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EFFECT OF DIGITAL HEALTH EDUCATION TOWARDS ANXIETY AMONG PRE-OPERATIVE PATIENTS: A SYSTEMATIC REVIEW

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ABSTRACT

Anxiety is a major issue that worsens clinical symptoms and often arises when patients undergo surgery. However, the review of the impact of digital health education on pre-operative patients with anxiety is still limited. This study aimed to determine the effectiveness of digital health education in reducing anxiety in pre-operative patients. Methods: A systematic review of quantitative studies was conducted. Relevant full-text articles were sourced from four databases: Web of Science, Science Direct, Proquest, and PubMed, from January 1, 2019, to December 31, 2024. The quality of the included studies was assessed by the Joanna Briggs Institute (JBI). A narrative analysis was performed to present the effectiveness of digital health education on pre-operative patients with anxiety. Results: A total of 13 studies were identified, involving 1,394 pre-operative patients. The age of the participants ranged from 5 to 68 years. The effectiveness of digital health education for pre-operative patients with anxiety was seen as a mixed program combining images, audiovisual materials, and interactive features that allowed patients to communicate with each other and healthcare professionals. Conclusion: This study highlights that digital health education interventions are a promising avenue in healthcare delivery due to advancements in technology and information.

Keywords: anxiety; digital health; health risks; health service; surgery

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INTRODUCTION

Preoperative anxiety is defined as an unpleasant emotional state characterized by feelings of tension, fear, nervousness, and increased autonomic activity, such as rapid heartbeats and elevated blood pressure. Physical responses to anxiety may include cold fingers, rapid heartbeats, cold sweats, dizziness, reduced appetite, lack of sleep, and chest tightness. Anxiety can also manifest in mental symptoms like fear of danger, inability to concentrate, and restlessness (Adwas et al., 2019; Dobrina et al., 2023; Tadesse et al., 2022).According to (Moon et al., 2019) and (Sui et al., 2023), factors influencing the level of preoperative anxiety include potential stressors, maturity, educational status, low economic status, physical condition, socio-cultural environment, situation, age, type of surgery, and lack of health information. If not promptly addressed, anxiety can lead to psychological issues such as depression, cognitive disorders, insomnia, pain, headaches, dizziness, and muscle tension, which can hinder the surgical process (Yang et al., 2021).

To address these issues, digital health education is necessary as an educational medium accessible to all age groups due to its ease of access, attractive presentation, and educational content, which can enhance knowledge and reduce patient anxiety (Gu et al., 2021; Jin et al.,

2021; Kondylakis et al., 2022; Luengo et al., 2023; Lunkenheimer et al., 2020; Xing et al., 2023).

Preoperative digital health education involves providing information from healthcare providers to patients and their families about surgery, preoperative preparation, surgery goals and risks, anesthesia, care environment, and postoperative care through digital applications. Digital applications facilitate patient access to information without requiring intensive accompaniment from healthcare providers, thus increasing patient satisfaction with the service (Akkuş et al., 2023; Knapp et al., 2021; Wong et al., 2022).Research by (Abate et al., 2020) indicates that the prevalence of preoperative anxiety varies across countries, with India ranging from 47% to 70.3%, Africa (Nigeria and Tunisia) from 51% to 90%, the United States at 20.2%, and Indonesia at 60% to 80% (Maulina et al., 2023). Studies by (Dobrina et al., 2023) show that digital health education for preoperative patients can improve self-efficacy, quality of life, and patient knowledge (Kaynar et al., 2023). This evidence supports that digital health education is highly effective in reducing anxiety.. Hence, This study aimed to determine the effectiveness of digital health education in reducing anxiety in pre-operative patients.

METHOD

The method applied in this study is a systematic literature review, which involves secondary research including the systematic collection and analysis of several primary studies related to the research topic or question. The detailed activities include the formulation of a data or reference source search strategy, selection of studies through assessment using eligibility criteria, and quality instruments. In the literature search, keywords and Boolean operators used include "Digital health and anxiety and surgery and health risks and health service." The information databases used in this study are Web of Science, Science Direct, Proquest, and PubMed.Additionally, to narrow the scope of the research, the researchers used the PICO (Population/Problem, Intervention, Comparison, Outcomes) approach, as shown in the following table:

Tabel 1.
PICO Formulation for Eligible Criteria

Criteria	Inclusion	Exclusion
Population	Studies focusing on the intervention using health media applications as an educational medium for preoperative patients.	Studies that do not review the intervention using health education applications.
Intervention	Studies that intervene with preoperative patients to reduce anxiety using health education application interventions.	Studies that do not conduct digital health education anxiety interventions on preoperative patients.
Comparation	None	None
Outcome	Studies explaining the impact of digital health education interventions on preoperative patients' anxiety.	Studies that do not discuss digital health education interventions on patients experiencing preoperative anxiety.
Study Design	Randomized Controlled Trial, quasi-experimental.	Cross-sectional study, Case report, experimental studies, and quasi-trial.
Publication year	The year 2019 and onwards.	Before the year 2019.
Language	English.	Other than English.

