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# Virtual Reality as an Innovative Tool for Reducing Kynophobia in Patients with Lumbar Intervertebral Disc Prolapse

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**ABSTRACT:** This study explores the innovative use of Virtual Reality (VR) therapy to manage kynophobia (fear of dogs) in patients with lumbar intervertebral disc prolapse. The study investigates the efficacy of VR as a tool for controlled exposure therapy, leading to a significant reduction in phobia symptoms and an improvement in the overall quality of life for the patients. Through a randomized controlled trial, patients were exposed to a series of virtual environments involving dogs, with gradual intensification of exposure. The results demonstrated that VR therapy is an effective, non-invasive treatment option that can alleviate phobic responses and support psychological well-being in medically complex cases.

**KEYWORDS:** Virtual Reality Therapy, Kynophobia, Lumbar Intervertebral Disc Prolapse, Phobia Treatment, Exposure Therapy

## I. INTRODUCTION

Kynophobia, the irrational fear of dogs, is a specific phobia that can significantly affect the quality of life of individuals, especially those with chronic conditions such as lumbar intervertebral disc prolapse. Patients suffering from chronic pain conditions are often more vulnerable to anxiety disorders, including specific phobias, due to the stress and limitations imposed by their physical ailments. Kynophobia in such patients not only exacerbates their psychological distress but also restricts their ability to engage in outdoor activities, thereby hindering their overall recovery and rehabilitation process.

Traditional methods for treating specific phobias, such as kynophobia, include cognitive-behavioral therapy (CBT) and exposure therapy, which require patients to confront their fears directly. However, these methods can be challenging for patients with concurrent medical conditions due to the physical and emotional stress involved. Virtual Reality (VR) therapy presents an innovative solution by offering a controlled, safe, and gradual exposure to feared stimuli. VR allows patients to experience and interact with their phobia triggers in a virtual environment, reducing the risks associated with real-world exposure. This approach is particularly beneficial for patients with lumbar intervertebral disc prolapse, as it minimizes the physical strain during therapy sessions while effectively addressing psychological issues.

Numerous studies have supported the efficacy of VR therapy in managing various psychological disorders, including specific phobias. For instance, Wiederhold et al. (2014) demonstrated the effectiveness of VR as a distraction technique in chronic pain patients, highlighting its potential to reduce both pain and anxiety during therapeutic interventions [1]. Similarly, Garcia et al. (2022) found that an 8-week home-based VR program significantly reduced chronic low back pain, which is closely related to conditions like lumbar intervertebral disc prolapse [2].

In the context of phobia treatment, Tashjian et al. (2017) reported successful outcomes using VR for managing pain in hospitalized patients, which also included addressing anxiety disorders [3]. This finding aligns with the work of Chan et al. (2018), who conducted a meta-analysis showing that VR is highly effective in acute procedural pain management, further suggesting its potential for broader psychological applications [4]. Additionally, Brea-Gómez et al. (2021) emphasized VR's role in treating chronic low back pain through exposure to therapeutic virtual environments, thus providing a dual benefit of physical and psychological rehabilitation [5].

Birckhead et al. (2021) proposed a comprehensive VR protocol for chronic pain, supported by the National Institutes of Health (NIH), which integrates exposure therapy elements to address associated psychological distress [6]. This protocol is particularly relevant to the treatment of kynophobia, as it offers a structured approach to gradually confronting and overcoming fear in a controlled setting. Pourmand et al. (2018) further highlighted the versatility of VR in clinical pain management, suggesting its applicability across various chronic and acute conditions [7]. Moreover, Grassini (2022) conducted a systematic review and meta-analysis that affirmed the effectiveness of VR in non-pharmacological treatments for chronic pain, underscoring its potential in reducing anxiety and improving mental health [8]. Darnall et al. (2020) also explored the self-administered VR interventions for chronic pain, which included components of exposure therapy for managing comorbid anxiety and phobias [9]. Finally, Chi et al. (2019) provided evidence supporting VR's utility in treating neuropathic pain and associated psychological conditions in spinal cord injury patients, reinforcing its relevance in the context of lumbar intervertebral disc prolapse [10].

The literature clearly supports the efficacy of VR therapy in both physical and psychological rehabilitation, particularly for patients with chronic conditions. The integration of VR in treating kynophobia in patients with lumbar intervertebral disc prolapse is well-founded, given the dual need to manage pain and anxiety without exacerbating physical stress. By synthesizing the findings from these studies, the current research builds on the established benefits of VR, aiming to provide a comprehensive treatment approach that addresses both the physical and psychological challenges faced by patients. The controlled, immersive nature of VR makes it an ideal tool for gradual exposure therapy, helping patients overcome their phobias while also facilitating their physical recovery.

## II. METHODOLOGY

### Study Design

The study employed a **Randomized Controlled Trial (RCT)**, which is considered the gold standard in clinical research to determine the efficacy of a treatment. In this RCT, 60 participants diagnosed with kynophobia and lumbar intervertebral disc prolapse were randomly assigned to one of two groups: the experimental group or the control group. This random assignment helps minimize selection bias, ensuring that any differences observed between the groups are due to the intervention rather than other factors.

- **Experimental Group:** This group received the VR therapy specifically designed to reduce kynophobia. Participants in this group were exposed to virtual environments where they encountered dogs in a controlled, gradual manner.
- **Control Group:** This group received standard exposure therapy, which is the conventional treatment for phobias. The therapy involved direct or imaginal exposure to dogs, without the use of VR.

The purpose of using an RCT was to compare the effectiveness of the VR therapy with the standard exposure therapy, providing strong evidence on the efficacy of VR in reducing kynophobia.

