

## Mix Reality in Reducing Operational Anxiety

Ameliyata Bağlı Anksiyeteyi Azaltmada Karma Gerçeklik

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### ABSTRACT

Augmented reality and virtual reality are some of the innovative products found in the healthcare industry. The use of these products in the hospital environment is becoming widespread today. The use of these methods can contribute to changing the diagnosis or treatment experiences that cause individuals to experience negative emotions with these products with different areas of use. In addition, it is predicted that both methods can produce effective results in the fields of health education in individuals, developing desired behavior in health management, preparing and disseminating programs for patient information and behavioral changes. It has been determined that these technologies, which produce effective results in the management of stress and anxiety, have similar results in the operating room. The article discusses the results of using virtual and augmented reality technologies for different purposes in healthcare. The information discussed is expected to raise awareness of the usage areas of the technologies in question and to shed light on studies for different areas of use.

**Keywords:** Virtual reality, Augmented reality, Operating Room, Technology, Anxiety

### ÖZ

Artırılmış gerçeklik ve sanal gerçeklik sağlık sektöründe yer bulan yenilikçi ürünlerden bazılarıdır. Bu ürünlerin hastane ortamında kullanımı günümüzde oldukça yaygınlaşmaktadır. Farklı kullanım alanları bulunan bu ürünlerle bireylerin olumsuz duygular yaşamasına neden olan tanı ya da tedavi deneyimlerini değiştirmede bu yöntemlerin kullanılması katkı sağlayabilir. Ayrıca her iki yöntemin de bireylerde sağlık eğitimi, sağlığın yönetiminde istendik davranış geliştirme, hasta bilgilendirmesi ve davranış değişiklikleri için programların hazırlanması ve yaygınlaştırılması alanlarında etkili sonuçlar oluşturabileceği öngörülmektedir. Stres ve anksiyete yönetiminde etkili sonuçlar oluşturan bu teknolojilerin ameliyathanede de benzer sonuçlar oluşturduğu belirlenmiştir. Makale sanal ve artırılmış gerçeklik teknolojilerinin sağlık alanında farklı amaçlarla kullanımına ilişkin sonuçları ele almaktadır. Ele alınan bilgilerin, söz konusu teknolojilerin kullanım alanlarına ilişkin farkındalık oluşturmaları ve farklı kullanım alanları için çalışmalara ışık tutması beklenmektedir.

**Anahtar Kelimeler:** Sanal gerçeklik, Artırılmış gerçeklik, Ameliyathane, Teknoloji, Anksiyete

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## INTRODUCTION

The use of the opportunities provided by technology has increased in order to solve the health problems of individuals and increase their quality of life<sup>1</sup>. Technological products used in healthcare services allow maintaining health, changing the course of the disease and managing health problems more easily<sup>2</sup>. At the same time, the use of these products reduces the probability of error in the service provision of healthcare workers, increases service efficiency and improves the quality<sup>3</sup>.

Proper use of technology is one of the most important issues in the field of health. The increase in digital technology trends in the health sector is increasing day by day and it is noted that it will increase rapidly in the next few years<sup>4</sup>. New technologies take own place in health practices with different approaches in providing personalized health services. Digital technological products used in the health sector appear with the use of "augmented reality" (AR) and "virtual reality" (VR) technologies in different areas. AR and VR applications create different application areas with the transformation effect in health service delivery. These technologies offer the opportunity to be used in different areas from remote surgery to health education, from patient education to symptom management.

The use of technological possibilities provides positive gains such as early discharge, reduction in the possibility of surgical complications, and shortening of the recovery period. These results are vital for safe and quality surgical treatment<sup>4</sup>. However, the fact that remains unchanged despite the changes in technology is that patients experience surgery-related anxiety.

Among the causes of anxiety related to surgery; fear of death, injury, loss of organs, pain, and fear of being dependent on others after surgery<sup>5</sup>. In addition to this, worries such as being in a hospital environment, adversely affecting living conditions, staying away from

loved ones, not being able to care for the people they are responsible for, losing their job are also factors that cause the patient to experience anxiety<sup>6</sup>. Negative thoughts such as increased anxiety, stress, fear and anxiety cause negative psychological and physiological changes in individuals<sup>7</sup>. High anxiety; causes problems during and after surgery, increases the risk of morbidity, and negatively affects the postoperative recovery process<sup>6,7</sup>.

