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Teaching Handball Game Rules with Computer Simulation

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Teaching Handball Game Rules with Computer Simulation

Abstract

This research aims to teach pre-service teachers the rules of the international handball game through a simulation developed using the Tactic3D program. The study was carried out in a single group pre-test and post-test experimental design. A total of 32 teacher candidates (13 females and 19 males, mean age: 18.84) enrolled in the Physical Education and Sports Teaching program of Muğla Sıtkı Koçman University Faculty of Sport Sciences in the 2022-2023 academic year participated in the research. The students were selected from among the teacher candidates who had not taken handball lessons before, did not participate in the competition as licensed in the branch of handball, and had not played handball before. A descriptive information form and the Handball Game Rules Knowledge Test developed in the current study were used as data collection tools. The research data were collected online in the fall semester of the 2022-2023 academic year. The obtained data were analyzed with SPSS 22 program. According to the findings of the study, there was a statistically significant difference between the pre-test (49.32) and post-test mean scores (85.26) of the participants ($p<0.05$). In addition, there was a significant difference in favor of females between genders regarding post-test scores ($p<0.05$). Concerning the findings, it is seen that simulation training contributes to the handball knowledge level of teacher candidates. Consequently, it can be suggested that educational tools, as in the current research, can be added to the undergraduate education of prospective teachers and used as a tool to enrich teaching.

Keywords: Handball, Game rules, Simulation, Tactic3D

Bilgisayar Simülasyonu ile Hentbol Oyun Kurallarının Öğretilmesi

Özet

Bu araştırma, öğretmen adaylarına uluslararası hentbol oyununun kurallarını Tactic3D programı kullanılarak geliştirilen bir simülasyon aracılığıyla öğretmeyi amaçlamaktadır. Araştırma, tek gruplu ön test ve son test deneysel deseninde gerçekleştirilmiştir. Araştırmaya 2022-2023 eğitim-öğretim yılında Muğla Sıtkı Koçman Üniversitesi Spor Bilimleri Fakültesi Beden Eğitimi ve Spor Öğretmenliği programına kayıtlı 13 kadın ve 19 erkek, yaş ortalaması: 18.84 olmak üzere toplam 32 öğretmen adayı katılmıştır. Öğrenciler daha önce hentbol dersi almamış, hentbol branşında lisanslı olarak müsabakalara katılmayan ve daha önce hentbol oynamamış öğretmen adayları arasından seçilmiştir. Veri toplama aracı olarak tanımlayıcı bilgi formu ve bu çalışmada geliştirilen Hentbol Oyun Kuralları Bilgi Testi kullanılmıştır. Araştırma verileri 2022-2023 eğitim-öğretim yılı güz döneminde online olarak toplanmıştır. Elde edilen veriler SPSS 22 programı ile analiz edilmiştir. Araştırmanın bulgularına göre, katılımcıların ön test (49,32) ve son test puan ortalamaları (85,26) arasında istatistiksel olarak anlamlı bir fark vardı ($p<0,05$). Ayrıca son test puanları açısından da cinsiyetler arasında kızların lehine anlamlı bir fark bulunmuştur ($p<0,05$). Bulgulara bakıldığında simülasyon eğitiminin öğretmen adaylarının hentbol bilgi düzeyine katkı sağladığı görülmektedir. Sonuç olarak, mevcut araştırmada olduğu gibi eğitim araçlarının da öğretmen adaylarının lisans eğitimlerine eklenerek öğretimi zenginleştirecek bir araç olarak kullanılması önerilebilir.

Anahtar Kelimeler: Hentbol, Oyun kuralları, Simülasyon, Tactic3D

Introduction

The developments in science and technology have been effective in educational environments, just as in all areas of life. The need to keep up with this change has led to reorganizing educational settings (Atam & Tekdal, 2010). Furthermore, the increase in digital materials and software in daily life has become a part of our learning experiences (Tutal & Üzer, 2021). In particular, the concept of mobile learning, a new learning model, has emerged to meet the differentiating demands and needs of the new generation, which has grown intertwined with technology today. This learning method provides the opportunity to learn independently of time and place. In addition, using mobile apps and tools such as games and videos makes learning more fun and effective (Sümer, 2020).

