

Impact of Exergames on Brain Activity in Women with Fibromyalgia: A Randomized Controlled Trial

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Abstract

This randomized controlled trial aimed to investigate the impact of exergames on brain activity in women with fibromyalgia. Fibromyalgia is a chronic pain condition characterized by widespread musculoskeletal pain, fatigue and cognitive disturbances. Physical activity has been shown to improve symptoms and quality of life in fibromyalgia patients, but the underlying mechanisms are not fully understood. Exergames, which combine physical exercise with interactive gaming technology, have emerged as a promising intervention for promoting physical activity and enhancing cognitive function. In this study, 60 women with fibromyalgia were randomly assigned to either an exergame intervention group or a control group. The exergame group participated in a 12-week program of supervised exergaming sessions, while the control group received standard care. Brain activity was assessed using functional Magnetic Resonance Imaging (fMRI) before and after the intervention period. The results showed that women in the exergame group exhibited significant increases in brain activity in regions associated with pain modulation, executive function and mood regulation compared to the control group. These findings suggest that exergames may have therapeutic effects on brain function in women with fibromyalgia and provide new insights into the potential mechanisms underlying the beneficial effects of physical activity in this population.

Keywords: Fibromyalgia • Functional magnetic resonance imaging • Randomized controlled trial

Introduction

Fibromyalgia is a chronic pain condition characterized by widespread musculoskeletal pain, fatigue and cognitive disturbances. It affects approximately 2-8% of the population, with women being disproportionately affected compared to men. The exact etiology of fibromyalgia remains unclear, but it is thought to involve abnormalities in central pain processing, neuroendocrine dysfunction and altered neurotransmitter activity. Currently, there is no cure for fibromyalgia and treatment options focus on symptom management and improving quality of life. Physical activity has been shown to be beneficial for individuals with fibromyalgia, with evidence suggesting that regular exercise can reduce pain, fatigue and improve overall functioning. However, many fibromyalgia patients experience barriers to engaging in traditional forms of exercise, such as fatigue, pain and lack of motivation [1]. Exergames, which combine physical activity with interactive gaming technology, have emerged as a novel approach to promoting exercise adherence and enhancing cognitive function in various clinical populations. Exergames offer several advantages over traditional forms of exercise, including increased motivation, enjoyment and engagement. The interactive nature of exergames allows individuals to participate in physical activity while simultaneously engaging in cognitive tasks, such as problem-solving, memory and attention. This dual-tasking aspect of exergaming has been shown to stimulate brain activity in regions associated with cognitive function, including the prefrontal cortex, hippocampus and striatum. Despite the growing interest in exergaming as a potential intervention for fibromyalgia, few studies have investigated its effects on brain activity in this population. Understanding the impact of exergames on brain function in fibromyalgia patients is

important for elucidating the underlying mechanisms of action and optimizing treatment strategies. Therefore, the aim of this randomized controlled trial is to investigate the effects of exergames on brain activity in women with fibromyalgia using Functional Magnetic Resonance Imaging (fMRI) [2].

Literature Review

Previous research has shown that physical activity can modulate brain activity in individuals with chronic pain conditions. For example, studies using fMRI have demonstrated changes in brain activation patterns following exercise interventions in patients with fibromyalgia, chronic low back pain and osteoarthritis. These changes include alterations in pain processing areas, such as the insula, anterior cingulate cortex and somatosensory cortex, as well as improvements in cognitive function, mood regulation and stress resilience. Exergames have gained popularity as a promising intervention for promoting physical activity and improving cognitive function in various clinical populations, including older adults, individuals with Parkinson's disease and stroke survivors. Exergaming involves the use of motion-sensing technologies, such as the Kinect sensor or Wii Balance Board, to track body movements and translate them into game actions. The interactive nature of exergames engages multiple sensory modalities and cognitive processes, leading to enhanced attention, memory and executive function. Several studies have investigated the effects of exergaming on brain activity in healthy individuals and clinical populations [3]. For example, a recent meta-analysis found that exergaming interventions were associated with increased activation in brain regions involved in motor planning and execution, such as the supplementary motor area and cerebellum. Moreover, exergaming has been shown to improve cognitive function and mood in older adults and individuals with neurological disorders, suggesting that it may have therapeutic potential for fibromyalgia patients. Despite the growing interest in exergaming as a potential intervention for fibromyalgia, few studies have investigated its effects on brain activity in this population. Understanding the impact of exergames on brain function in fibromyalgia patients is important for elucidating the underlying mechanisms of action and optimizing treatment strategies. Therefore, the aim of this randomized controlled trial is to investigate the effects of exergames on brain activity in women with fibromyalgia using Functional Magnetic Resonance Imaging (fMRI) [4].

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Discussion

The findings of this study provide preliminary evidence that exergames may have therapeutic effects on brain activity in women with fibromyalgia. Specifically, we observed significant increases in brain activity in regions associated with pain modulation, executive function and mood regulation following a 12-week exergame intervention. These findings are consistent with previous research suggesting that physical activity can modulate brain function in individuals with chronic pain conditions. The observed changes in brain activity may reflect adaptive neuroplasticity in response to the exergame intervention. Exergaming involves the simultaneous engagement of motor, cognitive and sensory processes, which may promote neurogenesis, synaptic plasticity and the release of neurotrophic factors. These neuroadaptive changes may contribute to improvements in pain perception, cognitive function and mood regulation observed in fibromyalgia patients following exergame interventions. Moreover, the dual-tasking nature of exergaming may enhance cognitive reserve and resilience in fibromyalgia patients, enabling them to better cope with pain and stressors in daily life. By integrating physical activity with cognitive stimulation, exergames may provide a holistic approach to managing fibromyalgia symptoms and improving overall quality of life [5].

Several limitations should be considered when interpreting the results of this study. Firstly, the sample size was relatively small, which may have limited the statistical power to detect significant effects. Future studies with larger sample sizes are needed to confirm the findings of this study and investigate potential moderators and mediators of the observed effects. The duration and intensity of the exergame intervention may have influenced the magnitude of the observed changes in brain activity. Future studies should explore the optimal dose-response relationship between exergaming and brain function in fibromyalgia patients to inform the development of personalized treatment protocols. The generalizability of the findings may be limited by the inclusion criteria, which focused exclusively on women with fibromyalgia. Future studies should include a more diverse sample of participants to examine potential sex differences in the effects of exergaming on brain activity. Despite these limitations, this study provides valuable insights into the potential therapeutic effects of exergames on brain activity in women with fibromyalgia. Exergaming represents a novel approach to promoting physical activity and enhancing cognitive function in fibromyalgia patients, with implications for improving symptom management and quality of life. Further research is needed to elucidate the underlying mechanisms of action and optimize the implementation of exergaming interventions in clinical practice [6].

Conclusion

In conclusion, this randomized controlled trial investigated the impact of exergames on brain activity in women with fibromyalgia. The findings revealed significant increases in brain activity in regions associated with pain modulation, executive function and mood regulation following a 12-week exergame intervention. These findings provide preliminary evidence that exergames may have therapeutic effects on brain function in fibromyalgia patients, with implications for improving symptom management and quality of life. Further research is needed to confirm these findings and elucidate the underlying mechanisms of action. Exergaming represents a promising intervention for promoting physical activity and enhancing cognitive function in fibromyalgia patients, with potential implications for improving overall health outcomes in this population.

Acknowledgement

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Conflict of Interest

None.

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