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*Research Results*
*Резултати от научни изследвания*

# EXPLORING THE POTENTIAL OF VIRTUAL REALITY AS PART OF THE TRAINING OF STUDENTS IN THE SELF-DEFENSE ELECTIVE COURSE

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**Abstract.** A new teaching method using virtual reality (VR) technology has been introduced into the self-defense training program for future medical professionals at the Medical University of Sofia. This experiment was conducted with students of an elective course in self-defense, using VR smartphone goggles and the online platform CoSpaces Edu for simulation. The research methodology included eleven questions about the potential and effectiveness of using VR in self-defense training. The results showed that most students were familiar with VR technology and thought it could be helpful. However, they reported that they had not yet attended a single workshop using VR technology, indicating limited use in higher education. The advantages of using VR in self-defense training include simulating real-world scenarios in a safe virtual environment, providing personalized training tailored to individual cases, and improving decision-making skills in critical situations. Disadvantages include a lack of specialized content, expensive equipment, and limited accessibility to training. Despite these challenges, many respondents believe that virtual training in a virtual environment is safer and more effective than traditional forms of training.

*Keywords:* educational technology; virtual reality; virtual environment; simulation; learning; distinct content; self-defense

## Introduction

The most important part of self-defense training is to develop awareness – of our own body, of the people around us, and of the visual cues that warn us of impending aggression, and then to take appropriate action in response to these cues (Modern Self-Defense Center 2023). The use of virtual reality in self-defense training can provide students with a simulation of various real-life situations and the practical application of realistic attack and defense scenarios. Using virtual reality technology, students can hone and practice their skills to respond to real-world situations without risk of injury in a safe, controlled environment. For example,

one of the best VR simulation training apps designed for self-defense training, Kick VR, can be used for this purpose. Realistic training and user-friendly guidance aim to help users learn how to better defend themselves in the real world (Zhou, Deng 2009). The term "virtual reality" was first used in 1989 by Jaron Lanier, founder of VPL Research. He used this term about his company's computer simulation products (Burdea, Coiffet 2003, p. 464). One of the most accurate definitions of innovative virtual reality technology is: Virtual reality is a high-tech user-computer interface that involves real-time simulation and interaction through multiple sensory channels. Virtual reality is an integrated trinity of immersion, interaction, and imagination (the three "I's" of VR) (Apo, Redei 2021). Virtual reality (VR) is a continuously evolving technology that is gradually integrating into higher education institutions' teaching and learning processes. It has the potential to transform the teaching process, enhance the student learning process, and engage students more effectively than has occurred in the past (Choi et al. 2021).

**Goals of the survey:** This study aims to determine the students' interest in the prospects and potential for integrating virtual reality technology into the self-defense elective at the Medical University of Sofia.

**Methodology**

**Study group:** The study was conducted with university students (12 females and 19 males between the ages of 19 and 23) participating in the elective course in self-defense conducted by the Sports Sector at the Medical University – Sofia. The study group was in their second semester of the academic year 2022/2023, and they were participating in previous self-defense courses by applying a virtual reality smartphone goggles experiment.

**Survey methodology:** The research was performed in a single class session using smartphone VR goggles. Using the CoSpaces Edu virtual environment creation library, learners were presented with a pre-planned real-life situation simulating a hospital where aggressive behavior occurred through a dialogue between a patient and a doctor with different response options in a virtual environment. CoSpaces Edu is an innovative educational platform allowing students and teachers to create, explore, and share virtual and augmented reality experiences. It offers a user-friendly interface that requires no programming experience and enables users to create virtual worlds with drag-and-drop functionality. The platform is compatible with various devices, including tablets and smartphones, making it ideal for classroom and distance learning environments. (CoSpaces Edu 2023). This study recreated the intricate nature of personal interactions in a medical environment, offering valuable insights into decision-making and conflict-resolution abilities. This unique technique not only improves the comprehension of human conduct but also demonstrates the potential of digital simulations in enhancing education and training in several professional fields.

In addition, during the 90-minute class session, learners participated in an underwater diving simulation to catch a fish in a virtual environment. The simulation aimed to evaluate their ability to react quickly and make sound decisions. This experience allowed learners to engage in a dynamic and immersive underwater scenario with movement from VR glasses, providing them with an interactive platform to assess and enhance their decision-making skills.

Following the end of the experiment, an online anonymous ten-question feedback form method was applied to analyze the responses to questions. Several sections were formed: demographic questions, students' experiences with virtual reality, and questions about students' opinions on its potential future use.