The use of technology in education has many benefits for students. Educational technology creates multiple possibilities for individual initiative and freedom for teachers and students. It ensures that information is obtained from a primary source, creates equality of opportunity by saving people from the pressure of time and space, and increases diversity and quality compared to individual education. Educational technology improves creativity with the multiple and alternative learning opportunities it offers students. It individualizes teaching as it is shaped by student initiative and increases learning speed with the new environment and methods it has developed (Alkan, 2011). Sümer (2020) states that mobile application technology increases students' motivation and interest in the lesson and gives them a chance to access information quickly.

Computers are crucial course material in educational technologies. However, the frequent use of computers in education causes their efficiency to be questioned in animation and simulation environments (Emrahoğlu & Bülbül, 2010). Simulation can be defined as the realization of guided learning in a vibrant environment as close to reality as possible to achieve educational goals through experiential learning. It is used for education, evaluation, and research purposes (Sezer & Elçin, 2017). Simulation-based activities reveal students' prior knowledge and increase learning speed. In addition, simulation helps to develop inquiring and exploratory features (Karabudak, 2019).

Studies indicate that the use of simulation in education contributes positively to learning (Akbulut, 2018; Dağdalan & Taş, 2017; Emrahoğlu & Bülbül, 2010; Gürcüoğlu et al., 2019; Okumuş 2016; Öner & Yaman, 2020). In addition, simulation is catchy and fun for students, provides easy and meaningful learning, and saves time (Harman & Yenikalaycı, 2019).

Technology-supported education also contributes positively to student learning in the field of physical education and sports (Çakıt & Karadeniz, 2020; Ölmez, 2021; Karaşahinoğlu, 2013).

Information and communication technologies should be used in educational processes to succeed in sports (Yücel & Devecioğlu, 2012). Yang (2014) emphasizes that simulation technology benefits in gaining skills and ensures that the education-teaching process is organized effectively.

Handball is one of the most popular team sports in the world, where players from two teams try to score goals against the other team (Atalay et al., 2018). It extends the features of thinking and acting together, obeying the rules, harmonizing with the team, making decisions, and developing skills (Çakıt & Karadeniz, 2020). Therefore, handball is one of the sports branches that can be carried out within the scope of Team Sports courses in Physical Education and Sports Teaching programs. In the course content, it is expected that the definition of the related sport, basic stances and movements, strategies and tactics, individual and team defense, team attack, game systems, and rules should be included (Council of Higher Education (YÖK), 2018). In addition, handball in physical education classes, movement skills, movement concepts, principles, related life skills, and movement strategy and tactics is a sport that can be preferred to reach achievements in the sub-learning area (MEB 2018a, 2018b).

This research aimed to teach the rules of the international handball game rules to physical education and sports teacher candidates through a simulation developed using the Tactic3D program, which is a program that allows sportive skills to be drawn in 2D and viewed in 3D.

Method

Research Design

The research is in a single group pre-test post-test experimental design. The testing procedure is interpreted based on the measurement difference before and after the intervention (Tuncer, 2020).

Participants of the Study

A total of 32 teacher candidates (13 females and 19 males) from 14 different sports branches enrolled in the Physical Education and Sports Teaching program of Muğla Sıtkı Koçman University Faculty of Sport Sciences in the 2022-2023 academic year participated in the research. The participants were selected from pre-service teachers who had not taken handball lessons before, did not participate in the competition as licensed in the branch of handball, and

had not played handball before. The ages of teacher candidates are between 17 and 23 (mean age 18.84).

Data Collection Tools

In the research, descriptive information form and the Handball Game Rules Knowledge Test developed by the researchers were used as data collection tools.

Descriptive Information Form: It includes questions about pre-service teachers' grade levels, gender, age, sports branches, and whether they have taken handball lessons before.

Handball Game Rules Knowledge Test: It was developed by the researchers to measure the knowledge level of the handball game rules of the participants. It is a multiple-choice test consisting of 14 questions in total. Although the questions have four options each, each question has only one correct answer.