In preoperative patients, anxiety may develop due to different reasons such as fear of unknown cause, fear of not waking up or death after anesthesia, loss of control, pain, isolation, separation from loved ones and distancing from social life<sup>8</sup>. It is of great importance for patients to cope with these problems for postoperative recovery<sup>9</sup>. Today, in order to reduce anxiety; playing music, hypnosis, games, etc. methods are used. However, it is seen that these methods have limited success in anxiety management<sup>7,8</sup>. Realities that offer different experiences using the latest developments in real experiences are defined as mixed reality<sup>8,9</sup>. Developing technological products and their widespread use in health also take place in anxiety management. VR and AR reality applications are among the preferred methods for solving this problem<sup>10</sup>.

**Virtual reality (VR)** enables the individual to be in another environment created by means of computer programs by removing the physical environment partially or completely<sup>10</sup>. This method is the combination of dream and reality with a simple expression. Computer-created three-dimensional environments (pictures, animations, etc.) and special glasses are used for the method (Figure 1). Thus, it is ensured that the individual perceives this three-dimensional environment with all sensory organs and feels as if he / she is in this environment<sup>7, 10</sup>.



Figure 1. Virtual Reality Application Examples<sup>11</sup>



Figure 2. Augmented Reality Application Example<sup>12</sup>

Virtual reality technologies are widely used in skill training (invasive applications, surgeon techniques, etc.) of healthcare team members. With the possibilities of this technology, the opportunity to experience the skill can be created with diagnosis, treatment and care applications and even surgery simulations<sup>13, 14</sup>. It is thought that the possible effects of the method on health services will be more than the other technology used<sup>15</sup>.

Virtual reality applications are used in the training of new skills (wound care, exercise, etc.) that need to be developed in healthy or sick individuals<sup>16</sup>. In this way, it contributes to the continuity of healthcare services by making patients experience practices that require skills in the continuation of patient education and planning of discharge. It also contributes to anxiety and stress management during the new skill experience thanks to its removal from the environment it hosts<sup>17</sup>.

**Augmented reality (AR)** is the adaptation of models, tools or objects in the virtual environment to the real world. Augmented reality technology is indirect physical view environments where people interact with virtual objects (computer-generated sound, image, etc.) placed on the real world environment<sup>7</sup>. Augmented reality applications provide information flow by establishing a bridge between the learner and the information (Figure 2). These applications create a sense of reality with the virtual information they add to the real environment<sup>7, 19</sup>.

Augmented reality glasses offer the opportunity to record images or videos with a

web-connected front-facing camera, to train users and to broadcast live. It contains technologies that can display pictures or videos and can share different visuals and sounds. In addition, it helps to enter health records into the electronic environment and to view existing records, thus allowing rapid analysis of diagnostic tests<sup>6, 19</sup>. With these features, AR; in medical education, patient training, consulting, archiving and operating room can be used. In studies conducted between 2010 and 2016 on augmented reality; It was stated that mostly (82.3%) pointer-based AR technology is used and (94.1%) video-based systems are preferred<sup>20-24</sup>.

These environments, which give the audience an active role in conveying information, offer different opportunities in situations that require the individual's own responsibility, such as anxiety management<sup>25</sup>. Especially in the treatment of psychological problems, AR applications are mentioned as a safer and more cost-effective new tool compared to real situations<sup>10, 26</sup>. It has been determined that the use of AR applications makes a difference in phobia treatment, creating a positive operating room experience and evaluating the waiting time in children waiting for examination<sup>27</sup>.

General study results; It shows that patients who use adaptation skills or different relaxation methods for surgery-related anxiety experience less anxiety and pain. Augmented reality is now referred to as one of these methods. In a study, it was stated that the augmented reality application applied during anesthesia reduced the amount of sedation used in individuals<sup>19</sup>.