**Results and analysis**

The questionnaire indicates a significant level of familiarity with VR technology, with 92.31% of respondents claiming familiarity with it. This high percentage suggests that VR has gained considerable recognition in contemporary society, possibly driven by its entertainment, gaming, and education applications. However, the remaining 7.69% who claim to be unfamiliar may indicate the need for further awareness campaigns or educational initiatives regarding VR.

The frequency of VR use in everyday life is also a significant factor in adopting VR in self-defense training. Only a minority of respondents (7.14%) use or have used VR regularly daily. Most appear to use VR infrequently (51.79%) or are familiar with it but do not use it (39.29%). These data reflect the evolving status of VR from novelty to practical integration, with many people acknowledging the technology but not yet fully integrating it into their daily routines.

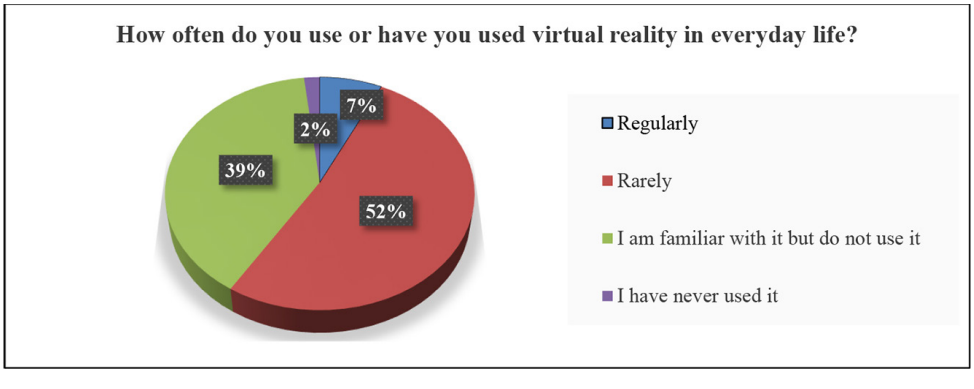


**Figure 1.** Frequency of virtual reality use

A significant proportion of respondents (70.37%) were optimistic about the effectiveness of integrating virtual reality into self-defense training. This perspective highlights the potential value of VR in providing an immersive and safe environment to improve self-defense skills. On the other hand, 18.52% felt that VR would have no effect, and a smaller percentage (11.11%) could not give a definite opinion. This diversity of perspectives highlights the need for more research and evidence to assess the true impact of virtual reality in self-defense training.

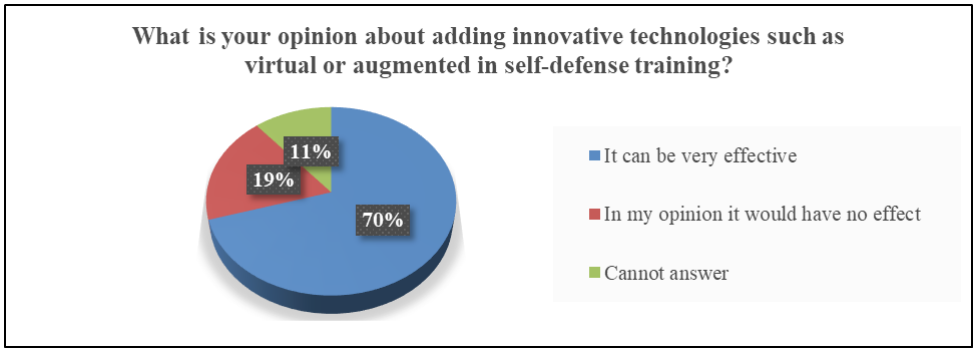


**Figure 2.** The effect of integrating VR into self-defense training

Notably, 86.36% of respondents indicated that their education programs at MU-Sofia do not include virtual or augmented reality technologies in their lectures or courses. However, 13.64% of respondents were unsure about the presence of such technologies in their programs. This suggests that the use of virtual reality in Medical University – Sofia higher education is not yet widespread.

