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The impact of an educational game on rational drug use and society's attitudes towards the role of nurses

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ABSTRACT

Introduction and aim. Despite critical role of nurses in managing medication[1], public perspectives of the role nurses play in rational drug use is still unclear. The study aimed to asess the impact of the "HEALTHgain" game, an educational tool, on enhancing individual comprehension of proper medication usage and their perceptions of the significance of the contributions of nurses in society.

Material and methods. This pretest-post-test, randomized control study took place betweenn May and November 2022 in Turkey. Two-hundred and thirty seven individuals aged 18 years and above were recruited.

Results. The "HEALTHgain" game had a noteworthy impact on the knowledge of rational drug usage ($F(1)=45.739$, $p<0.001$) and attitudes of society towards a nurse's role in rational drug use between the baseline and end measurements after 14-day of playing the game ($F(1)=283.434$, $p<0.001$). Morover, there were a significant improvement in both intervention and control group knowledge level of rational drug use between the initial and final assessments after a two-week period of game play, though it had not been presented in any table ($t=-3.824$, $p<0.001$ for control group; $t=-35.492$, $p<0.001$ for intervention group).

Conclusion. The study recommends that enhancing the game through contributions from various disciplines could elevate the rational use of medical knowledge and positively influence individual attitudes toward the role of nurses.

Keywords. Attitude, drug, medicine, nursing practice, public health policy

Introduction

The use of medications in the prevention and treatment of diseases significantly contributes to overall wellbeing and good health.[1,2] According to estimates, a minimum of 50% of medications are being prescribed and marketed in an improper manner, and a substantial 50% of individuals are not adhering to their prescribed medication regimens. Not following the prescribed dose of medicine not only poses a threat to one's health, but also results in a waste of limited resources.[3] The utilization of medications in a rational manner, which entails adherence to medical requirements, accurate dosage, appropriate duration, and minimal financial burden for individuals, poses a significant hurdle globally, particularly in nations with lower and moderate economic status.[2,4,5] As a matter of serious concern on a global scale, "irrational drug use" is characterised as several common phrases including polypharmacy, excessive medicine use, and inappropriate self-medication. According to the World Health Organization (WHO), public education about medicines is a necessary intervention to promote rational drug usage.[3] This purpose requires effective and cost-effective interventions that can be widely used in primary healthcare settings.

People with limited understanding of sound pharmaceutical practices tend to be more apt to take medicine without a doctor's prescription and not seek counsel from medical professionals.[6-8] A significant number of patients are not following their prescribed medications and treatment plans, leading to a drastic decrease in quality of life and expenditure of financial resources.[9] Insufficient public awareness and comprehension regarding appropriate pharmaceutical usage can often result in excessive, inadequate, or improper consumption.[10,11] and expectations for prescription medicines that are not commensurate with their health condition.[11] In this context, it is of the utmost importance for health authorities to take action in order to boost public knowledge about rational drug use and implement interventions to modify society's inappropriate behaviors concerning irrational drug use in order to advance public health.[12,13] Nurses play a critical role, as they often have more frequent contact with individuals than other healthcare professionals. They educate the public and improve adherence to medication regimes, enabling the implementation of appropriate interventions.

Public health interventions such as education, behavior modification, and medication for disease prevention require a multidisciplinary approach.[14] In many stages of medication administration process, especially when administering medications, nurses, pharmacists, and doctors collaborate closely.[15] Given nurses typically being the last to verify that medication is correct before it's given, they have a very special role and responsibility in the administration of medications.[1] Consequently, part of their nursing education should centre on learning from a manual on giving medications and maintaining the safety of patients.[16] Thus, it is important to educate and involve nursing students in managing medication during their education.

A systematic review showed that a few public health interventions utilizing multiple approaches, such as video or written information, as well as face-to-face instruction and interactive educational games, yielded a slight increase in awareness among the public regarding rational use of medication.[9] Despite nurses'

critical role in managing medication through interprofessional cooperation, patient encounters, and respect, public perspectives of the role nurses play in rational drug use is still unclear.[1] Therefore, the intervention tested in this study, created by nursing students under the supervision of a nurse academic, aims to be widely used in primary healthcare settings at a low cost. It also aims to contribute to increasing public awareness regarding the rational use of medicine and the role of nurses in this aspect.

