Virtual reality for physical and psychological improvement during the treatment of patients with breast cancer: Systematic review

Bryan Tito-Llana1, Nils Riveros-Torre1, Brian Meneses-Claudio2*, Monica Auccacusi-Kañahuire2

1Facultad de Ingeniería, Universidad Tecnológica del Perú, Lima, Perú
2Facultad de Negocios, Universidad Tecnológica del Perú, Lima, Perú

Abstract

During breast cancer treatment, patients face various physical and psychological problems. However, a promising solution has been found in the use of virtual reality as a tool to address these problems. Our goal was to identify the most common problems and symptoms during treatment, as well as investigate the effectiveness of virtual reality in addressing them. We also set out to determine if there are any disadvantages associated with using this system. To this end, we conducted a systematic review using a non-experimental, descriptive, and qualitative-quantitative approach. 20 open access articles were selected in the Scopus database, following established inclusion and exclusion criteria. The results revealed that anxiety and pain are the most common symptoms experienced during breast cancer treatment. Regarding the effectiveness of virtual reality to treat these symptoms, differences were found: a significant impact on anxiety was observed (p < 0.001), but no significant impact on pain was found (p < 0.07). In addition, only three studies mentioned the possible presence of cyberdisease as an obstacle. In conclusion, anxiety and pain are the most common symptoms during breast cancer treatment. Virtual reality shows high efficacy in managing anxiety, but its effectiveness in pain management is limited. In addition, technological advances appear to have reduced the occurrence of cyberdisease and associated drawbacks, although little information is available in the studies reviewed.

Keywords: Breast cancer, virtual reality, patients, medical treatment.

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1. Introduction

Breast cancer is a disease that is seen with high frequency throughout the world. It is one of the most common types of cancer globally (1) (2). The incidence rate of breast cancer in developed regions such as Australia, New Zealand and North America is almost three times higher than the rate in developing regions such as Central and South Asia, Central Africa, and East Africa. In 2020, approximately 2.3 million new cases of breast cancer were diagnosed, representing about 11.7% of all cancers diagnosed. These numbers reflect the high incidence of breast cancer worldwide. In addition, studies have shown that breast cancer is the fifth leading cause of cancer death worldwide, accounting for approximately 685,000 deaths. Many patients who have been diagnosed with this disease prolong their lives through different types of treatment. The types of treatment for this cancer are surgery, radiation therapy, chemotherapy, endocrine therapy, and targeted therapy. Cancer recovery or treatment involves a group of professionals from different disciplines working together.
to encourage patient functioning (3) (4) (5). There is also a growing need of inclusion and gender-based studies within healthcare, coping and identity areas (6) (7) (8). Unfortunately, during or after this process patients suffer physical and psychological symptoms, such as pain, fatigue, depression and anxiety, also functional deficits, such as cognitive impairment and reduced range of motion of the shoulder and complications such as haemorrhage, effusion, or flap necrosis. The limitations that arise due to cancer can further affect a person's ability to participate in everyday activities and have a good quality of life (9). These results are consistent with those shown by previous studies in various health disciplines (10) (11).

The management for pain and the other effects that this cancer brings has pharmacological and non-pharmacological methods. First, the pharmacological method; It involves the use of medications which can cause dry mouth, hallucinations, and myoclonic spasms. And second, the non-pharmacological method; This has two classifications: peripheral therapies; which has a cold and heat treatment, acupuncture, massage, hydrotherapy and exercise, and cognitive-behavioural therapies, such as relaxation, meditation, prayer, yoga, hypnosis, and distraction.

In recent years, a new technology came to support rehabilitation to manage the effects caused by this cancer, a technology known as virtual reality, this system has been widely used in cancer treatments, as it serves as a distraction system and this could relieve symptoms such as pain, stress, distress, worry, and other effects that make the patient uncomfortable. Several studies have approached to the importance of rehabilitation and their results are promising, although the are several question to be answered (12) (13) (14) (15) (16) (17) (18).

Virtual reality systems now have a device that looks like glasses and are mounted on the head, or also known as HMD, these help the person see what is shown on the screen (19). They now also feature additional devices like sensors for tracking body movements, headsets, and other types of hardware like data gloves and joysticks. These systems have two categories: immersive and non-immersive. The immersive practically refers to a complete immersion, bone that excludes the patient from the light and sound of the outside, making the person only concentrate on the screen they have mounted on the head or rather on the HMD. And the non-immersive, is also characterized by having a head-mounted screen, but the person can communicate with the external world through interventions allowed through the sensors or other additional devices already mentioned.