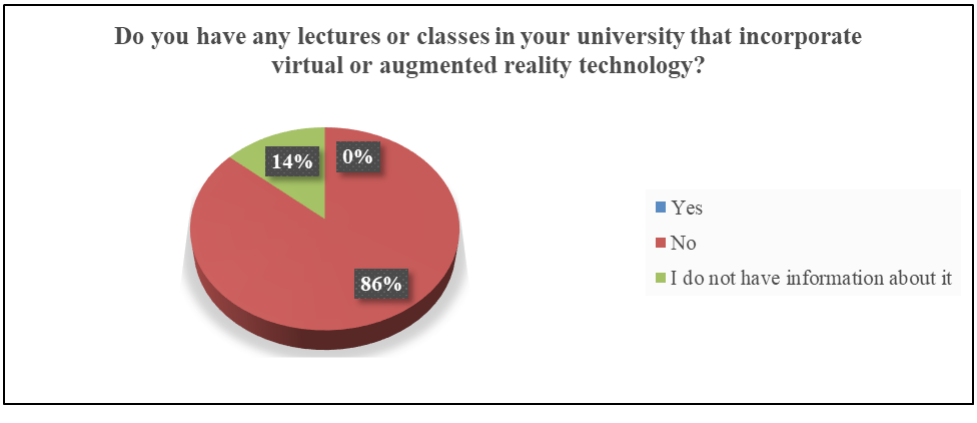


**Figure 3.** Integration of virtual reality in university curricula

The feedback form identifies several perceived benefits of using VR in self-defense training. The most prominent advantage is the more realistic simulation of physical reality situations in a safe virtual environment (51.95%). This finding is consistent with the essence of VR technology – to provide immersive experiences that closely resemble real-world scenarios. In addition, 15.58% cited the possibility of a highly personalized learning experience tailored to the individual student's needs. A further 15.58% cited the potential for more effective testing and assessment of students' skills. A smaller percentage, 9.09%, felt that virtual reality could increase student participation and engagement in the learning process. In comparison, 7.79% recognized its ability to improve student response and decision support in critical situations.

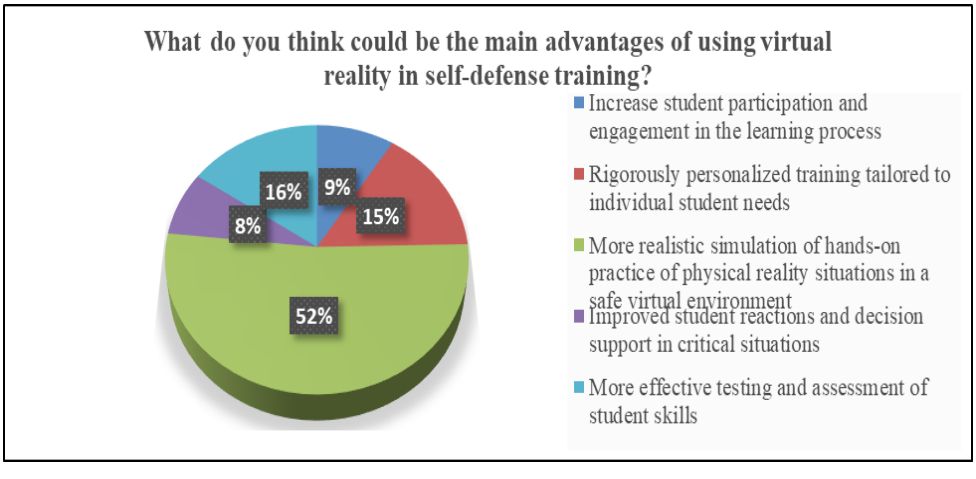


**Figure 4.** Benefits of VR in self-defense training

Despite its advantages, virtual reality in self-defense training has some disadvantages. The main concerns are the lack of clear content to integrate into the training process (50.00%) and the high cost of equipment (17.14%). The former underlines the importance of developing relevant and engaging content, while the latter necessitates finding cost-effective solutions to make VR training accessible to a broader audience. From the research, 25.71% of the students indicated some disorientation and nausea when using VR, which could be considered a significant disadvantage of using the method and highlighting the need for technological advances to mitigate these challenges. In addition, 7.14% felt that delivering quality training using virtual reality technology was challenging.

