents. They were also informed that participation was voluntary and that their information would remain anonymous. Then, all research samples completed the informed consent form. Subsequently, educational content in the two sub-disciplines of perinatology (maternal and fetal medicine) and infertility was presented to all learners.

Both types of sessions were conducted over a 10-month period, and gamification sessions always preceded traditional sessions. One-hour gamification training sessions were presented on the third Tuesday of each month, and traditional lecture-style training sessions were presented on the second Tuesday of each month. For example, the first gamification training session was held on September 05, 2024 (the first Tuesday of September) and the first traditional training session was held on September 12, 2024 (the first Tuesday of September). Similarly, for ten consecutive months, the trainings with the following content were presented to the residents in the same fixed order.

Educational content: The educational objectives included 20 scientific topics from the essential educational requirements of obstetrics and gynecology residents (in accordance with the approved curriculum) in the two sub-disciplines of perinatology (maternal and fetal medicine) and infertility, which were selected by the professors of this field.

Gamification-based training: In this study, elements such as visual training (clinical training with the help of photos and videos), earning points, rewards, comparison with peers, and a relative sense of competition between residents were used for gamification training. First, a group was formed in social media with the presence of all residents and professors. In the first step, ten residents volunteered and, based on personal interest, selected one of these topics related to the educational content (5

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volunteers on perinatology topics and 5 on infertility). Under the supervision and guidance of the participating faculty members, the volunteer residents prepared 10 questions at Bloom's taxonomy levels 3 and 4 in the form of clinical scenarios incorporating relevant photographs and videos from their selected topics.
At the beginning of each gamified training session, questions related to the selected topic were provided to the residents, who were asked to answer them within 20 minutes. After completing the test, the answer sheets were collected; then the session continued for an hour with detailed presentation of the answers, review of the material related to each question, and discussion and answering the participants' questions. After the professors corrected the answer sheets and calculated the points earned by the residents, as another element of the game, after the answer sheets were scored, the four highest-scoring residents within each residency year were identified separately, and to create motivation and a sense of competition among peers, the names of the top residents and the scores earned were announced in the virtual group.
This process continued regularly and monthly until the end of ten tests. After the training sessions were completed, the top 2 from each year of residency (8 people) who had achieved the highest scores in a total of 10 tests were selected and, as a reward, 5 points were added to the end-of-year intra-departmental score of this group of residents. Next, the same selected residents were randomly divided into two groups of four (one from each year of residency). Another test was held between these two groups in the form of a competition with ten questions posed by the project's implementing professors. The time to answer these questions was also 20 minutes. After collecting the answers, the answers were discussed and reviewed again, and prizes were awarded to the top group (4 residents) who had earned the highest scores.
Traditional training: In the traditional method, training was delivered solely through lectures, hour-long slide presentations by faculty to residents, and question-and-answer. The goal of this teaching style was to encourage residents to think critically about problems and find independent solutions. Thus, all residents first received educational activities in a gamified format in one session, which included presenting educational content in the form of questions in the form of a clinical scenario containing photos and videos, as well as rewards for those who achieved better scores. Then, all residents received another session of educational activities designed using traditional learning methods, such as lectures and questions and answers. On the other hand, blinding was not possible in this study, because both participants and instructors were aware of the type of sessions (gamification or traditional). The number of training sessions using the gamification method and traditional training was 10 times each. Also, the topics presented in each session were specific to that session and there was no overlap between the topics presented in the monthly sessions.
To assess the level of engagement and satisfaction of the residents with traditional and gamification training in this study, two questionnaires were distributed to all participants at the end of the course, and they were asked to adhere to ethical standards when answering the questionnaire questions so that the objectives of all sessions of both traditional training and gamification training could be assessed separately for both questionnaires. Of course, in this study, the method of assessing the participation and satisfaction of the residents was the same for all participants in the study. After completing the questionnaires, the data was collected and saved in an Excel file.