The use of immersive or non-immersive virtual reality becomes very useful to divert the attention of patients, causing them to concentrate on the screen of the system or intervening in it, in this way, the anguish, anxiety, worry or pain decreases when those are during or after treatment for this disease (20) (21) (22) (23) (24) (25) (26) (27).

Most studies have shown that the implementation of virtual reality during breast cancer treatment can play an important role in the symptoms and side effects that this process entails. However, the use of this technology has some drawbacks or problems that affect patients, such as cybernetic dizziness that refers to a discomfort that can occur after a few minutes of seeing the system used, causing different levels of discomfort and fear when using this system again. The weight of this technology is also presented as another drawback, causing pressure on the patient's head, causing him not to concentrate on the projected image, and thus not being able to manage the worry and the other effects that the patient entails. It is true that the use of this system helps in the treatment of breast cancer, but it also has some drawbacks (28) (29).

Increasing the level of knowledge about the obstacles currently existing in relation to the use of virtual reality would allow efforts to be directed towards improving aspects such as structure, weight or other characteristics that may impact the patient's experience when using this system, among other applications (30). By having a deeper understanding of the drawbacks that may arise, new opportunities would open to research and develop innovative solutions that effectively address the specific challenges faced by users of this technology. This continuous improvement approach seeks to optimize both the performance and comfort of virtual reality, to maximize its therapeutic potential and ensure a rewarding and safe experience for the patients involved, which is consistent with the data available in the literature (27) (31) (32).

The present study or systematic review was conducted to verify how effective the use of virtual reality is in rehabilitation during the treatment of patients with breast cancer. In addition, we will also study how much it affects the mentioned drawbacks in patients or if they are still present, since the articles studied show that this is not too clear. Therefore, the main objective of this document is to carry out a comprehensive analysis about the effectiveness of virtual reality in addressing the most common problems that arise during the breast cancer treatment process. The aim is to determine whether the application of this technology can provide significant benefits to patients and, at the same time, to identify whether problems related to its use persist in recent studies carried out in this field (27) (33).

In this sense, the content is structured as follows. Section 2, Methodology, describes the approach used to carry out the systematic review (SR), detailing from the research questions posed to the operations performed to select the material discussed in the paper. Section 3, Results, presents, and organizes findings obtained after analyzing primary studies examining the efficacy of virtual reality in breast cancer treatments. Section 4, Discussion, addresses the sources and examines the percentages or probabilities of effectiveness in implementing the virtual reality system to treat the most common symptoms. Finally, section 5, Conclusions, summarizes the main findings and suggests possible directions for future research on the topic.

2. Methodology
2.1. Description of the systematic search strategy

In the present systematic literature review, the PICO methodology was used to exhaustively search scientific articles. The PICO schema is a widely used heuristic for formulating research questions, especially in the field of clinical research. In this context, a specific research question was raised: To what extent does virtual reality improve the medical treatment of breast cancer patients? (34). As a result of the application of this methodology, a formula was developed that had a successful performance when used in the Scopus database. The scientific articles or documents obtained were carefully selected and filtered through different methods such as inclusion and exclusion. We developed the formula based on previous studies with similar purposes (35) (36) (37) (38) (39) (40).

PICO question and its components

Table 1. PICO and its components

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<thead>
<tr>
<th>P</th>
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<tbody>
<tr>
<td>Medical Treatment of Breast Cancer</td>
<td>Virtual reality</td>
<td>Breast cancer patients</td>
<td>Improve medical treatment</td>
</tr>
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Relevant specialized keywords

We established 4 keywords that emerged from the research question:

Table 2. Keywords

<table>
<thead>
<tr>
<th>Keyword (Spanish)</th>
<th>Keyword (English)</th>
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<tbody>
<tr>
<td>Medical Treatment of Breast Cancer</td>
<td>&quot;Breast cancer&quot; OR biopsy OR metastasis OR chemotherapy OR radiotherapy OR mastectomy OR lymphedema OR &quot;mammary cancer&quot; OR &quot;breast carcinoma&quot; OR &quot;medical attention&quot;</td>
</tr>
<tr>
<td>Virtual reality</td>
<td>&quot;Virtual reality&quot; OR &quot;walled garden&quot; OR avatar OR &quot;digital twins&quot; OR &quot;augmented reality&quot; OR &quot;3D devices&quot; OR &quot;artificial intelligence&quot; OR &quot;instructional virtual&quot; OR &quot;virtual realities&quot;</td>
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Search equation used.