RESULTS

The search yielded 13 articles, all of which were selected and revised based on a full-text assessment. Table 2 showed a total of 13 studies were identified, involving 1,394 pre-operative patients, the majority of whom (61%) were female. The age of the participants ranged from 5 to 68 years. The types of surgeries included orthopedic, eye, and gynecological procedures. The digital health education in these studies included websites and text messages through applications like WhatsApp, Telegram, and Facebook. Devices used for access were mobile phones, tablets, and computers. Instruments used to measure anxiety included the State-Trait Anxiety Inventory (STAI), Amsterdam Preoperative Anxiety and Information Scale (APAIS), and Visual Analog Scale (VAS). The effectiveness of digital health education for pre-operative patients with anxiety was seen as a mixed program combining images, audiovisual materials, and interactive features that allowed patients to communicate with each other and healthcare professionals. Figure 1 is an overview of the research flowchart.

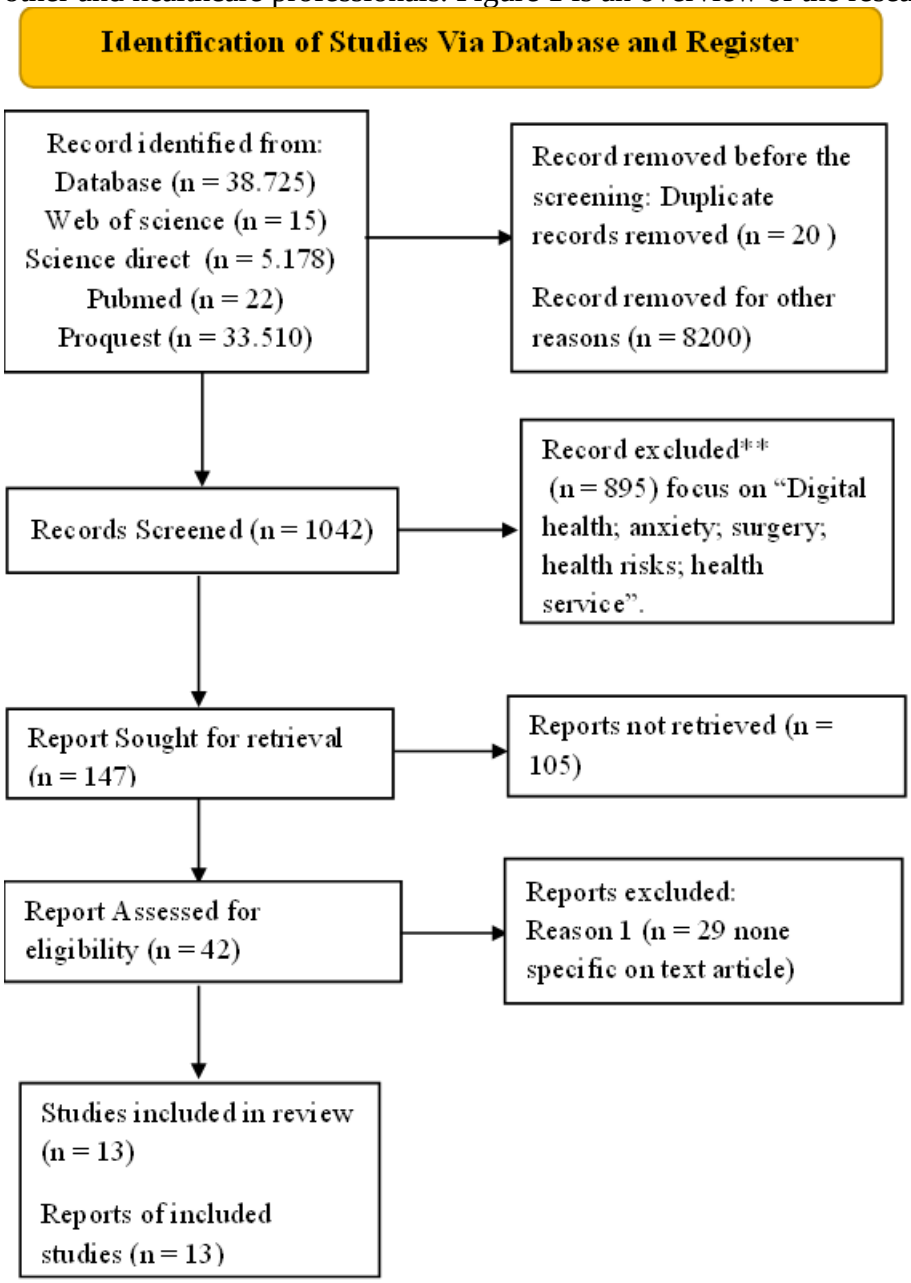

Table 2.
Included Study Characteristics

Author and Year of Publication	Country	Type of Digital Health Intervention	Duration, Frequency of Intervention	Results	Instruments Used to Measure Results	Number of Participants	Average/Median Age	Medical Conditions Related to Surgery and Type of Surgery	Comorbidities
(Kaynar et al., 2023)	China	Mobile application-based program for rehabilitation	5 days a week for 6 weeks	Positive impact on patients' self-efficacy, reported physical function, health-related quality of life, and levels of anxiety and depression	Anxiety and depression levels measured using the Chinese version of the Hospital Anxiety and Depression Scale	Total: 86 IG: F 32, M 11 CG: F 35, M 8	IG: 68.0 (10.0, 33–83), CG: 70.0 (10.0, 31–94)	Osteoarthritis Femoral Neck Fracture Others	Hypertension Diabetes mellitus Heart conditions Endocrine and Metabolic disorders Stroke Psychological issues Cancer - Others
