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IN BRIEF REPORT

Serious Games and Gamification: Health Care Workers' Experience, Attitudes, and Knowledge

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Abstract

Objective With the rapid advancement of digital technology due to COVID-19, the health care field is embracing the use of digital technologies for learning, which presents an opportunity for teaching methods such as serious games to be developed and improved. Technology offers more options for these educational approaches. The goal of this study was to assess health care workers' experiences, attitudes, and knowledge regarding serious games in training.

Methods The convenience sample consisted of 223 participants from the specialties of internal medicine and psychiatry who responded to questions regarding sociodemographic data, experience, attitudes, and knowledge regarding serious games. This study used an ordinal regression model to analyze the relationship between knowledge, attitudes, and experiences and the idea or wish to implement serious games.

Results The majority of healthcare workers were not familiar with serious games or gamification. The results show gender and age differences regarding familiarity and willingness to use serious games. With increasing age, the respondents preferred conventional and traditional learning methods to playful teaching elements; younger generations were significantly more motivated than older generations when envisioning using elements of serious games in the future.

Conclusions The COVID-19 pandemic has encouraged the use of new technologies and digitalization. This study describes positive attitudes toward serious games, mainly in younger people working in health care. Serious games present an opportunity to develop new approaches for postgraduate medical teachings and continuing medical education.

Keywords Gamification · Serious games · Medical education · Postgraduate education

The concept of "serious games" was first outlined and published in 1970 by Clark C. Abt [1], who saw them as games that "have an explicit and carefully thought-out educational purpose and are not primarily intended for entertainment." Serious games can be fun, but they also have to aim at achieving learning goals. "Gamification" deals with the use of game mechanics in situations outside the game to increase motivation and influence behavior [2]. Game designs use point systems, leaderboards, awards, and badges to motivate players. These elements are present in many areas of life, at school, in the military, in marketing, and even in health care [3].

The scope of serious games and gamification in teaching is expansive. Due to the rapid development and spread of gamification, more reviews are published every year examining the effects of these teaching methods. The use of serious games is associated with several perceptual, cognitive, behavioral, affective, and motivational effects and results [4], confirming the advantage of motivational effects through quick feedback mechanisms, increasing strategic thinking

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and decision-making, whereby multiplayer functions offer opportunities for collaborative learning and teamwork development. Furthermore, these methods can be useful survey and evaluation tools to determine strengths and weaknesses of a learner and specifically sharpen skills. They support student engagement and reduce stress and anxiety while improving content retention [5].

These learning methods have been implemented in pharmaceutical and medical education, especially in recent years [6]. In emergency medicine and anesthesiology [3], dermatology [5], surgery [7], and neonatology [8], serious games have been used effectively in both training and continuing education programs, with positive effects for students regarding decision-making ability and increased motivation and satisfaction.

Research regarding medical education and training of different generations shows that younger generations (born around the millennium) are surrounded by technology from a younger age [9] and that some prefer Web-based learning and immediate feedback [10]. Studies confirm that in addition to traditional learning and communication methods, social media has become an important form of learning in medical education [11]. While there are studies regarding experiences and attitudes of teachers and students toward the use of serious games in traditional school settings, there is an apparent lack of research focusing on experiences and attitudes in medical education [12].

There are several studies examining the use of serious games teaching elements in the training and continuing education of various medical specialties [5–8]. However, the literature on the acceptance of these methods, especially among trainees and young people across professional disciplines, is sparse. This study aims at analyzing health care workers' experience, attitudes, and knowledge toward serious games across professions and generations to provide a platform to discuss further research and implementation strategies for the future of medical education.

Method

We recruited participants from four major psychiatric clinics and one general hospital on the basis of convenience sampling in the eastern part of Switzerland, which includes an urban population with three major cities as well as rural and alpine regions, allowing for a varied sample of people working in health care in the German-speaking part of the country. We sent the links to the questionnaire to all health care staff at the participating institutions with the invitation to participate on a voluntary and anonymous basis. This study was determined to meet criteria for exemption by the internal ethics committee review based on the sole use of data

from non-patient participants and posing a minimal risk. The study was performed in accordance with all national and international legal regulations and with the Declaration of Helsinki (7th revision).

The questionnaire included questions regarding sociodemographic data, experience, attitudes, and knowledge about serious games. The participants received via email a link to the questionnaire on SurveyMonkey. The first part of the questionnaire inquired about age, gender and profession. The second part included five questions focusing on previous experience with serious games, and the remainder focused on participants' personal knowledge and attitude about serious games. The questions were based on the extant literature, specifically on the dimensions of knowledge, skills, attitudes, and satisfaction as proposed by Gentry and colleagues [13]. The questions were formulated to address the lack of research in medical education regarding serious games. The questionnaire was initially piloted and tested with a group of selected health care workers at one of the participating psychiatric clinics; based on initial feedback, the questions were revised, and the final questionnaire was created. The psychometric format used for the questions was a Likert-type rating scale.