**Table 1. Research Examples on Augmented Reality Applications**

Author	Year	Sampling characteristics	Application features	Conclusion
Turrado et al. <sup>28</sup>	2021	126 patients who undergoing surgery for colorectal cancer	Patients were randomized into the control group (68) or the intervention group (58). Intervention group had unlimited access to VR glasses and to the VR App. The patient could experience the various steps of their admission to surgery, from the first interview with the surgeon, to admission into the surgical ward, the operating room, and the postoperative recovery room	The use of simulation using VR can reduce perioperative anxiety in patients undergoing surgery for colorectal cancer.
Koo et al. <sup>29</sup>	2020	10 randomized controlled trials with a total of 813 patients	The purpose of meta-analysis was to validate whether VR could relieve preoperative anxiety in patients undergoing surgery.	Preoperative anxiety was significantly lower in the VR group than in the control group. VR could decrease preoperative anxiety, especially in pediatric patients.
Eijlers et al. <sup>30</sup>	2019	191 pediatric patients who undergoing elective day care surgery under general anesthesia	The aim of study was to investigate if virtual reality exposure for elective day care surgery in children is associated with lower levels of anxiety, pain and emergence delirium compared with a control group receiving care as usual.	No significant differences were found between VR and usual care in child anxiety, pain, emergence delirium, or parental anxiety. However, after VRE, less rescue analgesia was needed after painful surgery.
Ryu et al. <sup>31</sup>	2018	80 pediatric patients scheduled for surgery	Patients were randomly allocated into either the control or VR group. The VR group watched a VR video (4-minute) showing the operating theater and explaining the perioperative process.	Preoperative VR tour of the operating theater did not reduce the incidence and severity of emergence delirium, although it was effective in alleviating preoperative anxiety in pediatric patients.
Ganry et al. <sup>32</sup>	2018	20 patients in the outpatient surgery department	The purpose of study was to determine whether a VR program presenting natural scenes (5-minute) could be reduced skin cancer patients' preoperative anxiety.	The stress level was significantly reduced after the simulation as was the level of salivary cortisol.
Chuang et al. <sup>33</sup>	2016	64 patients with cervical disc herniation	The patients in the control group were trained via a booklet and the patients in the experimental group via mobile devices.	It was found that the psychological burden caused by anxiety and uncertainty was less in the patients in the experimental group.
Ottaviani et al. <sup>34</sup>	2012	62 patients who underwent joint lavage for knee osteoarthritis	The patients in the experimental group were played lyrical music with VR before the procedure (5-10 minute) and during the procedure (10-20 minute) without using headphones.	It was determined that the level of perioperative anxiety and pain related to the procedure was lower in the experimental group.
Kim et al. <sup>35</sup>	2011	219 patients undergoing mandibular third molar extraction	The patients in the experimental group were played music with VR from the entrance to the operating room until the end of the surgery.	Intraoperative anxiety level was found to be lower in the experimental group.

**Table 1. (Continued)**

Author	Year	Sampling characteristics	Application features	Conclusion
Jlala et al. <sup>36</sup>	2010	110 patients who will undergo upper or lower extremity surgery with regional anesthesia	The patients in the experimental group were shown a short film about the patient's journey in the hospital, which was created by the authors.	It was found that the pre- and postoperative anxiety levels of the patients in the experimental group were lower than the patients in the control group.
Mahmoudi-gharaei et al. <sup>37</sup>	2008	75 pediatric patients scheduled for surgery	The patients in the experimental group were allowed to spend at least half an hour with the AR in a child-friendly game room in the preoperative period.	The level of anxiety during the waiting period was found to be statistically significantly lower in the experimental group. In the postoperative period, an increase was observed in the anxiety levels of the patients in both groups.
Mott et al. <sup>38</sup>	2008	42 pediatric patients with burns	The augmented reality system was created by placing plastic figures on a camera unit mounted on the screen. The patients in the experimental group, the three-dimensional character; He can visualize the figure in the camera by manipulating it. Voice narration guides the child to perform the tasks and move on to the next figure animation. Cognitive techniques such as distraction, positive thinking, and age-appropriate video watching were used for the children in the control group.	The pain level of the experimental group was found to be statistically significantly lower.

With augmented reality or virtual reality applications, patients can experience the operating room in a virtual environment before encountering the reality. The common feature of these methods is to enable patients to experience the environment they fear in advance and thus to realize that their imaginary fears are not real. Methods such as music, affirmation and daydreaming have been used for many years in the management of anxiety. The common feature of these methods is to divert attention away from the source of anxiety. Among these methods with similar mechanism of action, AR and VR; It can be preferred more than other methods with its new, accessible and different features<sup>20,40</sup>. In a meta-analysis, attention is drawn to the fact that SG is an effective method as a means of reducing anxiety by

changing the focus of attention during medical procedures<sup>20, 28, 39,40</sup>.

The studies and results in which AR and VR were used to reduce the anxiety experienced by the patients regarding surgery are shown in Table 1. When the results of the study are examined, it is seen that the augmented reality applications are effective in the experiences that are desired to be changed in the patients, in the management of the problems and in reducing anxiety. Due to the lack of similar studies in our country, data on the changes that may occur due to the culture in the use of the method cannot be presented. However, there are studies revealing that technological product experiences in the field of health have significant effects on our country<sup>20, 36</sup>. In this context, it can be said that studies on augmented reality and anxiety stress management are needed in our country.

With the inclusion of augmented reality applications in the solution of health problems and their effective results, their use is becoming widespread and the search for different areas of use continues. As a result, it is clear that AR or VR applications are a method that can be used to change operating room experiences. In addition to this situation, the use of these methods may contribute to

changing the experiences of patients that cause negative emotions and solving fear-based problems. It is predicted that both methods can produce effective results in the fields of health education in individuals, developing desired behavior in health management, preparing and disseminating programs for patient information and behavioral changes.

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