(Yang et al., 2021)	China	Computer-assisted cognitive behavioral therapy (cCBT) on psychobiological responses	cCBT program consists of five sessions, each session 20 minutes. Intervention performed 1-2 days before surgery and 2-4 days after surgery	Newly developed cCBT program is an effective non-pharmacological adjunct treatment for improving psychosomatic responses related to surgery and perioperative outcomes	State-Trait Anxiety Inventory (STAI), Patient Health Questionnaire-9 (PHQ-9), Athens Insomnia Scale (AIS), Satisfaction Survey Questionnaire	Total: 100 IG: F 28, M 22 CG: F 25, M 25	IG 42.10, CG 43.08	CRS with NP (Chronic Rhinosinusitis with Nasal Polyps) CRS Others	N/A
(Kakde et al., 2023)	Singapore	Music listening	Listening to music for about 30 minutes during spinal anesthesia and cesarean section	Listening to music reduces postoperative anxiety and lowers pain catastrophizing. Based on good patient satisfaction and positive feedback, music listening is recommended in obstetric conditions	VAS-A, Pain Score, total PCS score	Total: 108 IG: 53 CG: 55	IG 33.6, CG 34.4	Cesarean section	N/A
(Anthony et al., 2020)	The US	Therapy Delivered via a Mobile Phone Messaging Robot to Decrease Postoperative	ACT intervention delivered via mobile text messages twice a day for 2 weeks	ACT intervention delivered via mobile text messages can reduce opioid use after orthopedic trauma surgery	PROMIS Emotional Distress-Anxiety 8A Short Form to measure anxiety	Total: 76 IG: 38, F 22, M 19 CG: 38, F 21, M 20	IG 45.5, CG 48.7	Orthopedic trauma	N/A