Data analysis

After data cleaning and coding, the data were analyzed using SPSS version 24. Descriptive statistics, including means and standard deviations, were calculated for the engagement and satisfaction scores under each training condition. Paired-samples t-tests were used to compare engagement and satisfaction scores between gamified and traditional training. One-way analysis of variance was used to examine whether the magnitude of change in these outcomes differed across residency years. Thus, the variable entered into the one-way analysis of variance was exactly the difference between the gamification and traditional scores. Cohen's d was used to determine the effect size, which was calculated by dividing the mean difference by the standard deviation of the difference scores. To examine the residents' questionnaire scores more closely based on academic year, a separate descriptive analysis was performed, and the descriptive results were compared between and within groups of different academic years using the one-way analysis of variance test. For all tests, $P<0.05$ was considered significant.

Results

Among the 34 participating residents, 12 were first-year, 6 were second-year, 7 were third-year, and 9 were fourth-

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year residents. Despite the presence of all residents in the training sessions, some residents were unable to complete some questionnaires due to being called to attend emergency surgeries at the hospital and were excluded from the study at the final stage. Ultimately, 31 people (91.18%) completed the engagement questionnaire and 30 people (88.24%) completed the satisfaction questionnaire. The descriptive results of the scores and Paired T-test of the two questionnaires are shown in **Table 1**.

Table 1. Descriptive statistics of scores, and paired T-test

					Paired t-test		
		n	Mean	SD	Mean	Sig.(2-tailed)	Effect size
Pair 1	Engagement- Traditional Q.	31	75.77	21.42	20.80	0.000	0.971
	Engagement- Gamification Q.	31	96.58	12.08			
Pair 2	Satisfaction- Traditional Q.	30	44.36	11.56	7.66	0.001	0.663
	Satisfaction- Gamification Q.	30	52.03	6.39			

Note: A paired t-test was employed to compare the two teaching methods among the same participants. Mean differences were computed by subtracting the gamification scores from the traditional scores; hence, negative values reflect higher scores for the gamification approach. A 95% confidence interval was considered for the mean difference.
Abbreviations: n, number of participants; SD, standard deviation; Sig., statistical significance; Q, questionnaire.

The engagement scores were significantly higher after gamified training than after traditional training (96.58 ± 12.08 vs. 75.77 ± 21.42, respectively; mean difference = 20.80, $p < 0.001$, Cohen's d = 0.971). These findings indicate higher self-reported course engagement following the gamified sessions.

Similarly, satisfaction scores were significantly higher after gamified training than after traditional training (52.033 ± 6.39 vs. 44.36 ± 11.56, respectively; mean difference = 7.66, $p = 0.001$, Cohen's d = 0.663). These findings indicate greater self-reported satisfaction following the gamified sessions. To further examine whether the magnitude of change differed according to residency year, a separate analysis was conducted, as presented in **Table 2**.

The comparison of descriptive results between groups of different academic years using the analysis of variance test is shown in **Table 3**.

One-way ANOVA showed no statistically significant differences in the magnitude of change in engagement or satisfaction scores across residency years ($p > 0.05$), suggesting that the observed differences between training formats did not significantly vary by residency year.

Table 2. Descriptive statistics of questionnaires scores by academic year

	Academic years	n	Mean	SD	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Engagement- change	1	11	20.54	19.80	7.23	33.85
	2	5	19.60	17.99	-2.74	41.94
	3	7	20.42	17.53	4.20	36.64
	4	8	22.25	32.54	-4.96	49.46
	Total	31	20.80	21.98	12.74	28.87
Satisfaction- change	1	11	6.81	11.15	-0.673	14.31
	2	5	6.80	6.64	-1.45	15.05
	3	7	8.85	12.99	-3.15	20.87
	4	7	8.42	12.06	-2.73	19.58
	Total	30	7.66	10.72	3.66	11.66

Note: Values represent the mean change in questionnaire scores between gamified and traditional training, with corresponding 95% confidence intervals. A 95% confidence interval was considered for the mean difference.
Abbreviations: n, number of participants; SD, standard deviation.