The PICO method resulted in the following formula, which was used in Scopus to search scientific documents that contribute to the research.

("breast cancer" OR biopsy OR metastasis OR chemotherapy OR radiotherapy OR mastectomy OR lymphedema OR "mammary cancer" OR "breast carcinoma" OR "medical attention") AND ("virtual reality" OR "walled garden" OR avatar OR "digital twins" OR "augmented reality" OR "3D devices" OR "artificial intelligence" OR "instructional virtual" OR "virtual realities") AND (Patients OR "sick people" OR affected OR sickly OR "serious health" OR infected OR indisposed OR "worn out person") AND (Improvement OR empower OR recover OR "effective method" OR thrive OR "quiet therapy" OR "peaceful process")

2.1.4. Definition of the inclusion and exclusion criteria for scientific articles

After the collection of information from the investigations, a critical evaluation was carried out taking into account the following points.

**Inclusion criteria:**

CI1. Included studies should address breast cancer treatment.

CI2. Studies should address improvements in virtual reality elements for better comfort for patients.


CI4. Accepted publication types are review articles.

**Exclusion criteria:**


CE2. Documents in languages other than English and Spanish.

CE3. Documents such as conference paper, thesis, or non-indexed material.

2.2. Description of the selection process

**Results obtained from the scientific literature search process.**

After carrying out the rigorous keyword search process to obtain the scientific articles that will contribute and support the research being done, we proceeded to use the formula generated from the PICO methodology. As an initial result of this application, a total of 317 documents were obtained that will be analyzed and filtered to use those that are really related to the chosen topic and achieve the objectives set.
Description of the selection logic considered (PRISMA)

The process of obtaining articles or documents that provide significant value to our systematic literature review has been based on the PRISMA statement logic. The statement Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), published in 2009, was created with the purpose of making it easier for systematic reviewers to transparently report on the reasons behind a review, the procedures carried out by the authors and the results found. According to this logic, once the systematic literature search has been carried out, a series of steps are carried out to ensure the quality and relevance of the selected documents (41).

First, we proceed to remove any duplicates that may have arisen if more than one database was used during the search. Next, a review of the titles and abstracts of the papers is performed to identify those that are of interest to our research. Also, an additional filter is made to ensure that the selected documents are available in their full version, whether in PDF, HTML, or other formats.

Once a complete set of documents has been obtained, a final selection is carried out using previously established inclusion and exclusion criteria. Finally, the entire process is documented in a flowchart following the structure and guidelines provided by PRISMA. In this way, a rigorous and transparent systematic review is guaranteed, supported by a reliable methodology.

Detailed description of the steps of the selection process and their results

First, a total of 317 documents were obtained because of the search carried out exclusively in the Scopus database, without finding duplicate files. Subsequently, a filtering process was carried out in which those documents that did not present a direct relationship with the research topic were discarded, based on the reading of titles and summaries of the documents obtained in the first phase of search, which found 251 documents that had no relation to the chosen topic, and we were left with 66 documents.

Additionally, documents in which the PDF or HTML file could not be extracted because they were not available for free to users or were no longer accessible were discarded, giving a total of 18 documents without full text. As a result of this filtering stage, 48 documents remained. A series of additional exclusion criteria were also applied, such as documents that were not in Spanish or English, that were not systematic literature reviews and that their year of publication was not earlier than 2019. Where it was found that all documents were in English and Spanish, 5 were conference papers and 23 were documents that have been published before the year 2019. In this way, 28 documents were deleted.

Taking into account the aspects mentioned above, 20 documents were selected to support our systematic literature review.

Figure 1. PRISMA flowchart

3. Results

Based on the articles obtained, the precedent of these studies was analyzed, where it was obtained that most of the articles studied are from the United States with a total of 6 investigations. The high incidence of breast cancer in the United States is because it is the most common type of cancer in this country.

There is an estimated 1 in 8 women chance of developing invasive breast cancer in their lifetime. In addition, the chance of dying due to this disease is about 1 in 35 women. China ranks second with 5 investigations, in a study by Wang et al. (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61).

A summary of cancer awareness levels is provided with the aim of increasing awareness of this disease among people, as this disease is very common in people. We also have three investigations originating in Italy, along with two studies from New Zealand. In addition, four investigations with respective origins in Poland, Iran, Portugal, and Egypt are included (20) (27) (54) (55) (56) (57) (58) (59) (60) (61).

