

REVIEW ARTICLE

Investigating the Therapeutic Role of Immersive Virtual Reality in Mitigating Menopausal Symptoms: A Narrative Review

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ABSTRACT

Background: Menopause, or the permanent cessation of the menstrual cycle, was a significant physiological transition in a woman's life. It was frequently associated with symptoms such as hot flashes, night sweats, vaginal dryness, sleep difficulties, sexual dysfunction, depression, anxiety, memory loss, fatigue, headache, joint pain, weight gain, stress urine incontinence, and pelvic floor muscle dysfunction. Traditional therapies mainly involved hormonal and pharmaceutical procedures, but other non-pharmaceutical ways were progressively investigated.

Objective: This review explores the potential of immersive Virtual Reality (IVR) as an innovative, non-drug-based solution for managing menopause-related challenges.

Methods: An extensive literature search was conducted to identify relevant studies that explored the use of immersive, semi-immersive, and non-immersive VR in alleviating menopausal symptoms. A total of 15 studies were analyzed to evaluate the effectiveness of IVR in addressing symptoms, including osteoporosis, cognitive problems, stress urinary incontinence, hot flashes, anxiety, pelvic floor dysfunction, and overall well-being.

Results: The findings indicated that immersive VR offered unique benefits such as enhanced engagement, real-time feedback, and personalized interventions. Evidence suggested significant improvements in balance, cognitive function, muscle strength, and psychological health. IVR interventions also demonstrated potential in managing symptoms such as stress urinary incontinence, pelvic floor dysfunction, anxiety, and hot flashes, contributing to improved overall well-being.

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Conclusion: IVR offers a promising, non-pharmaceutical solution to improve menopausal women’s quality of life by effectively addressing physical and emotional symptoms.

KEYWORDS

- Immersive Virtual Reality • Virtual reality • Menopause • Menopausal symptoms

INTRODUCTION

Virtual reality training (VRT) is one of the most innovative and advanced exercise methods in physical therapy¹. Virtual rehabilitation is the use of virtual reality technology and simulations to give therapeutic interventions to patients, with a focus on the application of virtual reality (VR) tools and techniques in the medical area for rehabilitation². Jacobson divides virtual reality into four categories: immersive virtual reality (IVR), non-immersive virtual reality (NVR), augmented reality, and mixed reality^{3,6}. The main aim behind IVR is to promote sensory input in patients through the use of various virtual games^{3,4}. IVR can help menopausal women manage symptoms like hot flashes, mood swings, cognitive changes, and sleep difficulties by providing therapeutic diversion, relaxation, cognitive stimulation, pelvic floor muscle dysfunction, stress urine incontinence, and improved sleep quality.^{1,5,25,26} Menopausal women are more likely to develop osteoporosis due to a decrease in estrogen levels, which are essential for maintaining bone density^{27,28}. Menopause is a natural biological process that affects women at different periods and in varied ways, therefore there is no clear global ratio. However, most women experience menopause between the ages of 45 and 55.⁷ Menstrual cessation, which is not caused by illness or other physiological causes, marks the end of a woman’s reproductive phase, as the ovaries gradually lose function during the menopausal transition.^{8,9} This narrative study will look into IVR’s therapeutic potential as a non-pharmaceutical way to addressing the multiple issues that menopausal women confront. While IVR does not directly treat the hormonal changes linked with menopause, it can help reduce some of the symptoms and enhance general well-being. Let’s look at how IVR can help in this area.

MATERIAL AND METHOD

This narrative review was guided by the SANRA checklist to ensure quality. A comprehensive

search was conducted across multiple databases, including Google Scholar, PubMed, Cinahl Plus, Medline, Web of Science, using keywords such as “menopause,” “menopausal women,” “menopausal symptoms,” combined with terms like “immersive virtual training,” and “immersive virtual reality rehabilitation.”

The initial database search identified 172 records. After reviewing the titles and abstracts, 84 records were excluded as they were not relevant to the topic. This left 88 records, which were further assessed. However, 35 of these studies were excluded because their full text was not available. The remaining 53 full-text articles were carefully reviewed for eligibility. During this stage, 38 studies were excluded for reasons such as being in a non-English language or focusing on diseases unrelated to the review’s purpose. Finally, 15 studies met all the inclusion criteria and were selected for the final analysis. This process is summarized in Figure 1, which visually represents the selection and screening stages.