The 'HEALTHgain' game

The '*HEALTHgain*' game was used as an intervention in this study. The game was designed by the authors based on the existing scientific literature and guidelines in Turkish.[3,17-22] The game consists of 47 items, which is either a 'False' or 'True' statements about rational drug use. One person who is not a player leads the game by reading out the items. Players think about the sentence, decide whether the item is 'False' or 'True', and assign points of 25 (strongly disagree), 50 (somewhat disagree), 100 (somewhat agree), 250 (strongly agree), depending on how certain they are. When the cards have been used up, the game is finished and the person with the highest score wins (**Figure 1**). The procedure was applied by the second, third, and fourth authors and supervised by the first author.

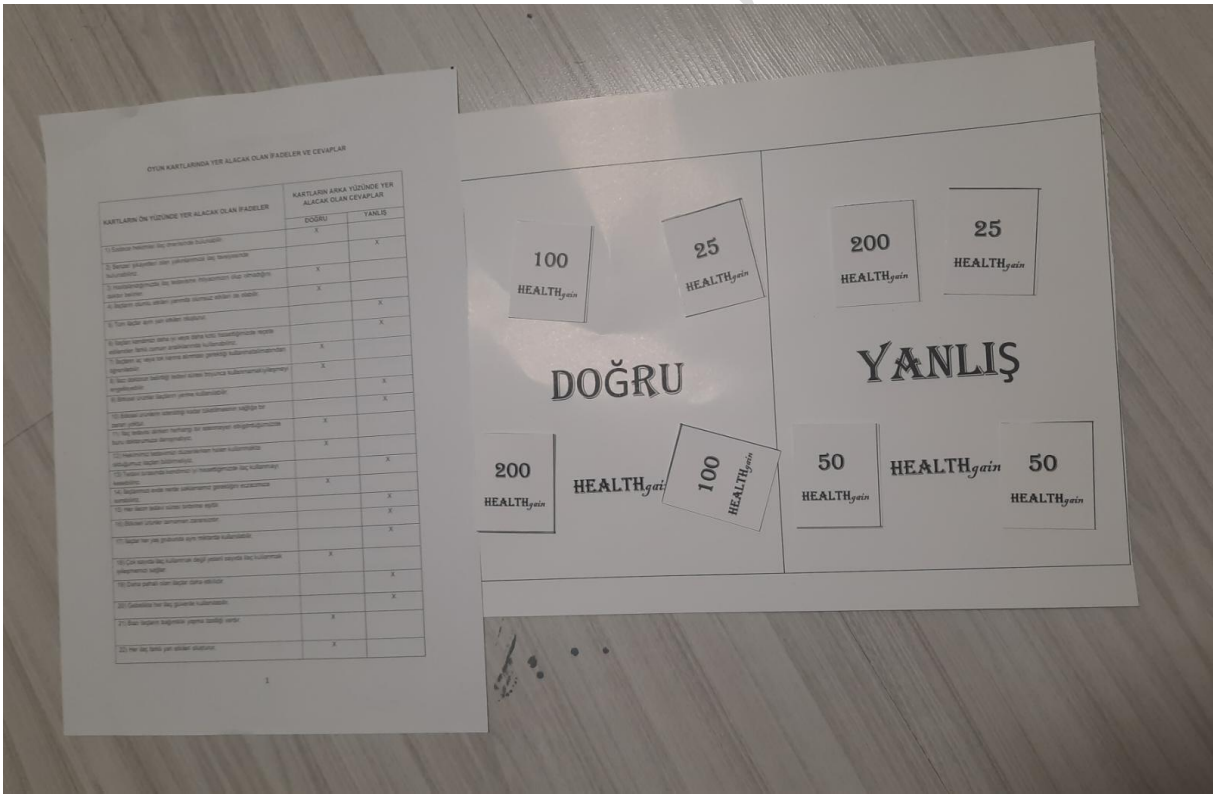

Fig. 1. An example of 'HEALTHgain' game (Doğru=True; Yanlış=False)

Aim

The purpose of this investigation was to evaluate the impact of the "HEALTHgain" game, an educational tool, on enhancing individuals' comprehension of proper medication usage, as well as their perceptions of the significance of nurses' contributions to society.