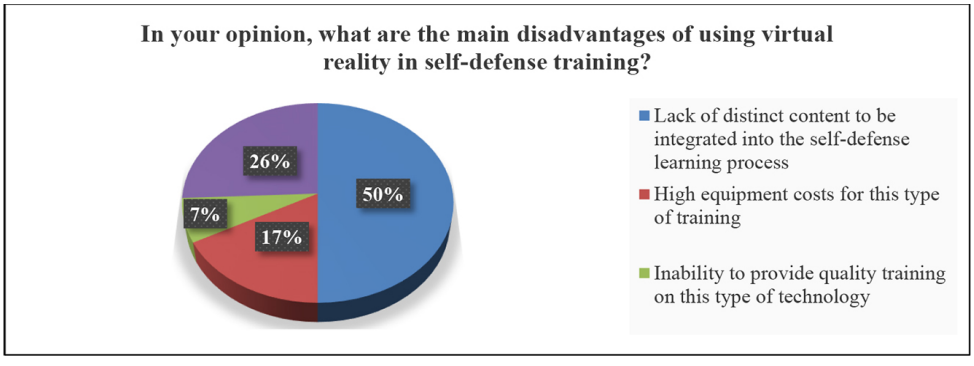


**Figure 5.** Disadvantages and challenges of VR in self-defense training

Regarding specific skills that can be improved using virtual reality in self-defense training, 58.14% of respondents felt that virtual reality could improve the ability to identify and assess danger in various situations close to real-life situations. 32.56% of respondents recognized its potential to improve communication skills in conflict situations. A further 9.30% of respondents felt that virtual reality training could help improve self-defense techniques.

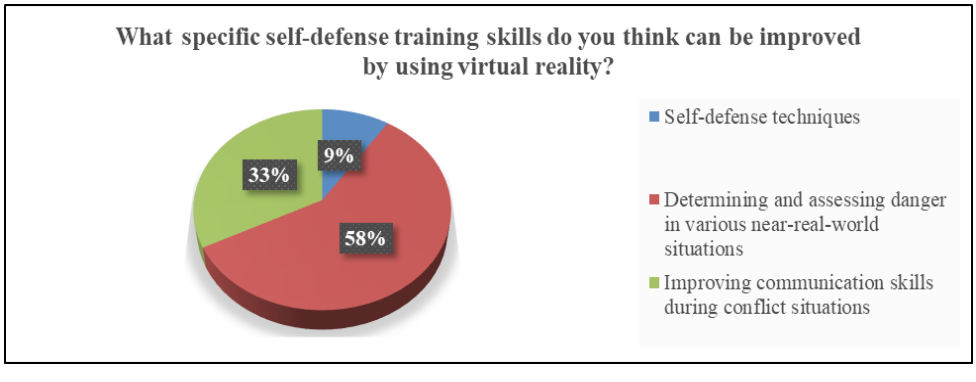


**Figure 6.** Improving skills using virtual reality

Most respondents (78.26%) agreed that virtual reality provides an experience close to the real environment regarding self-defense training. This positive perception of realism is consistent with the potential effectiveness of VR in self-defense training, where immersive environments could facilitate skill acquisition that closely mirrors real-life scenarios. However, 13.04% disagreed, stating that virtual reality does not adequately replicate the real environment. A small percentage of 8.70% could not decide on the degree of similarity.

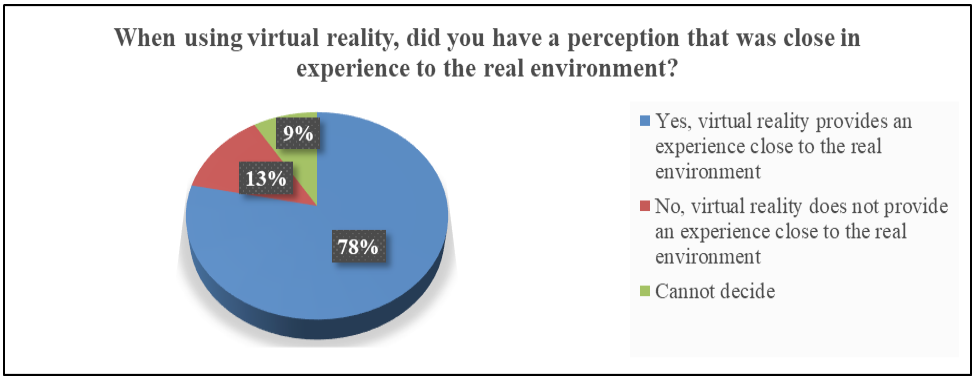


**Figure 7.** Perception of VR realism

Regarding discomfort, dizziness, or nausea when using virtual reality, 25.71% of participants admitted to having experienced such sensations. This statistic highlights the need for ongoing research and technological advances to mitigate these adverse effects and make VR training more comfortable and accessible. Conversely, for many of the students, 70.12% did not experience any discomfort, and 4.17% could not give a definite answer.