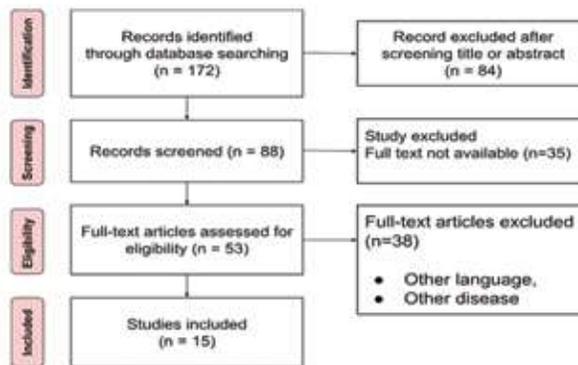


Figure 1: Flow Chart of Literature Search

DISCUSSION

In what ways does IVR demonstrate effectiveness in managing osteoporosis symptoms among menopausal women?

Nambi *et al.* showed that IVR training helps manage osteoporosis in menopausal women by improving muscle strength and

stimulating sensory and motor systems. IVR exercises also provide feedback, keeping participants motivated and improving brain function, which enhances quality of life and independence.¹⁰ **Rezaei et al. and Torkaman et al.** found that IVR exercises improve balance and coordination in people with osteoporosis, reducing the risk of falls.¹¹ **Gilani et al.** studied the effects of IVR on postmenopausal women with osteoporosis. They discovered that after six weeks of IVR, participants had better muscle response times, muscle activity levels, and balance compared to traditional training. IVR also reduced the fear of falling and improved quality of life more effectively than traditional training. They recommended IVR to help osteoporotic women regain balance and confidence.¹² **Yilmaz and Kösehasanoğulları** found that IVR exercise games, especially on the Nintendo Wii, improved balance and reduced the fear of falling in women with osteoporosis.¹³

Overall, IVR technology offers a promising and engaging way to improve rehabilitation for people with osteoporosis.³¹ Future research should explore how to best use IVR for long-term benefits and better quality of life.

How is IVR effective in menopausal women with Cognitive Problems?

Duivon and their team explored using IVR to help menopausal women with cognitive health by creating lifelike environments to assess cognitive functions. This method, more engaging than traditional tests, provided real-time feedback for tailored interventions and showed promise in managing cognitive impairments.¹⁴ **Kim and colleagues** found that IVR's immersive environments made cognitive training more enjoyable and effective, boosting motivation and engagement.¹⁵ Studies by **Zangirolami-Raimundo J.** demonstrated that IVR enhances cognitive function, distracts from vasomotor symptoms, manages headaches, and improves emotional well-being in postmenopausal women.¹⁶ Similarly, **Sikka et al.** found that IVR applications could manage pain, anxiety, and anger by immersing patients in engaging environments, reducing physical discomfort and emotional distress.²³ Overall, these studies highlight IVR technology's potential to benefit postmenopausal women through effective cognitive training, realistic assessments, and personalized interventions, despite factors like age and health symptoms

influencing outcomes.

How is virtual reality effective in menopausal women with Stress Urinary Incontinence?

IVR offers promising benefits for women managing bladder control issues. According to **Botelho et al.** IVR can make pelvic floor exercises more engaging and effective by providing real-time feedback, enabling users to see and feel how their muscles are working. This personalized, game-like approach not only enhances motivation but also helps users perform exercises correctly. Additionally, healthcare providers can remotely monitor progress, making therapy more accessible and interactive¹⁷. **Rutkowska et al.** further emphasize the potential of virtual reality-based therapy for urinary incontinence. They highlight advantages such as increased engagement, customized training programs, and real-time feedback, which contribute to better treatment adherence and improved patient satisfaction. However, they also stress the importance of further research to fully understand the long-term benefits and clinical applications of this technology²⁴. Similarly, **Woodley et al.** suggest that IVR provides real-time visual feedback during pelvic floor exercises, simplifying the process of learning correct muscle contractions. This interactive and tailored training approach makes exercises more enjoyable, improving patient compliance and outcomes. IVR also facilitates remote monitoring and personalized rehabilitation programs, ensuring care is adapted to individual needs¹⁸.

This evidence supports the growing potential of IVR as an innovative, non-pharmaceutical tool for improving outcomes in women with urinary incontinence.

How is IVR effective in menopausal women with Hot flashes and Anxiety symptoms?