Hypothesis:

H_1 = *'HEALTHgain'* game has a positive effect on knowledge level of rational drug use.

H_2 = *'HEALTHgain'* has a positive effect on attitudes of society towards nurses' role in rational drug use.

Material and methods

Participants and study design

This pre-test-post-test, randomized control study analyzed the effects of the '*HEALTHgain*' game on knowledge of rational drug use and attitudes of society towards a nurses role in rational drug use. Participants were recruited from a previous study, consisting of 1072 people aged 18 and over, to assess their knowledge level on rational drug use and their attitudes towards a nurses role in rational drug use.[23] The previous study recruited the individulals aged 18 years and old throuh 18 neighborhood headmanships in the central district, and the data collection process was conducted through these headmanships. Each headmanship was considered as a cluster, and the total number to be reached was collected by proportionally relating it to the population in each headmanship area. We excluded 553 individuals who did not score 34 or above among participants who did not meet the inclusion criteria (Fig. 2). The inclusion criteria were: i) age of 18 or over; ii) score of 34 or less on the Rational Drug Use Scale, iii) not having graduated from a school related to health science, nor working in this area; iv) being a volunteer for the study.[17] The intervention took place from 1st May 2022 through 20th November 2022 in a province in the Black Sea region of Turkey. All participants provided verbal consent before the beginning of the study. The Bartın University Ethical Committee study approved this study (reference number: 2021-SBB-0238).

Sample size calculation

Sample size was determined through utilization of G*Power 3.1.9.7 software, guided by Jha et al.'s study and utilizing a significance level (α) of 0.05 for Type I error and a power (1-α) of 0.80 for Type II error, with an effect size of 0.32. Ultimately, a sample size of 232 participants (split equally between the intervention and control groups at n=119 each) was deemed appropriate for this investigation[24]

Research protocol

The study comprised of participants who were assigned at random to either an intervention or control group, in a 1:1 proportion, through utilization of a computer-generated algorithm.[25] The intervention group comprised of 119 adults aged 18 years and above, while the control group consisted of 119 individuals in

the same age range (Fig. 2). Rational Drug Use Scale and Attitudes of the Society Towards Nurses' Role in Rational Drug Use Questionnaire were administered at the initial stage prior to random assignment (pre-intervention) and again at the 14-day mark following the administration of the game (post-intervention). After identifying the potential participants who scored 34 or less on the Rational Drug Use Scale, we randomly allocated them into intervention and control groups until we reached the required number of participants, 119 for each group. The participants allocated to the intervention group were asked to play the game, provided by the research team for free, at least three times over a 14-day period at home. Following the conclusion of the study, all participants in both the intervention and control groups were conferred the game as a token of appreciation.