We performed the statistical analysis using IBM® SPSS® Statistics 26. We applied a Welch t-test to examine differences in the continuous variables, assuming unequal variances of the tested variables. To assess differences in categorical variables, we used Spearman's rank correlation coefficient. To analyze the relationship among knowledge, attitudes, and experiences regarding the implementation of serious games in the clinic or hospital, we constructed an ordinal regression model. We used the regression model to explain the observed dependent variable "I can picture my clinic/hospital using it in the future" by several independent variables, including knowledge and attitudes. Possible additive confounders overlay this relationship. Based on experience and the existing literature, we used gender and age as possible confounding variables. We also used a sensitivity analysis for the primary objective; for this purpose, we ran the statistical models excluding the 22 participants who had prior knowledge regarding serious games. We drove at a significance level of $p < 0.05$.

Results

A total of 223 participants completed the questionnaire. The majority of participants were between 30 and 45 years of age and female. As described in Table 1, the respondents were mainly physicians, followed by qualified nursing staff, psychologists, and other clinical professionals. Participants were classified into five age groups: under 18, between 18 and 29, between 30 and 44, between 45 and 59, and over

Table 1 Age and gender distribution stratified by professional categories

|	Psychiatrists	Internists	Psychologists	Nurses	Others	Total
n (%)	65 (29.1%)	29 (13.0%)	33 (14.8%)	77 (34.5%)	19 (8.5%)	223 (100%)
Gender						
Males (%)	40 (61.5%)	12 (41.4%)	5 (15.2%)	21 (27.3%)	3 (15.8%)	81 (36.3%)
Females (%)	25 (38.5%)	17 (58.6%)	28 (84.8%)	56 (72.7%)	16 (84.2%)	142 (63.7%)
Age categories						
< 18 (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (15.8%)	3 (1.3%)
18–29 (%)	12 (18.5%)	7 (24.1%)	6 (18.2%)	14 (18.1%)	1 (5.3%)	40 (17.9%)
30–44 (%)	21 (32.3%)	18 (62.1%)	19 (57.6%)	30 (39.0%)	2 (10.5%)	90 (40.4%)
45–59 (%)	29 (44.6%)	3 (10.3%)	7 (21.2%)	25 (32.5%)	10 (52.6%)	74 (33.2%)
60 + (%)	3 (4.6%)	1 (3.4%)	1 (3.0%)	8 (10.4%)	3 (15.8%)	16 (7.2%)

60. A total of 22 out of 223 participants responded that they have had contact with serious games in their professional or private lives. Significantly more women than men reported contact with these kind of teaching methods.

Figure 1 shows the distribution of responses regarding personal attitudes and opinions of the subjects. Most differences regarding personal attitudes and opinions were related to age distribution. With increasing age, the respondents preferred conventional and traditional learning methods over playful teaching elements ($\beta = 1.20$, $p = 0.022$). Younger trainees and professionals also mentioned more frequently that these non-conventional teaching techniques could promote professional development ($\beta = 1.96$, $p < 0.001$). In contrast, older respondents thought that serious games were a waste of time ($\beta = -1.56$, $p = 0.010$). Younger generations (< 18–44 years) were significantly more motivated than older generations (45–60 + years) when envisioning using elements of serious games in the future ($\beta = 1.82$, $p = 0.004$).

The gender distribution showed a similar response pattern. The only significant difference referred to the question of the competitive nature of serious games: significantly more men ($n = 38$, 46.9%) than women ($n = 19$, 13.4%) believed that serious games should be competitive ($p = 0.010$).