The researchers sent the test to two physical education and sports teachers and one academician who had played handball before. Then they asked the experts for their opinions on whether the test was appropriate. After receiving expert opinions, a pilot study was conducted. At this stage, the test was applied to 23 first-year students in the Physical Education and Sports Teaching program's spring semester of the 2021-2022 academic year. The results obtained from the pilot study were transferred to the Test Analysis Program (TAP), and the reliability coefficient of the test was found to be KR20 (Alpha) = 0.738.

Data Collection

International handball game rules were drawn using the Tactic3D program within the scope of the research (https://www.tactic3d.com/handball/handball-software.html). The rules were drawn in 2D and recorded in 3D.

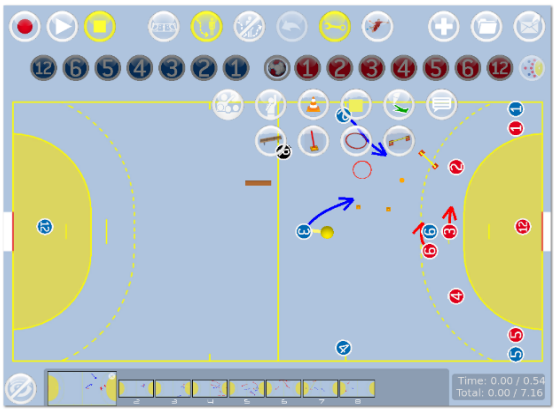

Figure 1. 2D drawing of the rules of the handball game

Figure 1. 3D video representation of the rules of the handball game

A website was created to participate in the research. General information, the aims, objectives, and the necessary links for participation in the study have been added to the website. The research data were collected online in the fall semester of the 2022-2023 academic year (http://www.hentbol2209a.mu.edu.tr/).

Pre-service teachers were informed about the research subject in a lesson held at the beginning of the semester. Then, candidates were directed to the website where the tests were located to participate in the research. Participants accessed the pre-test from the link on the Project Participation page on their website. When the pre-test data were collected, the pre-service teachers were directed to the educational videos via the link below the test.

Participants who completed the pre-test accessed the educational videos by clicking the link at the end of the test. The pre-service teachers who completed watching the videos were directed to the post-test via the link at the bottom of the page with the videos. The videos were initially only available to those who participated in the research. However, at the end of the study, it was made available as open access (http://www.hentbol2209a.mu.edu.tr/tr/egitim-videolari-8230).

Data Analysis

The data collected within the scope of the research were recorded in the computer environment. The pre-test and post-test scores of the participants were transferred to the SPSS 22 program. Whether the data showed a normal distribution was evaluated with the Kurtosis and Skewness coefficients, and it was determined that the data obtained in the study had a normal distribution. Paired t test was used to analyze differences between groups.

Results

The data obtained from the research are presented in the tables below.

Table 1. Comparison of participants' pre and post-test scores

	N	$\bar{x}$	*ss*	*t*	*p*
Pre-test	32	49.32	15.95	-10.42	**.000***
Post-test	32	85.26	13.81		

*p<0.05; Skewness: 0.33; Kurtosis: -0.90

According to the data obtained from the research, the average pre-test score of the participants is 49.32, and the post-test mean score is 85.26. Watching handball educational videos increased the pre-service teachers' scores by 35.94 points. In addition, this score increase was found to be statistically significant (p<0.05).

Table 2. Comparison of participants' pre and post-test scores by gender

		N	$\bar{x}$	*F*	*t*	*p*
Pre-test	F	32	51.12	1.93	.765	.450
	M		46.69			
Post-test	F	32	89.46	1.92	2.20	**.035***
	M		79.11			

*p<0.05, F: female, M: male; Skewness: -1.67; Kurtosis: 4.02

According to Table 2, while there was no significant difference between the genders in the pre-test (p>0.05), there was a significant difference between the genders in the post-test scores (p<0.05). When taking into consideration mean scores, this difference is in favor of females.