Below is a table that provides more detailed information on the number of investigations by country of origin.

Table 3. Country of origin
People suffering from breast cancer often mention that they experience debilitating symptoms from both the disease itself and the treatments. These symptoms can manifest both on a physical level, such as pain and fatigue, and on a psychological level, such as depression and anxiety. These symptoms can have a significant impact on quality of life and become a source of suffering and limitations (62) (63) (64) (65).

We have also done a collection of symptoms that some of the studies mention. According to Yazdipour et al, it has been observed that many breast cancer survivors experience symptoms such as pain, fatigue, depression, anxiety, and lymphedema. In a study by Hao et al., it was found that patients also experience pain, fatigue, and anxiety, all of which can limit their participation in daily activities. Reynolds et al. They found that people who undergo rehabilitation for this disease experience stress, pain, and anxiety. Sharifpour and his team reported that people experience a significant level of pain. According to Zhang et al., patients experience great distress during different treatments for this disease. According to Zhao et al., during the radiotherapy process, patients often experience anxiety and stress. Finally, Horesh and his team have highlighted that people often suffer from depression, distress, and anxiety throughout the process. Anxiety is one of the most common symptoms experienced by patients (27) (42) (44) (46) (51) (58).

Virtual reality is an innovative method of active distraction (71) (72), it is used to cope with stressful or painful medical procedures, and there are two types of virtual reality, immersive and non-immersive. Immersive virtual reality uses accurate, real-time motion tracking devices and powerful graphics processors to generate continuous stereoscopic images on head-mounted displays (HMDs). This type of technology can provide the illusion that users are interacting with 3D objects in a virtual environment as they would in the real world, while non-immersive virtual reality only allows participants to view content based on how the device in use is held and moved. It implements the virtual scene using devices with traditional graphics, such as a large screen or a wall screen (55) (73). We conducted a count of studies that used immersive and non-immersive virtual reality to assess their efficacy in cancer treatments. We noted that 11 studies used immersive virtual reality, while only 1 study employed non-immersive virtual reality.
In addition, we found that 8 studies used both types of virtual reality. Therefore, immersive virtual reality was used in practically 19 studies, suggesting that it is the most recommended option for better results in interventions.

In Figure 4, we can see the distribution of the types of virtual reality and the number of repetitions used in the studies. Immersive VR was used in 12 studies, not immersive VR in 6 studies, and immersive and non-immersive VR in 1 study. The repetitions varied from 0 to 12.

Some studies indicate that certain patients who have used virtual reality have experienced certain drawbacks, such as cyberdisease. Cybersickness refers to the unpleasant symptoms and side effects that users experience during or after immersing themselves in virtual reality, including nausea, dizziness, dry mouth, headache, eyestrain, and sweating (74). According to Horesh et al., most of the patients involved in their study did not report any symptoms of cyberdisease (44). Zasadzka et al. presented a study in which these symptoms manifested themselves in less than 20% of cases (20). Yazdiopour also mentions these problems associated with the use of virtual reality, but stresses that it is a minority (27).

Symptoms of cyberdisease were only mentioned in three studies on the use of virtual reality in the treatment of breast cancer patients, while other studies do not refer to them, which could indicate that technology has advanced enough to reduce the occurrence of such symptoms.

![Types of VR and Repetitions](image)

**Figure 4. Types of VR and repetitions**

In another context, Zhang et al, they recruited ninety-eight breast cancer patients for their study, and all these patients were evaluated through a functional assessment (51). Also, Sharifpour et al., they investigated the effect of virtual reality therapy on pain variables among 30 adolescents in the chemotherapy stage, randomly assigning them to experimental and control groups (46). Finally, Ying Chun et al. They included 165 patients in their study, with the average age of these participants being 47.14 years. The cancers included in their sample included lung, liver, breast and colorectal (53).

In summary, when considering the number of patients collected from the studies analyzed, a total of 1748 patients is obtained. This figure is considered sufficiently representative to be able to evaluate whether the use of virtual reality can contribute to counteract the negative aspects associated with cancer treatment.