Author and Year of Publication	Country	Type of Digital Health Intervention	Duration, Frequency of Intervention	Results	Instruments Used to Measure Results	Number of Participants	Average/Median Age	Medical Conditions Related to Surgery and Type of Surgery	Comorbidities
(Jin et al., 2021)	China	Self-Produced Audio-Visual Animation Introduction	Children and their parents watch audio-visual animation three times, 10 minutes each time	Audio-visual animation effectively reduces preoperative anxiety in both children and their parents in a pediatric context	Modified Yale Preoperative Anxiety Scale (mYPAS) for children, Spielberger State-Trait Anxiety Inventory (STAI) for parents	Total: 100 IG: 50 CG: 50	IG 4.65, CG 4.72	Strabismus surgery in pediatric patients	N/A
(Gu et al., 2021)	China	TikTok Browsing for Anxiety Relief	Video provided for 20 minutes	TikTok application can significantly reduce blood pressure and anxiety scores	Spielberger State-Trait Anxiety Inventory (STAI), Amsterdam Preoperative Anxiety and Information Scale (APAIS), and Anxiety Visual Analog Test (AVAT)	Total: 80 IG: F 38, M 42 CG: F 44, M 36	Ages 18 to 45 years	Preoperative patients	N/A
(Knapp et al., 2021)	The US	Digital Application-Based Technology	Total 14 hours overall, module over 15 weeks	Digital technology platform provides a scalable and meaningful approach to engage patients throughout the joint replacement care continuum and can serve as a cost-effective supplement to traditional methods. Also has a high compliance rate	In-app survey	207 patients aged between 25 and 65 years Male: 73 Female: 134	Average age in the study was 60 years	Total hip arthroplasty (THA) and total knee arthroplasty (TKA)	N/A
(Townsend et al., 2021)	The US	Noise-Canceling Headphones and Music	Patients given noise-canceling headphones and listen to music during surgery	Noise-canceling headphones and music listening during hand surgery with local anesthesia wide-awake no tourniquet (WALANT) can reduce	Visual Analog Scale, State-Trait Anxiety Inventory (STAI)	Total: 50 IG: F 12, M 13 CG: F 14, M 11	IG 58.4, CG 63.2	RKT 7 RKT 8 TFR 6 TFR 8 RKT and TFR 2 Dupuytren 2 Cyst Removal 2 CTR and TFR 1 Dupuytren Cyst Removal 2 1 Mass Excision 2 DeQuervain Release 1	N/A

Author and Year of Publication	Country	Type of Digital Health Intervention	Duration, Frequency of Intervention	Results	Instruments Used to Measure Results	Number of Participants	Average/Median Age	Medical Conditions Related to Surgery and Type of Surgery	Comorbidities
				intraoperative anxiety in patients				Skin Cover 2 DIP Joint Fusion 1 DeQuervain Release 1 DIP Joint Debridement 1 DIP Joint Fusion	
(Kwon et al., 2023)	South Korea	preoperative education using virtual reality	Intervensi Intervention performed in a private room and lasted for 11 minutes	VR is effective in reducing anxiety and patient information needs before undergoing general anesthesia	APIS, Satisfaction	Total: 80 IG: F 13, M 27 CG: F 15, M 25	Age >14 IG 40.75 CG 42.75	Facial fracture reduction Corrective nasal surgery Breast augmentation Excision or soft tissue reconstruction Burn	N/A
(Yıldız & Karagözoğlu, 2023).	Turkey	Web-Based Interactive Nurse Support Program Based on the Health Promotion Model	Web-based interactive nurse support program applied to the intervention group for 10 weeks, while the randomized controlled trial lasted 6 months	Web-based interactive nurse support program has the potential to improve health behaviors and self-efficacy of patients	1. Dutch Eating Behavior Questionnaire (DEBQ) 2. DISCERN measurement tool 3. Website 4. General Self-Efficacy Scale	Total: 62 IG: F 19, M 12 CG: F 18, M 13	Average age IG 38.41 CG 37.38	Patients Who Regained Weight After Bariatric Surgery	N/A
(Lahti et al., 2020)	Finland	Virtual Reality Relaxation	Watching videos in VR for 3 minutes while sitting in a niche	Short VRR application is feasible and effective for reducing preoperative dental anxiety in general dental care settings	Modified Dental Anxiety Scale (MDAS)	Total: 255 F 171 M 84	Average age F 53 years M 50 years	Adult patients (≥18 years) presenting for dental care	N/A
(Daf & Patil, 2024)	India	Virtual Rehabilitation	Intervention given 5 days/week. Each session lasts 60 minutes	Study reveals that virtual rehabilitation in addition to conventional physical therapy for proximal humerus fracture is more effective in improving shoulder ROM, muscle	Numerical Pain Rating Scale (NPRS), universal goniometer, markers, Shoulder Pain and Disability Index (SPADI), Disabilities of the Arm, Shoulder, and Hand (DASH) Questionnaire	Total: 50 IG: 25 CG: 25	Ages 40 – 60 years	Patients with Proximal Humerus Fracture	N/A

Author and Year of Publication	Country	Type of Digital Health Intervention	Duration, Frequency of Intervention	Results	Instruments Used to Measure Results	Number of Participants	Average/Median Age	Medical Conditions Related to Surgery and Type of Surgery	Comorbidities
				strength, and upper limb function compared to conventional therapy alone					
(Zheng & Yan, 2023)	China	application of short-form video health education	Nurses create short 1-3 minute videos, total 14 videos	Application of short-form educational videos during perioperative care for lower extremity fracture patients can increase patients' understanding of perioperative health and improve satisfaction with nursing care	Health Education Knowledge Awareness Questionnaire, Newcastle Satisfaction with Nursing Scale (NSNS)	Total: 122 IG: F 27, M 34 CG: F 32, M 29	IG: 18-55 years old 20 people, 56-76 years old 41 people CG: 18-55 total 24 56-75 total 37 people	Hip Femoral Shaft Tibia and shin Patella Calcaneus Ankle	N/A