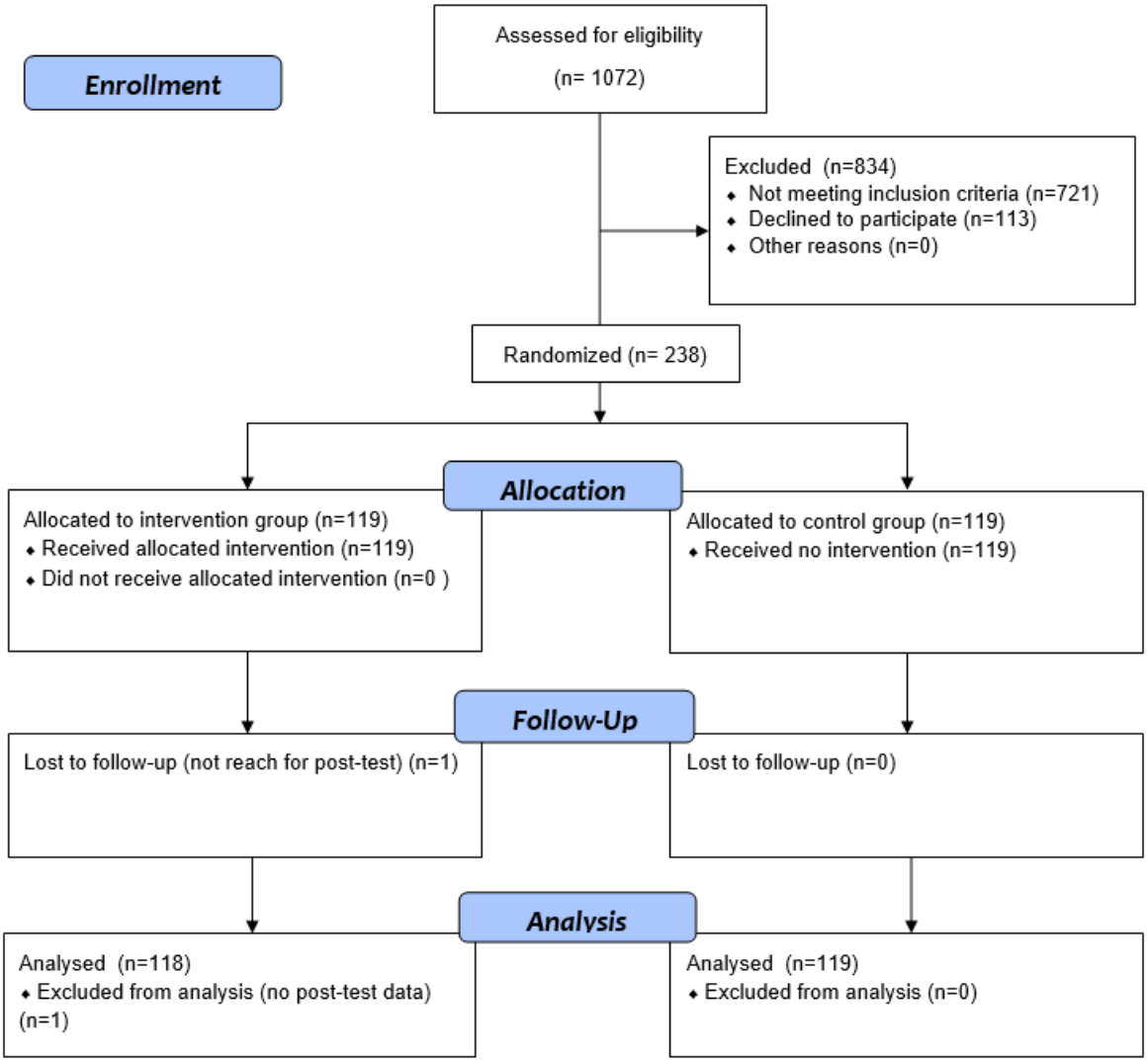

Fig. 2. CONSORT diagram of study procedure

Measurement tools

Rational Drug Use Scale

The scale was employed to assess the level of knowledge pertaining to rational drug use.[26] The scale consists of 21 items, with 11 of them being marked as 'True' and the remaining 10 being marked as 'False'. Participants mark the items as "(2 point) True", "(0 point) False" or "(1 point) I Don't Know". The total score varies from 0 to 42, and the cut-off point is 34, indicating a lack of knowledge of rational drug use. In the original study, the Cronbach's alpha coefficient for the scale was recorded to be 0.79, and it was calculated as 0.72 in this study.

Attitudes of the Society Towards Nurses' Role in Rational Drug Use Questionnaire

The questionnaire was developed by the authors.[23] The questionnaire comprises 16 questions, with response options on a scale of 'Strongly disagree (1)' to 'Strongly agree (5)'. A higher score on the scale indicates a favorable perception of the role of nurses in promoting rational drug use. The original study reported a Cronbach's alpha coefficient of 0.96 for the questionnaire, a finding likewise replicated and measured at 0.96 in the current study.

Statistical analysis

The data underwent analysis using the Statistical Package for the Social Sciences (SPSS) 25.0 version. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were calculated and reported. Furthermore, the differences between the two study groups at baseline were examined through the utilization of statistical methods such as Student's t test for independent samples and the statistical chi-squared test. Repeated Measure ANOVA was performed, with reading Wilks' Lambda to evaluate the impact of the intervention on dependent variables. A significance level of less than 0.05 for the p value was deemed to be statistically significant. Intergroup effect sizes were calculated using Cohen's d. Value of $\geq$0.8 represents a large-size effect.[27]

Results

The baseline characteristics of the participants and dependent outcome measures are presented in Table 1. The analysis demonstrated that there were no noteworthy variations of statistical significance observed between the control group and the intervention group ($p>0.05$), except for gender ($X^2=5.803$, $p=0.016$) and perception of monthly income ($X^2=7.564$, $p=0.023$).