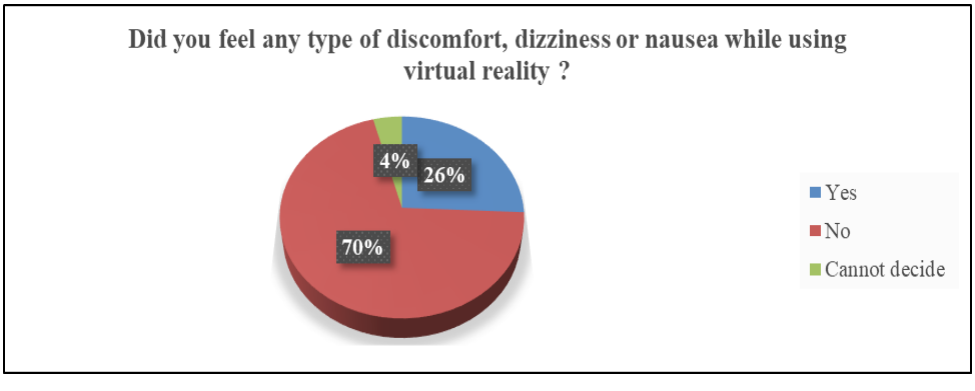


**Figure 8.** Discomfort with the use of virtual reality

Regarding the safety and risks of using virtual reality in self-defense training, 56.52% of respondents felt that virtual reality provided a safe environment to practice without risk. They perceive virtual reality as a controlled and secure environment. Conversely, 30.43% acknowledged the potential risks of disorientation and nausea when using VR but still considered it safer than physical training. A small percentage of 13.04% of respondents could not answer clearly.

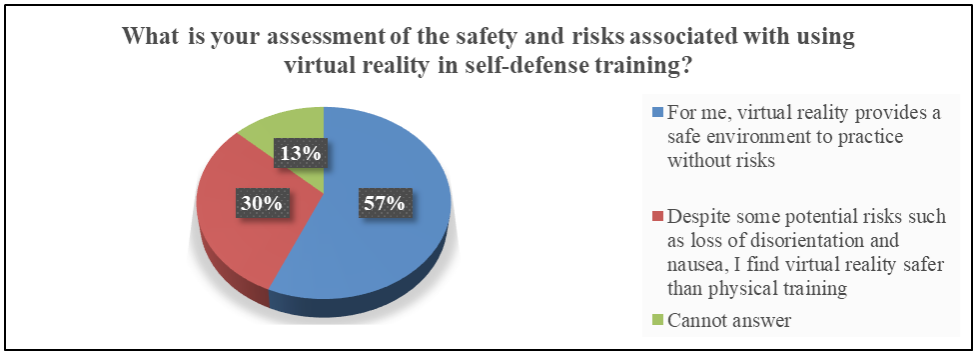


**Figure 9.** Safety and risks associated with the use of VR in self-defense training

**Discussion and conclusion**

According to Asenov (2023a), the adequate choice of (self) defense is essential in combat sports. It is the principles of combat sports, of self-regulation and good decision making, that are at their core, and according to Asenov (2023b) it is largely based on building willpower and morality. When analyzing the results statistics gathered from the questionnaire of the students' responses to the study, the following conclusions can be drawn:

– A significant proportion of respondents are optimistic about the effectiveness of integrating VR into self-defense training, highlighting the potential value of VR in providing an immersive and safe environment to improve self-defense skills. Some research has already shown that VR training can be highly effective, and it is 4x faster when learning specific soft skills (PwC 2023).

– The use of virtual reality in higher education at the Medical University - Sofia is not yet widespread, with most respondents stating that none of their university curricula include VR technologies.

– Virtual reality can potentially improve several skills in self-defense training, including identifying and assessing danger, communication skills in conflict situations, and self-defense techniques. Most respondents agree that VR provides an experience close to the real environment.

– The perceived benefits of using VR in self-defense training include more realistic simulations, personalized learning experiences, more effective testing and assessment, increased student participation and engagement, and improved decision support in critical situations.

– There is a need for continued research and technological advances to reduce discomfort and the possibility of motion sickness, disorientation, or nausea and adverse effects when using VR. While a significant percentage of respondents have experienced discomfort, the majority have not. This highlights the importance of making VR training more comfortable and accessible.

– As technology continues to evolve, integrating such immersive experiences into education not only enhances skill development but also engages students interactively and memorably, fostering a deeper understanding of the subject matter.

In Kuleva's research it was concluded that immersive VR exergames can result in the same or greater exercise intensity than conventional exercise conditions but with higher ratings of enjoyment and interest, and also that VR technology can be engaging, enjoyable, and conducive to a healthy lifestyle (Kuleva 2023). However, there are concerns about a lack of specialized content, the requirement for powerful and high-cost hardware, and ethical concerns regarding safeguarding personal information and data when using VR. These challenges need to be addressed to realize the full potential of VR in self-defense training.

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