In the distribution across occupational groups, there were some differences, but only one question reached the level of significance. The physicians in psychiatry ($n = 53$, 81.5%) showed the greatest willingness and aspiration to use
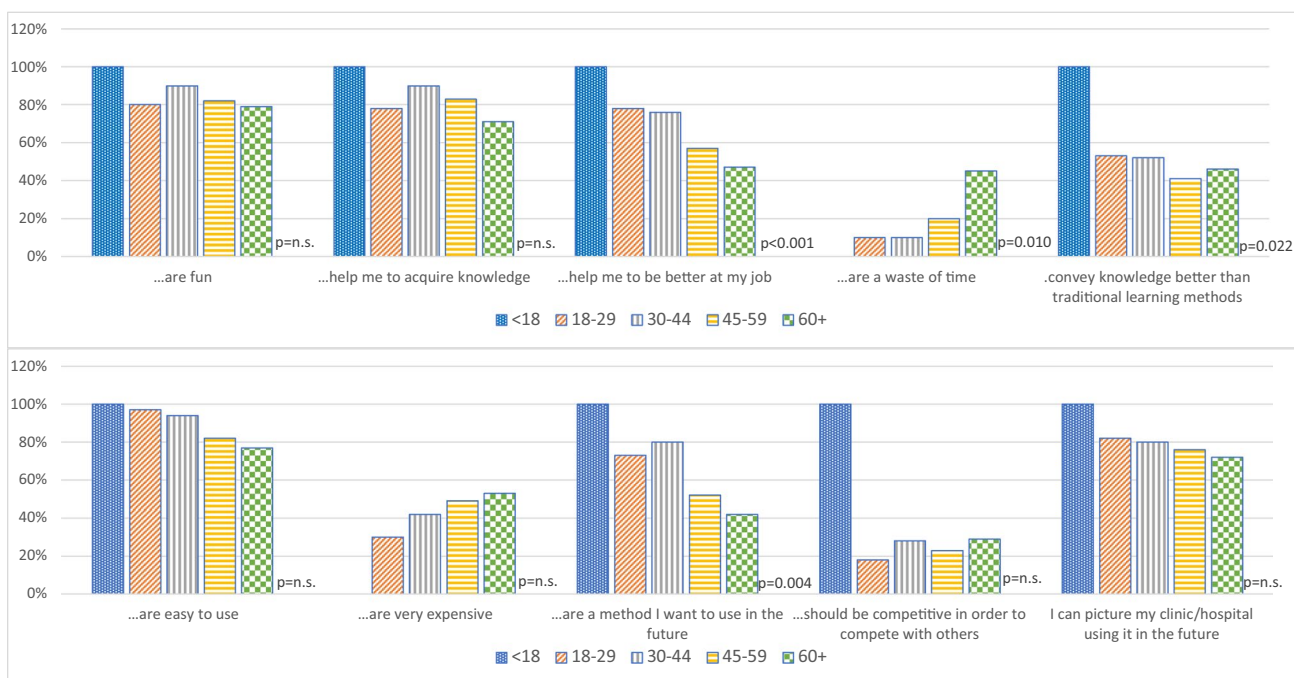
Fig. 1 Knowledge and attitudes regarding serious games stratified by age. Serious games. Note: Total $N = 223$; males $n = 81$; females $n = 142$; Cumulated responses (true, mostly true), *p*-values are reported accordingly; n.s. = not significant

playful teaching elements in the future, followed by physicians in internal medicine ($n = 23$, 79.3%), then psychologists ($n = 23$, 69.7%), nursing staff ($n = 43$, 55.8%), and other professional groups ($n = 7$, 36.8%; $p = 0.004$).

Discussion

This study focused on knowledge and attitudes toward serious games as a new teaching method among different professions and age groups in health care. As described, the majority of participating health care workers were not familiar with these learning methods, with fewer than 10% reporting a previous experience. This finding is likely to be an indication that serious games are still not widely used in the education of physicians, nurses, or other health care workers. However, it appears to be possible that some participants did not recognize serious gaming teaching methods as such due to the playful nature of these approaches [14].

This study shows a gender difference regarding competitiveness, which contrasts with some studies that reported no relevant difference in the overall competitive nature between genders [15]. Stratifying by age groups resulted in the largest differences, reflecting mainly dissimilarities in generational attitudes. Most questions regarding knowledge and attitudes showed age-dependent variations, mainly focusing on the utility, applicability, and usefulness of these methods. Younger people are increasingly willing to use serious games as compared to older generations, which adds to existing knowledge about generational differences regarding these methods. Our results need to be interpreted with caution, as the use and acceptance of technology in general should not be equated with the acceptance of serious games.

Regarding the different professional groups that participated in the study, only the question whether they would want to use serious games in the future showed significant differences, with physicians working in psychiatry being the most interested group. Otherwise, our results showed little variation across professions. This finding underlines the applicability of these methods in a wide array of teaching and educational settings [16].

This study has some limitations. The participants were recruited from the eastern, German-speaking part of Switzerland, limiting the generalizability on a national, linguistic, and international level. Based on the study design, we were not able to access any information about people who were invited but chose not to participate. The convenience sampling might have introduced a selection bias, in that those who are predisposed to these types of technologies may have been more likely to participate. In particular, because the survey was distributed only in a digital form using the platform Survey Monkey, with no option to participate on a paper–pencil basis, we may have selected against those who are less digitally inclined or experienced. We were not able to examine potential sociodemographic variables that may have influenced participation, as the questionnaire distribution relied on clinic mailing lists that were anonymized to the researchers. Because the study used a cross-sectional design, causality cannot be inferred from the various statistical relationships detected. Also, our study does not analyze the impact that the acceptance of new technologies has on how serious games are perceived, which might be a variable that differs across generations.

The COVID-19 pandemic has forced us to embrace new technologies and digitalization in all aspects of our lives [17]. Serious games present an opportunity to develop new approaches to postgraduate medical training. Our study confirms the positive attitudes and acceptance of this technology among younger professionals working in health care. New, blended forms of teaching offer an opportunity to motivate future generations of health care workers to acquire the knowledge needed for their respective professions in creative ways.

Declarations

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