![Recurrences of cyberdisease](image)

**Figure 5. Mention of cyberdisease in studies**

The studies examined also shed light on the number of patients who were evaluated for the effectiveness of using virtual reality in breast cancer treatments. In this connection, Grilo et al., they indicate that a total of 376 patients with various oncolgical diseases participated in their studies, of which approximately 300 people were identified as breast cancer patients (60). On the other hand, Zhao et al., to evaluate the effectiveness, carried out tests with a group of 120 patients undergoing radiotherapy. These patients were divided into two groups: one control and one intervention (49). In another study, Hao et al. They identified a total of 799 patients with different types of cancer, and through a pooled analysis, we sought to determine whether the use of virtual reality showed significant improvements in treatment (42).

Regarding the methodology used, Ioannou et al. conducted a randomized crossover trial with 50 patients receiving active chemotherapy treatment, using linear mixed-effects models for statistical analysis (43). Reynolds et al., meanwhile, invited women with cancer to participate in their study through mailing lists of the New Zealand Breast Cancer Foundation and Sweet Louise (58). To assess the acceptability of the system in their research, they selected 30 adult participants (58).

In another study, Horesh et al. They recruited 42 women with cancer aged between 18 and 60. These participants were recruited by sending emails or direct contact with their personal physician (44). Chin et al. They included 38 women with cancer in their study and carried out interventions using virtual reality (59).

In another context, Zhang et al, they recruited ninety-eight breast cancer patients for their study, and all these patients were evaluated through a functional assessment (51). Also, Sharifpour et al., they investigated the effect of virtual reality therapy on pain variables among 30 adolescents in the chemotherapy stage, randomly assigning them to experimental and control groups (46). Finally, Ying Chun et al. They included 165 patients in their study, with the average age of these participants being 47.14 years. The cancers included in their sample included lung, liver, breast and colorectal (53).

In summary, when considering the number of patients collected from the studies analyzed, a total of 1748 patients is obtained. This figure is considered sufficiently representative to be able to evaluate whether the use of virtual reality can contribute to counteract the negative aspects associated with cancer treatment.
Anxiety and pain are common symptoms among patients undergoing breast cancer treatments. Therefore, a comprehensive analysis has been conducted on the effectiveness of virtual reality in alleviating these common symptoms.

First, emphasis has been placed on anxiety, where Yazdipour et al. have conclusively shown that the use of virtual reality systems has a significant impact on reducing anxiety (27). Grilo et al. have also backed up this claim in their study, evidencing a decrease in anxiety levels. Their results highlight the specific advantages of using virtual reality as a complement to educational methods in preparing patients to undergo radiotherapy (60) (75) (76).

In addition, the joint analysis conducted by Hao and his team has revealed that patients experienced improvement in both fatigue and anxiety after using virtual reality (42). Similarly, Zhao has pointed out in his findings that virtual reality can significantly reduce anxiety. On the other hand, Reynolds et al., in their study, have indicated that virtual reality offers some benefits in managing anxiety, albeit in a more limited way (58).

Zhang's study found that virtual reality intervention significantly reduced psychological distress and improved quality of life for women who had survived breast cancer in their daily lives. In addition, during an 8-month follow-up, patients who participated in such a study reported a decrease in levels of distress and anxiety. Ying Chun also supports the idea of the positive impact that the implementation of virtual reality has on the management of anxiety in treatments. Another study has conclusively shown that VR-based interventions achieved significant improvement in anxiety.

Five studies show that virtual reality is very effective against anxiety during treatments and two studies still wanted to do more evaluations to reach a conclusion. Therefore, it can be concluded that virtual reality intervention has a significant impact on the symptom of anxiety.

Pain is the second most common symptom among patients undergoing breast cancer treatments. Research has been conducted to evaluate the effectiveness of virtual reality in managing this symptom.

Hao and his team conducted a pooled analysis that showed significant improvement in pain experienced by patients (42). However, summarizing the findings of several experimental and quasi-experimental studies, Comparcini and his team found inconclusive evidence about the beneficial effects of virtual reality on pain reduction in patients receiving chemotherapy (55).

One study by Lee Wong et al. used an exploratory randomized control trial along with qualitative interviews in Chinese pediatric patients receiving their first intravenous chemotherapy. While the study suggested positive results regarding the use of virtual reality for pain management, the researchers concluded that large-scale randomized controlled trials were required to validate these effects (50).

Moreover, Ioannou and his team conducted a randomized crossover trial and found that virtual reality did not show efficacy in relieving symptoms of nausea, pain, and discomfort, although an improvement in patients’ mood was observed (43). Two studies did not demonstrate effectiveness, another study did not reach a definitive conclusion, while another study did find a positive result (43).

