OPEN ACCESS
Scholars International Journal of Traditional and Complementary Medicine
Abbreviated Key Title: Sch Int J Tradit Complement Med
ISSN 2616-8634 (Print) |ISSN 2617-3891 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Short Communication

Virtual Reality Complementary Therapy and Breast Cancer Recovery: A Brief Update

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DOI: 10.36348/sijtcm.2022.v05i07.001 | **Received:** 09.06.2022 | **Accepted:** 26.07.2022 | **Published:** 03.08.2022

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Abstract

This update reviewed the effects of VR complementary therapy in breast cancer patients regarding physical symptoms such as the common triad of pain, lymphedema and upper limb impairment following treatment. The results revealed weak but consistently positive, significant effect in physical symptoms. Findings, however, were limited by poor methodological quality, small sample sizes and low statistical power in studies. Future recommendations include better designed studies with large sample sizes and acceptable power to investigate the effects of VR interventions in women with breast cancer, during and after cancer treatment.

Keywords: Virtual reality and breast cancer, virtual reality and cancer, virtual reality and rehabilitation, virtual reality and cancer rehabilitation.

INTRODUCTION

Female breast cancer (BC) has surpassed lung cancer as the most commonly diagnosed cancer in the world, accounting for nearly 12 percent of all cancer cases, and is the leading cause of cancer deaths in women globally [1, 2]. While BC incidence has increased gradually, survival has increased sharply due to earlier detection, diagnosis and treatment; indeed, the 5-year relative survival rate for those with breast cancer is 82 percent [3]. Typical treatments include surgery, chemotherapy, and radiation. Today, survivors are able to live a prolonged life post-treatment, yet physical and psychological consequences of treatment and the disease routinely affect quality of life (QOL) in this population. Thus, these negative consequences can severely eclipse the overall QOL in this population [4, 5]. One complementary therapy that shows potential to mitigate treatment issues is virtual reality therapy (VR). A brief review of physical post-treatment issues is presented, followed by a research update as to VR intervention in women with breast cancer. A later work will review breast cancer post-treatment research into VR complementary therapy and psychological issues

The Physical Triad of Post-Breast Cancer Disease and Treatment

After the war has been waged against cancer by various weapons, be it surgery, chemotherapy, radiation/endocrine therapies, etc., many women experience multiple disease and treatment-related physical problems that reduce QOL. Three adverse related physical consequences are postsurgical pain, lymphedema, and upper limb dysfunction.

Breast cancer survivors face a lifelong risk of post-surgical pain, lymphedema, and upper limb impairment [4]. The estimated prevalence of persistent postsurgical pain of nearly 80 percent exists in BC along with the lifelong potential for lymphedema [6]. After surgery such as mastectomy, axillary node treatment, abnormal accumulation of fluids may build up in the axillary space with chronic inflammation, edema and pain [5]. A specific serious consequence unique to BC is ROM impairment of upper extremities after mastectomies with axillary node dissection and radiation. Upper limb dysfunction such as limited shoulder mobility or decreased arm strength can reduce activities of daily living (ADL), compromising survivor status [5-7]. Consequently, a vicious cycle of related triad symptoms manifests: persistent pain, lymphedema probability and upper limb ROM impairment that cycles back to exercise evasion during physical rehabilitation to avoid pain, further increasing limb dysfunction. VR may have the potential to enhance rehabilitation exercises that improve upper limb dysfunction and ROM.

VR COMPLEMENTARY THERAPY

Definition and Types

Recent decades have witnessed advancements of technology in health and medicine such as virtual reality therapy (VR). VR, along with other emerging complementary therapies, have been used increasingly to assist in managing morbidity outcomes of cancer treatment. While various definitions exist, a simple one is that VR is a computer-generated artificial environment where users can explore and interact in such a simulated virtual world; that is, multi-modal, synthetic sensory stimuli are presented by VR such as visual imagery, sound, tactile and olfactory feedback [7]. Thus, the user is separated from reality and isolated from the medical milieu by this digital distraction of VR, of which there are immersive and non-immersive types: the fully immersive involves the user's view is totally cut off from time and reality while the non-immersive experience allows the user contact with external reality. It can be argued that full immersion allows the user to focus solely on enjoyable artificial stimuli, thus reducing uncomfortable emotions.

RESEARCH UPDATE: PAST AND PRESENT

Previous VR Research

Historically, there have been mixed findings as to the effectiveness of VR complementary therapy in cancer patients in general and breast cancer, specifically, producing inconsistent research. This has been fueled by a general lack of methodological quality, few randomized as well as diverse designed trials, small sample sizes or low statistical power, and immersive vs non-immersive (5,7). For example, previous analyses of literature (2016 – 2021) concluded that VR significantly improved physical (and psychological) symptoms in patients with multiple types of cancer [e.g., 8, 9), while other studies---also consisting of multiple types of cancer---concluded that VR interventions did not ameliorate such symptoms significantly or results were inconclusive [e.g., 10, 11]. Additionally, one previous analysis [Chirico] considered immersive VR to be the more effective intervention to treat pain amongst BC patients. The current update below is based upon recent analyses of VR therapy for only one cancer population---breast cancer patients---rather than mixed types.

Recent Research Update

BC surgery may result in the previously discussed physical triad of pain, lymphedema and upper limb ROM impairment, thus physical therapy (PT) rehabilitation is salient. Rehabilitative exercises are challenging since patients may be averse to repetitive movements precisely because it produces more pain. However, technological advances in health and medicine, specifically here VR assisted rehabilitation management, may help to improve BC patients' efforts in PT activities. The recent analyses were selected below that (1) only included BC patients rather than mixed cancer types and (2) were conducted in accordance with the consistent, standardized research protocol of systematic guidelines or PRIMA---the Preferred Reporting Items for Systematic Reviews and Meta-analyses [5-7]. Again, the focus here is that of physical symptoms; a later work will address VR effects on psychological issues.

In general, all studies found that VR-based interventions produced positive and significant improvements in physical symptoms of pain, lymphedema and upper limb ROM in general, and specifically, in the following: shoulder ROM, including flexion, extension, adduction, abduction, internal and external rotation but not grip, in breast cancer patients, compared with other interventions. A major distinction was added to the literature in terms of VR type being used as well as timing of VR therapy. Chirico and colleagues previously recommended immersive VR as an effective distraction intervention for pain and anxiety in BC patients [8]. Zasadzka *et al*., specified that their findings indicated non-immersive VR as more appropriate for BC rehabilitation treatment, that is, physical therapy exercises, upper limb dysfunction treatment after surgery, etc., along with studies needed to assess VR therapy during and after cancer treatment [5, 12]. All researchers in this present update emphasized that stronger support or interpretation is limited due to the overall poor methodological quality, small sample sizes, and low statistical power of studies as well as the need for large and better designed randomized controlled trials (RCTs) in the future.

CONCLUSION

This update reviewed the effects of VR complementary therapy in BC patients regarding physical symptoms such as the common triad of pain, lymphedema and upper limb impairment following treatment. The results revealed weak but consistently positive and significant improvement in physical symptoms. Findings, however, were limited by poor methodological quality, small sample sizes and low statistical power in studies. Future recommendations include better designed studies with large sample sizes and acceptable power to investigate the effects of VR interventions in women with breast cancer, during and after treatment.

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