Table 1. Baseline characteristics of study participants[a]

	Total (n=237)	**Control group (n=119)**	**Intervention group (n=118)**	**X^2/p**
Gender				
Female	124	53	71	5.803/0.016
Male	113	66	47	
Age*, mean (±standard deviation)	34.1 (±13.52)	35.31 (±13.33)	32.87 (±13.65)	1.391/0.165
Marital status				
Single	142	70	72	0.119/0.719
Married/having partner	95	49	46	
Educational status				
Secondary school	78	45	33	0.3275/0.194
High school	131	59	72	
Bachelor and above	28	15	13	
Perception of mounthly income				
Income=expence	107	45	62	7.564/0.023
Income>expence	32	22	10	
Income<expence	98	52	46	
Do you have any chronic disease?				
Yes	25	10	15	1.166/0.280
No	212	109	103	
Do you use medicine regularly?				
Yes	34	15	19	0.590/0.443
No	203	104	99	
Attitudes of the Society Towards Nurses' Role in Rational Drug Use, Mean (±standart deviation)*	3.79 (±0.79)	3.83 (±0.64)	3.75 (±0.91)	0.781/0.436
Rational Drug Use, Mean (±standart deviation)*	1.04 (±0.32)	1.02 (±0.35)	1.06 (±0.28)	0.811/0.418

[a] * – t-test

A repeated measures ANOVA was conducted to assess the impact of the '*HEALTH*gain' game on both knowledge acquisition regarding rational drug use and societal perceptions of nurses' role in promoting rational drug use. Following the completion of a fourteen-day gaming intervention, a notable difference was observed in the participants' knowledge level of drug use, as demonstrated by a statistically significant variance between the initial and final assessments ($F(1)=45.739$, $p<0.001$). Additionally, it was revealed that there was a statistically significant difference in attitudes of society towards nurses' role in rational drug use between the baseline and end measurements after fourteen days of playing the game ($F(1)=283.434$, $p<0.001$) (Table 2, Fig. 3).

Table 2. Effects of 'HEALTHgain' game on rational drug use and attitudes of society towards nurses' role in rational drug use

	Pre-intervention		**Post-intervention**		**F/p**	**Cohen's d**
	Control group	Intervention group	Control group	Intervention group		
Attitudes of the Society Towards Nurses' Role in Rational Drug Use, mean (±standard deviation)	3.83 (±0.64)	3.75 (±0.91)	3.71 (±0.28)	4.45 (±0.53)	45.739/ <0.001	0.882
Knowledge of Rational Drug Use, mean (±standard deviation)	1.02 (±0.35)	1.06 (±0.28)	1.17 (±0.27)	1.99 (±0.36)	283.434 /<0.001	2.198

The statistical analysis revealed a significant improvement in groups' knowledge level of rational drug use between the initial and final assessments after a two-week period of game play, though it had not been presented in any table ($t=-3.824$, $p<0.001$ for control group; $t=-35.492$, $p<0.001$ for intervention group). Moreover, the increase in society attitudes towards nurses' role in rational drug use in the intervention group ($t=-7.033$, $p<0.001$) was statistically significant, whereas the decrease in the control group was not statistically significant ($t=1.710$, $p=0.090$), not presented in any table (Fig. 3).