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Table 3. ANOVA for group comparisons

		Sum of squares	df	Mean square	F	Sig.
Engagement- change	Between Groups	25.697	3	8.566	0.016	0.997
	Within Groups	14479.142	27	536.265		
	Total	14504.839	30			
Satisfaction- change	Between Groups	25.659	3	8.553	0.067	0.977
	Within Groups	3307.008	26	127.193		
	Total	3332.667	29			

Note: One-way analysis of variance test was used to compare the means between and within groups of different years of residency. A 95% confidence interval was considered for the mean difference.
Abbreviations: df, degree of freedom; F, F- distribution; Sig., statistical significance.

Discussion

The present study compared self-reported engagement and satisfaction following gamified and traditional training among obstetrics and gynecology residents. Our findings showed that a gamified approach to training was associated with both higher engagement and greater satisfaction among residents in the learning environment compared to traditional training. The results obtained are consistent with previous research that considers gamification to be effective in medical education [19–21]. The higher engagement scores following gamified sessions may reflect an association between the gamified training format and self-reported engagement. However, given the fixed intervention order and differences in session topics, this difference cannot be attributed exclusively to the instructional format. This is consistent with the results of Elliott et al. These researchers conducted a study of medical residents, tracking their engagement in their weekly attendance at an internal medicine residency program using the gamification method "The House Cup." In this method, they implemented a longitudinal, point-based game that encouraged residents to participate in training with positive reinforcement. They then added graduated positive reinforcement and positive punishment to the game. The results of this study showed a greater number of residents participating in the gamification method to attend and maintain educational compliance requirements. However, longitudinal gamification was not significantly associated with improving residents' understanding of educational sessions [22]. Also, in a review study conducted by Neubacher et al. to investigate the improvement of obstetrics and gynecology education through gamification, they identified a diverse set of studies that, in line with our study, had confirmed the use of gamification in obstetrics and gynecology education. These studies demonstrated the potential of game-based learning to increase knowledge retention, practical skills, motivation, satisfaction, and engagement of learners at various educational levels, from medical students to practicing physicians [16]. In a review study by Xu et al. on game-based learning content in medical education, the use of gamification was also mentioned as an important supplement to residency medical education programs. These researchers also found that resident medical students were less motivated to participate in traditional classes and that in most cases; gamification was able to change the boring traditional formats of teaching activities [23]. Manzano-Leon et al. also believe that in higher education, teaching is mainly educational in nature; therefore, the instructor who takes the lead should not passively present knowledge and materials to students, but should encourage them to receive and remember information.

However, new educational trends emphasize the combination of methods that allow for the engagement and active role of the learner in their own learning. As a result, gamification is considered a tool to motivate students during the learning process. These researchers concluded that gaming can act as an attention activator and complement standard teaching methods [24]. Therefore, gamification-based education, combined with repeated studies at specific intervals, may gradually become an optimal complementary method for motivating postgraduate medical students and be effective in revealing the benefits of modern education in promoting retention of clinical understanding and greater learner engagement. In contrast to the study by Driessen et al. [25], in which adding gamification elements to a web-based clinical registry did not significantly improve clinicians' engagement or involvement, our intervention used relatively simple elements, including clinical scenarios with photographs and videos, points, and rewards. These elements were integrated into routine educational sessions without requiring a separate technological platform or substantially disrupting residents' clinical activities. The relative simplicity of the

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intervention may facilitate its implementation in residency education.

Furthermore, our findings indicate that residents' satisfaction with gamification training was associated with more items, as evident in the difference between questionnaire scores. This is consistent with the study by Karimian et al. who found that gamification is an effective method for increasing medical students' knowledge, skills, and satisfaction. In their research, they uploaded educational content using images, text, and tables to the "Quiz-maker" platform. They then introduced students to a competitive gamification environment and a predetermined learning path. On this platform, students could earn points by answering questions correctly, thereby increasing their scores. In addition, by completing questions related to each chapter, they could upgrade their level and receive additional incentive packages [26]. Therefore, using gamification in educational environments may have benefits in terms of learner satisfaction, by engaging them in the learning process and increasing their enjoyment of learning by creating a motivating environment.