Overall, the studies analyzed have mixed results regarding the efficacy of virtual reality in pain management in breast cancer patients. Although some studies suggest benefits, others find no strong evidence of its effectiveness. Therefore, further research and well-designed clinical trials are required to determine with certainty the impact of virtual reality on pain relief, and practical solutions for the identified limitations and the adequate integration of ICT (77) (78) (79) (80) (81) (82) (83).
In this systematic review, we examined the effectiveness of virtual reality in pain management, revealing results indicating a relatively low impact ($p < 0.07$) when comparing an intervention group using virtual reality with a control group. However, a significant difference in pain reduction was observed only in patients aged between 12 and 17 years. On the other hand, the findings of Ioannou et al. did not support the efficacy of virtual reality in relieving pain symptoms, presenting a $p$-value lower than 0.05 (43). In contrast to the results mentioned above, the study by Hao et al. suggests that virtual reality can significantly reduce the pain experienced by patients. In that study, pain intensity was assessed using both a visual analogue scale and the McGill pain questionnaire (42). The results of a pooled analysis showed that the level of pain decreased significantly after the virtual reality intervention, with a $p$-value of less than 0.001. Despite these promising results, it is important to mention that there are two studies that did not find such significant efficacy of virtual reality in pain relief. These findings suggest that there may be variations in outcomes depending on participant characteristics, the type of pain assessed, and other contextual factors (55).

The effectiveness of virtual reality in managing anxiety was also investigated, and the results of several studies, such as those conducted by Grilo et al. and Hao et al., consistently indicated that virtual reality had a significant impact on reducing anxiety. Grilo reported on a study in which scores of three measures of anxiety (STAI-S, systolic blood pressure, and heart rate) were examined in the experimental group and found that these scores were significantly lower compared to the intervention control group (60). These differences reached statistical significance, suggesting that virtual reality had a positive effect on decreasing anxiety in that specific study. On the other hand, Hao conducted a study in which a pooled analysis was performed within the experimental group, revealing that the virtual reality intervention significantly reduced the level of anxiety ($p < 0.001$) (42). In addition, when performing a comparative analysis between groups, it was found that the group that used virtual reality showed significantly lower anxiety levels compared to the control group ($p < 0.001$). These results support the efficacy of virtual reality as an effective tool in reducing anxiety. However, it is important to mention that, in contrast to previous findings, Reynolds et al., in their study, indicated that reductions in anxiety did not reach the threshold to be considered clinically important (58). They raised the possibility that this was because the sample initially had relatively low levels of anxiety, which could have limited the scope for a clinically meaningful reduction. Although these results may suggest some variability in the effects of virtual reality on anxiety, most of the studies reviewed generally point to virtual reality as an effective tool to decrease anxiety levels in treatments (42) (58) (60) (84).

Still, challenges regarding ICT integration, teaching and learning of these tools and similar, remain as main target for future studies (85).

### 5. Conclusions

In conclusion, this study has carried out an exhaustive investigation that has identified, through various studies, that anxiety is the most frequently mentioned problem during breast cancer treatment, followed closely by pain. Given this problem, the feasibility and effectiveness of the implementation of virtual reality as a potential solution to address these challenges has been investigated.

The results obtained indicate that, about anxiety, the application of virtual reality has yielded significant results in the reduction of this worrying emotion. Patients who have experienced virtual reality sessions as part of their treatment have shown a considerable reduction in their anxiety levels, which represents a promising advance in the field. As for pain, while some studies have shown some effectiveness of virtual reality in its management, most have not found solid evidence to support its effectiveness in this regard. Although it is important to note that there is research that supports its benefit, it is necessary to delve into this topic and carry out more studies to obtain more conclusive conclusions.

Regarding the symptoms associated with cyberdisease, it was observed that only three studies specifically addressed this aspect in the context of the use of virtual reality in patients with breast cancer. In contrast, other studies did not make explicit references to these symptoms, which could indicate that technological advances have made it possible to reduce their occurrence and, therefore, the disadvantages related to them.

In terms of future research, it is recommended to explore other databases and additional information sources, with the aim of obtaining a broader and more complete view on the effectiveness of virtual reality in pain management. Likewise, it is crucial to identify if the symptoms associated with the use of the virtual reality system continue to be a relevant concern, since so far there is no definitive clarity in this regard. These aspects will be key to advancing the implementation of virtual reality as an effective and safe therapeutic tool in the treatment of breast cancer.
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References