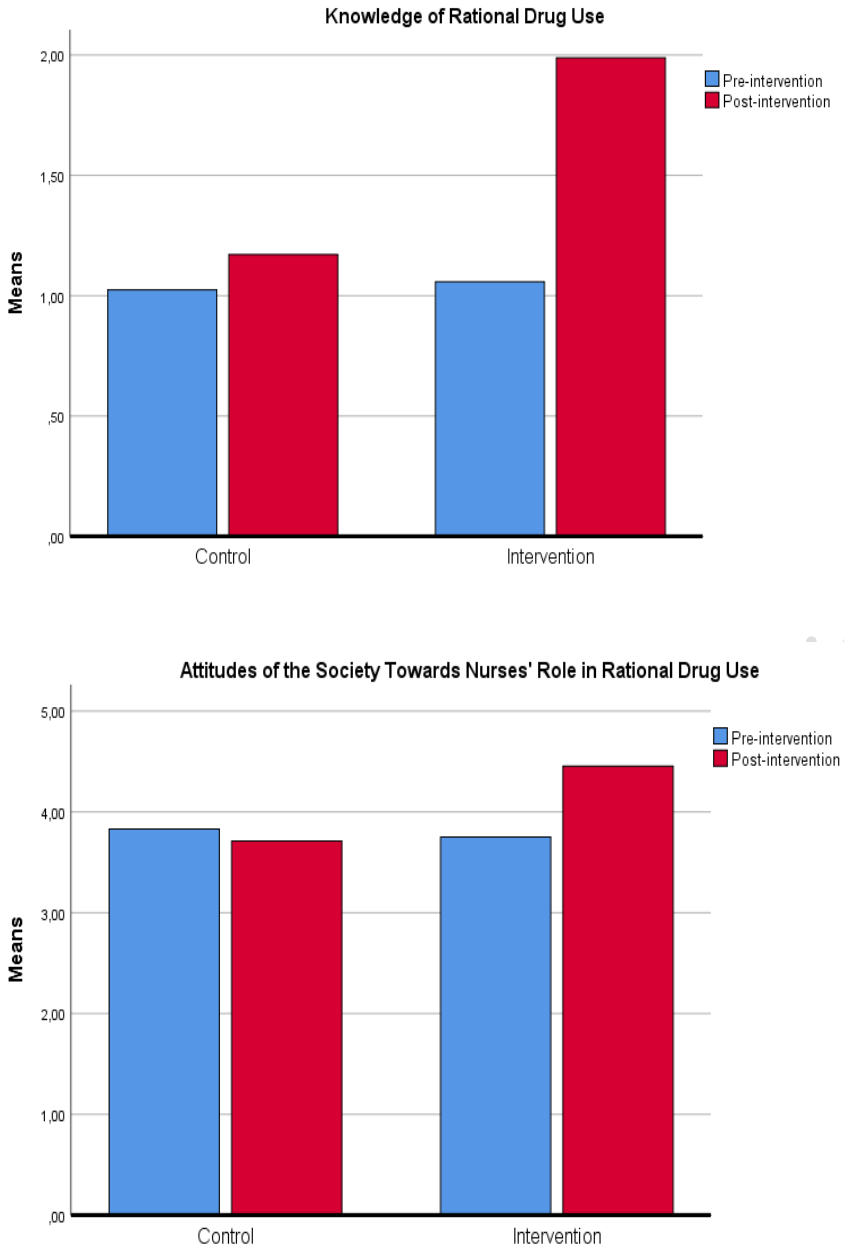

Fig. 3. Between-group and within-group comparison of measurements

Discussion

This study, assessed the impact of an educational game, the '*HEALTHgain*' game, on society's knowledge of rational drug use and their attitudes towards nurses' roles in rational drug use. All over the world, people commonly use medications inappropriately and health authorities are making more effort to raise people's awareness of how to use drugs rationally and change their improper behaviors.[3] Interventions on rational drug use in primary care settings are necessary to protect people from adverse events due to medication and promote public health.[1,3,24]

We found that the educational game tested in this study had a significant impact on people's knowledge levels of rational drug use. It is already known that people with a high level of knowledge are more likely to use medicines appropriately.[28] Without adequate awareness of the risks and benefits of taking medications, as well as when and how to use them, it is inevitable that individuals will often not experience the desired therapeutic outcomes.[29] A previous study showed that educational interventions had a positive impact on the knowledge levels of individuals with inadequate knowledge when using medicines.[30] Promoting rational drug use in the community is among the core component to promote rational use of medicine. Materials to be used for the purpose of public education need to be designed to take into account cultural beliefs and the effectiveness of social factors.[29]

In recent years, a significant number of educational games have been designed to increase knowledge levels about a particular medical condition. A scoping review revealed the importance of developing health education games are essential for increasing public health knowledge.[31] In addition to influencing a player's attitudes and values around targeting medical conditions, games can provide them with a rich emotional experience. Games can easily and cheaply create a variety of realistic situations, while removing the undesirable elements of such circumstances, making the learning environment more interesting, attractive, scientific, enjoyable, and effective.[32] Therefore, providing free educational games in primary healthcare settings could aid people in comprehending the significance of medicine use rationally and in gaining understanding of the role that nurses play in this regard.