In a recent study by **Alizadeh et al.** IVR technology can help manage hot flashes symptoms in cancer patients by providing immersive distraction, promoting relaxation and stress reduction, offering a personalized approach through AI algorithms, facilitating skill development for coping strategies, and creating a positive psychological impact that may reduce anxiety and improve overall well-being. IVR offers a multifaceted approach to managing hot flashes. Firstly, it provides an immersive environment that distracts patients

from the discomfort of hot flashes, allowing them to focus on a virtual world instead. Secondly, IVR experiences can be tailored to promote relaxation and reduce stress, common triggers for hot flashes. Additionally, AI algorithms can personalize the IVR content to suit each patient's preferences and needs, enhancing engagement and support. Furthermore, IVR can provide patients with tools and coping strategies to effectively manage their symptoms through interactive experiences. Lastly, engaging with IVR technology can have a positive psychological impact, potentially reducing anxiety and improving overall well-being, which may indirectly aid in managing hot flashes symptoms.¹⁹

How is IVR effective in menopausal women with Pelvic Floor Dysfunction?

IVR technology offers a compelling approach for enhancing stress urinary incontinence (SUI) management in menopausal women through interactive exercises and real-time feedback to strengthen pelvic floor muscles. Research by **Botelho et al.** demonstrates that IVR-based pelvic floor muscle training can effectively improve muscle strength and endurance while alleviating urinary symptoms in postmenopausal women. By immersing users in engaging virtual experiences, IVR programs make pelvic floor exercises more accessible and enjoyable, potentially leading to better control of SUI in this demographic.²⁰ Another study conducted by **Natalia M. Martinho et al.** IVR was found to be effective in improving pelvic floor muscle strength in postmenopausal women with pelvic floor dysfunction. The abdominopelvic training by virtual reality protocol showed significant improvements in muscle endurance compared to pelvic floor muscle training using a gym ball. The virtual reality-based training engaged participants in interactive exercises, potentially enhancing motivation and engagement, leading to improved muscle endurance in the pelvic floor muscles. Therefore, the study by **Martinho et al.** demonstrated that IVR training can be an effective and innovative approach for addressing pelvic floor dysfunction and improving pelvic floor muscle strength in postmenopausal women.²¹

In what ways does IVR exercise program effects on BMI, depression, exercise fun and exercise immersion in overweight women?

The study by **Eun-Young Seo, Yeon-Suk**

Kim, and colleagues examined the impact of IVR exercise programs on BMI, depression, enjoyment, and immersion in overweight middle-aged women. The findings revealed that IVR exercises effectively lowered BMI and enhanced mood by offering an engaging and interactive environment. This immersive experience helped distract participants from negative emotions, making the workouts more enjoyable and reducing feelings of depression. By incorporating motion sensors to track participants' movements, the IVR program ensured that the exercises were both effective and consistent. The enjoyable and interactive nature of IVR kept participants motivated, encouraging them to put in more effort and stick to the program, which led to increased calorie burn and a reduction in BMI over time. Compared to traditional indoor exercises like cycling, IVR programs utilized gamified elements, real-time feedback, and interactive features to make workouts more appealing. This not only improved the efficiency of the exercises but also supported better mental health and long-term commitment. In essence, IVR exercise programs offer a powerful combination of physical and mental health benefits, helping to reduce BMI while enhancing mood and exercise adherence in overweight individuals.²²

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CONCLUSION

In conclusion, IVR exercise programs are a modern and practical way to promote women to stay healthy during menopause. They're easy to use and fit into different lifestyles, making them a great option for women looking to enhance their overall well-being. By combining fun and physical activity, these programs not only help with fitness but also enhance mood and mental health, offering support during this important phase of life.

Clinical relevance

The clinical implications of this study are significant, showing that IVR can effectively address various symptoms in menopausal women. IVR's real-time feedback, personalized interventions, and remote monitoring enhance patient compliance and outcomes. For osteoporosis, IVR exercises can improve muscle strength and balance. Cognitive IVR training can boost memory and cognitive functions. IVR-based pelvic floor muscle training can aid in treating stress urinary incontinence. IVR can also help manage hot flashes and anxiety through relaxation and coping strategies, IVR exercise programs can reduce BMI and alleviate depression, making workouts more enjoyable and effective.

Further recommendation

Future research should focus on understanding the long-term advantage of IVR exercise programs for managing menopausal symptoms. Studies should similarly assess how cost-effective these programs are compared to traditional treatments and look into any probable side effects. To make the findings more relevant, it's important to encompass women from different backgrounds. Additionally, using AI and machine learning could help tailor IVR programs to individual needs, generating them much more effective

and invaluable for menopausal care.

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