In line with our study, Asadzandi et al. found it important to consider the underpinnings of learning theories for gamification. They believe that these theories enhance satisfaction and improve skills such as problem solving and critical thinking [27]. Singhal et al. also believe that gamification as an effective educational tool increases the quality of education, creates motivation and enthusiasm, and promotes a sense of competition in the target community. In their opinion, creating a competitive environment through individual play or discussion and deliberation in different groups is a powerful tool in improving the learning process, memorizing material, and increasing motivation and satisfaction [19]. In our study, it seems that gamification, by targeting the knowledge and skills of residents, was able to convey educational concepts to learners through elements such as images, videos, feedback, and rewards. In this method, learners are faced with challenges that increase their skill and satisfaction through correct decision-making.

Maryam et al. evaluated game-based learning in student education in a study. In this study, like our study, the games were designed in accordance with educational objectives and in line with the course content, but the type of gamification was different. In the implementation, these researchers used cards containing disease slides that had to be played wordlessly by a group of students and guessed by the other group and a creative sentence made from it. The results of this research, consistent with the findings of our study, showed a significant increase in motivation, participation, and satisfaction among students in the gamification-based educational method [28]. Therefore, it seems that using simple but creative methods such as gamification can provide education to learners in a more effective and engaging way. However, choosing the right games, precise timing for implementation, and proper management of training classes should not be overlooked.

In the present study, limitations and obstacles can be pointed out, such as the research population being limited to residents studying at Yas Hospital Complex in Iran, which makes it difficult to generalize the results to other populations. The fixed order effect of holding sessions (always gamification training first, then traditional training) is also an important limitation of the present study. Moreover, because gamified sessions always preceded traditional sessions and the topics differed across sessions, the effects of intervention order, session timing, and topic characteristics cannot be completely separated from the effect of the instructional format and the observed difference cannot be attributed solely to differences in teaching methods, as the type of intervention may be confounded by the order in which the session was held and the teaching topic. Also it is possible that the residents obtained higher scores due to the novelty of the gamification method, fatigue from traditional sessions, or learning the material presented in traditional sessions that affected performance in gamification sessions. The absence of pre-intervention measurements and the impossibility of blinding participants and instructors were additional limitations of the study. Also, despite the presence of all residents in the training sessions, some residents were not able to complete some questionnaires due to being called to attend emergency surgeries at the hospital, and were excluded from the study at the final stage. Despite these limitations, this study provides preliminary evidence regarding the use of gamification to support engagement and satisfaction among obstetrics and gynecology residents. However, given the impact of various variables on the effectiveness of gamification training, further research in this field is necessary.

Conclusion

The findings of the present study indicate that gamified training was associated with higher levels of self-

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reported engagement and satisfaction than traditional training among obstetrics and gynecology residents. Game elements such as clinical scenarios, photographs and videos, points, rewards, and peer comparison may provide a practical way to increase learner engagement and satisfaction in residency education. However, because the intervention order was fixed and the topics differed across sessions, the findings should be interpreted cautiously. Future studies using randomized or counterbalanced designs and standardized outcome assessments are warranted to further evaluate the educational value of gamification in residency training.

Ethical considerations

The objectives of the study were explained in detail to the study participants. Demographic information and study data were collected from participating residents after obtaining informed consent and voluntary agreement to participate. Also, all information remained confidential and the results were published anonymously and for statistical purposes only. Ethical approval for the study was obtained from the Ethics Committee of Tehran University of Medical Sciences with code: 74157 (Ref No: IR.TUMS.MEDICINE.REC.1404.394). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Artificial intelligence utilization for article writing

No Artificial Intelligence (AI) tools were used in the writing or preparation of this manuscript. All content, interpretations, and conclusions were developed by the authors.

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Conflict of interest statement

The authors declare no conflicts of interest.

Author contributions

BS and ME conceptualized and designed the study; AM and DS performed the statistical analysis; MA, BS, and FG designed and prepared the questionnaires; BS, FG, NS, ZS, and PN collected and curated data; ME, MA, and DS wrote the manuscript. All of the authors reviewed the results and approved the final version of the manuscript.

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Data availability statement

The data are available from the corresponding author upon reasonable request.

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