The World Health Organization suggested that the use of medicines should be incorporated into school curricula and adult education programs.[29] Moreover, it is highly recommended that rational drug use should be included in both undergraduate Nursing curricula and continuous education programs.[33] Nurses are expected to gain rational drug use competencies, as they are frontline healthcare personnel. Their role is key, given their interactions with individuals in providing care and engaging in broader population.[34] Our study findings also showed that '*HEALTHgain*' game, a game developed by a nurse educator and four nursing students and tested during this study, had a statistically significant positive impact on public attitudes towards nurses' roles in rational drug use.

Our research team believes that this research is the pioneering investigation on the public's views regarding the involvement of nurses in promoting rational medication use. A qualitative study conducted in 14 European countries from the perspectives of pharmacists, physicians, and nurses reported that assuming the duties and responsibilities associated with administering pharmaceuticals had a beneficial effect on the overall quality of care provided and the outcomes of their patients.[35] Nurses guide and educate the public not only in health care settings but in all other areas as well. Public opinion of the nursing profession can influence both individuals and health policies.[36] A positive public perception of the health care system is crucial to enhancing the rational use of medicine in public.[37] Drugs, as a component of this system, are tied to multiple health variables.[38] The health care system is one of the major factors influencing health.

Therefore, promoting a positive opinion about nurses in public could help to improve adherence to treatment and increase the benefits derived from treatment.

Study limitations and suggestions for further future research

The study has both strengths and limitations. First, we only stipulated that participants must play the game at least three times over the 14-day period, they have unlimited replays of the game and evaluated its effectiveness at the end of this period. Therefore, there is a lack of follow-up evaluations available to support the long-term efficacy of this intervention. Second, the game was developed by a nurse educator and four nursing students, so we suggest that it could be improved by working with a multidisciplinary team in the future. Third, this study was conducted in one province in Turkey, therefore the findings have limited generalisability. Fourth, participants were recruited from a previous study sample, whose score was 34 or less on the Rational Drug Use Scale.[23] Finally, there were some differences between the participants in the intervention and control groups, such as educational level, monthly income, and chronic diseases, that should be considered when interpreting the study results. Our sample characteristics and size were among the major strengths of this study. It is also recommended to plan further studies to provide evidence on long-term effectiveness of the games.

Conclusion

Individuals frequently misuse prescriptions all across the world, thus health authorities are putting greater effort into teaching individuals how to use medications appropriately and safetly. Interventions on rational drug use are required in primary care settings to safeguard patients from medication-related side effects and advance public health. Our study findings revealed that the educational game tested in this study had a greater impact on both the knowledge levels of individuals and positive public attitudes towards a nurse's role in rational drug use. We believe that offering educational games for free during nursing services in primary healthcare settings could help individuals understand the importance of the rational use of medicine and gain insight into the role of nurses in this aspect. We also considered that improving the game through contributions from a variety of disciplines, designed to take into account cultural beliefs and the effectiveness of social factors, could help to increase its effectiveness in subsequent studies.

Declarations

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Author contributions

Conceptualization, İ.D., Y.Ö., Z.T., S.N.S., and F.Y.; Methodology, İ.D.; Software, Z.T., S.N.S.; Validation, F.Y. and Y.Ö.; Formal Analysis, İ.D.; Investigation, Y.Ö., Z.T., S.N.S., F.Y.; Resources, Y.Ö.; Data Curation, İ.D.; Writing – Original Draft Preparation, Z.T., S.N.S., İ.D.; Writing – Review & Editing, İ.D.; Visualization, İ.D.; Project Administration, Y.Ö.; Funding Acquisition, Y.Ö.

Conflicts of interest

The authors declare that they have no competing interests.

Data availability

All data generated or analysed during this study are included in this published article.

Ethics approval

This study was approved by the Ethics Committee of the Bartın University according to the Declaration of Helsinki, good clinical practice, and applicable laws and regulations (Register no: 2021-SBB-0238).

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