DISCUSSION

This study aimed to determine the effectiveness of digital health education in reducing anxiety in pre-operative patients. Anxiety according to (Dobrina et al., 2023), is an emotional state that occurs when someone is under pressure. This state is characterized by tension, worrying thoughts, and can increase physical responses. Anxiety is also defined as a disturbance in emotional state marked by feelings of fear or deep and ongoing worry but without an impaired sense of reality (Borkovec et al., 1998; Ghinassi, 2010; Lader & Marks, 2013; Yang et al., 2021).Anxiety in perioperative patients generally leads to feelings of fear, which can trigger stressors that lead to stress reactions accompanied by symptoms of anxiety and depression (Antonis, 2022; Obuchowska & Konopinska, 2021; Rich, 2020). Anxiety is not only experienced by patients but also by their caregivers or family members during hospital care and recovery processes (Kaynar et al., 2023). Anxiety in patients can increase physical responses such as elevated heart rate, increased blood pressure, and psychological disturbances (Gu et al., 2021).

The rise in anxiety incidents among perioperative patients is closely related to the lack of health information obtained during healthcare services (Yang et al., 2021). High preoperative anxiety rates can cause mood disorders such as anxiety and depression, with research data showing rates between 60-80% in Western populations (Afrassa et al., 2022). Therefore, preoperative anxiety requires serious attention, and educational media is needed as an information tool to address these issues. Digital health information media also includes treatment information and medical procedure details, aiding individuals in making decisions about their healthcare or that of their family members (Jin et al., 2021; Lunkenheimer et al., 2020). Digital health education features various tools such as text messaging apps, websites, virtual reality, images, videos, audio, and other interactive features that attract children,

adults, and the elderly. This health information can be easily accessed via mobile phones, tablets, or computers and can be an effective means to enhance patient cognition during surgery preparation, thus managing psychobiological stress responses (Anthony et al., 2020; Kwon et al., 2023; Townsend et al., 2021).

Research by (Daf & Patil, 2024; Lahti et al., 2020) shows that virtual media-based interventions can reduce anxiety, improve sleep quality, and increase awareness levels. Health education serves not only as an educational tool but also as a health promotion medium to improve service quality and patient satisfaction with healthcare services (Knapp et al., 2021). Similarly, (Yıldız & Karagözoğlu, 2023) state that web-based interactive nurse support programs have the potential to improve healthy behaviors and self-efficacy in patients during care. Thus, 13 studies involving 1,394 preoperative respondents, with a majority of 61% female patients ranging from children to the elderly, concluded that digital health education can manage anxiety and serve as an interactive information medium between healthcare providers and patients during care and postoperative recovery with significant values ($p < 0.005$) and patient satisfaction ($p < 0.005$). In the rapidly evolving digital era, information technology has become an integral part of various aspects of life, including healthcare. The application of digital-based information technology in the health sector offers significant opportunities to address challenges faced by conventional healthcare systems. Digital innovations, including telemedicine, TikTok, and various other medical technologies, offer solutions to improve healthcare service efficiency and effectiveness and have the potential to transform patient care approaches (Daf & Patil, 2024; Kakde et al., 2023; Zheng & Yan, 2023).

CONCLUSION

Based on the review conducted, it can be concluded that digital health education shows significant potential in reducing pre-operative anxiety in patients. This approach offers innovative, effective, and adaptable solutions to meet the individual needs of patients while also serving as a promotional tool to enhance health quality and service standards, ultimately contributing to community well-being.Digital health education is expected to serve as an interactive medium between healthcare providers and patients to increase patient satisfaction and prepare patients both physically and mentally for surgery. Digital health education is an accessible medium that can be used anywhere and anytime, making information available without spatial and temporal limitations.It is important to note that digital health education must be supported by accurate, reliable, and evidence-based content. Additionally, attention must be paid to user privacy and data security to ensure that patients' personal information is not misused. The article search could not specifically target patients with certain medical diagnoses due to the limited number of articles. The reflection on the results of the studies conducted in this systematic review cannot be specified for particular cases with anxiety disorders.

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