Discussion

This research aimed to teach the rules of the international handball game rules to physical education and sports teacher candidates through a simulation developed using the Tactic3D program.

The findings show that the international handball game rules can be taught with simulation-supported training. Many studies in the literature state that utilizing educational technologies contributes positively to students. Atam and Tekdal (2010) determined that simulation-based software prepared in the science and technology course contributed positively to the academic success of the students and the permanence of the knowledge. Aycan et al. (2002) determined that computer-assisted simulation education positively affected the success of classroom teaching students. Öner and Yaman (2020) stated that the simulation and animation-supported 5E learning model significantly increased pre-service teachers' science achievement and motivation scores compared to the traditional education method group. Also, Emrahoğlu and Bülbül (2010) determined that animation and simulations positively affect academic achievement and permanence of knowledge. Dağdalan and Taş (2017) found that simulation-assisted science education increased academic achievement. Gürcüoğlu et al. (2019) stated that simulation is an effective method for acquiring cognitive skills. Okumuş (2016) determined that interactive simulation course software positively affects academic achievement, and students respond better to comprehension and application questions with simulation.

There are also studies in the physical education and sports field that deal with the positive effects of technology use. For example, Ölmez (2021) determined that using video and visual material support in taekwondo training is effective in executing technical, tactical, and psychological features specific to taekwondo. According to a study by Mirzeoğlu et al. (2006), basketball lessons taught with computer-assisted teaching contribute to the student's cognitive development more than traditional teaching methods. Çakıt and Karadeniz (2020) revealed that the blended educational activities supported by internet-based online environments such as Facebook, Youtube, and Blogs contribute to the development of handball skills. Hu (2020) stated that using computer technology to teach badminton education helps students learn, increases communication and cooperation, and develops lifelong sports awareness by encouraging students' initiative and enthusiasm for learning. Another study showed that the use of animation in teaching the basic rules of the handball branch contributes to the learning of children aged 7-10 (Karaşahinoğlu, 2013). The mentioned studies show parallelism with the current research results.

According to the findings, there is a statistically significant difference between the genders in the post-test scores ($p<0,05$). The difference in post-test scores is in favor of females. Yaman (2007) determined that female physical and sports teachers use educational technologies more than male teachers. On the other hand, Ulucan and Karabulut (2012) found that physical

education and sports teacher candidates' self-efficacy regarding educational technology standards did not differ in gender. Similarly, Çar and Aydos (2022) state that there is no significant gender difference in technological pedagogical content knowledge levels of physical education and sports teachers. According to another study, techno-pedagogical education proficiency levels of male physical education teacher candidates are higher than female candidates (Erbaş & Ünlü, 2017). These studies show that different findings regarding the gender variable have been found in the literature. The fact that female pre-service teachers have higher scores than male pre-service teachers in the current study may have emerged due to the characteristics of the student group participating in the research.

Conclusion

The use of simulation in education contributes positively to the knowledge levels of pre-service physical education and sports teachers' handball game rules.

Suggestions

The findings obtained from the research are limited to the level of international handball game rules knowledge of physical education and sports teacher candidates. In future research, simulation education for the technical and tactical features of the handball branch can be added. In addition, the effect of simulation education on the affective and psychomotor skills of teacher candidates and their cognitive characteristics can be examined. Similar studies can be carried out for different sports branches and grade levels. On the other hand, the effect of simulation training on candidates in different sports branches can be examined by increasing the number of participants in the research.

Finally, the educational tools used in the current research can be added to the undergraduate education of pre-service teachers as an enriching tool for teaching.

Author Contribution

Ayan, İ and Sakallı, D (Conceptual Framework, Preparation of Educational Materials), Ayan, İ (Data Collection), Sakallı, D (Data Analysis), Ayan, İ and Sakallı, D (Writing).

Conflicts of Interest

All authors declare that there is no conflict of interest in this study.

Ethical Statement

Before starting the research, the ethics committee approval was obtained by the Social and Human Sciences Research Ethics Committee of Muğla Sıtkı Koçman University by protocol 210035 and decision number 31.

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