### Participants

Participants were carefully selected based on specific inclusion and exclusion criteria to ensure that the study's results would be relevant to the target population.

- **Inclusion Criteria:**
  - **Age Range:** Participants were adults aged 18 to 65 years. This age range was selected to ensure that the study included a diverse group of adults who are commonly affected by lumbar disc prolapse and related conditions.
  - **Diagnosis:** All participants were diagnosed with lumbar intervertebral disc prolapse, a condition associated with chronic lower back pain. Additionally, they had clinically significant kynophobia, meaning their fear of dogs was intense enough to impact their daily lives.
  - **Chronic Pain:** Participants had experienced chronic pain for more than three months, a common duration used to distinguish chronic pain from acute pain.
- **Exclusion Criteria:**
  - **Severe Psychiatric Disorders:** Participants with severe psychiatric conditions, such as schizophrenia or severe depression, were excluded to avoid confounding factors that could influence the outcomes related to phobia treatment.
  - **Visual Impairments:** Since VR therapy relies heavily on visual stimuli, individuals with significant visual impairments were excluded to ensure that all participants could fully engage with the VR environments.
  - **Medical Contraindications:** Participants with medical conditions that could be aggravated by VR use, such as severe motion sickness or epilepsy, were also excluded to protect their safety.

### Intervention

The intervention spanned eight weeks, with participants in the experimental group attending **bi-weekly sessions** (two sessions per week). Each session was carefully designed to provide gradual exposure to the phobia-inducing stimulus (dogs) in a controlled and safe manner.

- **Virtual Reality Therapy (Experimental Group):**

- **Week 1-2:** Initial sessions involved low-intensity exposure, where participants were introduced to static images of dogs in a virtual environment. This phase allowed participants to familiarize themselves with the virtual setting without overwhelming them.
- **Week 3-4:** The exposure gradually intensified, with participants encountering more dynamic images of dogs, such as dogs moving slowly or from a distance. The aim was to gently escalate the exposure while monitoring the participants' anxiety levels.
- **Week 5-6:** Participants were exposed to scenarios involving closer interactions with virtual dogs, such as dogs walking towards them or barking softly. This phase was designed to challenge the participants' phobia while still maintaining a controlled environment.
- **Week 7-8:** The final phase involved high-intensity exposure, including scenarios where participants could interact with the virtual dogs more closely, such as petting or playing with them. The goal was to reduce the fear response significantly by the end of the therapy.

- **Standard Exposure Therapy (Control Group):**

- This group received traditional exposure therapy, which involved either real-life interactions with dogs (under controlled conditions) or imaginal exposure, where participants were asked to visualize their interactions with dogs. The intensity of exposure was gradually increased, similar to the VR therapy, but without the immersive virtual experience.

### Assessment Tools

To evaluate the efficacy of the interventions, the following assessment tools were used:

1. **Fear of Dogs Questionnaire (FDQ):**

- The FDQ is a standardized tool used to measure the severity of kynophobia. Participants completed the FDQ both before the intervention (pre-intervention) and after the intervention (post-intervention). The questionnaire included items that assessed the emotional, cognitive, and physiological responses participants experienced when they encountered dogs. Scores on the FDQ provided a quantitative measure of the participants' fear levels, with higher scores indicating greater fear.

2. **Visual Analog Scale (VAS):**

- The VAS is a widely used tool for measuring subjective levels of anxiety. During each therapy session, participants were asked to rate their anxiety on a scale from 0 to 100, where 0 indicated no anxiety and 100 represented the highest level of anxiety. The VAS allowed for real-time monitoring of how participants' anxiety levels fluctuated throughout the therapy sessions. This tool was particularly useful for tracking the immediate effects of the VR therapy on reducing anxiety associated with phobia exposure.

3. **Quality of Life (QoL) Measures:**

- These measures included a set of scales designed to assess various aspects of psychological well-being, such as emotional balance, social functioning, and overall life satisfaction. The QoL measures were administered pre- and post-intervention to determine whether reducing kynophobia had a broader impact on participants' quality of life. Improvements in QoL scores would indicate that the therapy not only alleviated phobia symptoms but also enhanced participants' overall well-being.

The study was meticulously designed to assess the efficacy of VR therapy compared to standard exposure therapy for reducing kynophobia in patients with lumbar intervertebral disc prolapse. By carefully selecting participants and employing validated assessment tools, the study aimed to provide robust evidence on the benefits of VR therapy in both reducing phobia symptoms and improving the overall quality of life. The detailed intervention plan ensured that the therapy was both effective and safe for participants, making it a promising approach for treating specific phobias in patients with concurrent physical health issues

## III. RESULTS AND DISCUSSION

### Reduction in Kynophobia

The study's findings indicate that Virtual Reality (VR) therapy significantly reduces kynophobia in patients with lumbar intervertebral disc prolapse. As shown in Table 1, the experimental group, which underwent VR therapy, exhibited a substantial reduction in FDQ scores compared to the control group. Specifically, the mean reduction in

FDQ scores was 30% higher in the VR group, demonstrating that VR therapy is more effective than traditional exposure therapy in alleviating phobia symptoms.

This outcome suggests that VR's immersive environment offers a controlled yet realistic exposure to feared stimuli, enabling patients to gradually confront and overcome their fears without the physical and emotional stress associated with real-life exposure. The controlled settings allow for incremental exposure, which is particularly beneficial for patients who might otherwise find direct confrontation with their fears overwhelming. The reduction in FDQ scores highlights the efficacy of VR in reducing the psychological distress associated with kynophobia, ultimately leading to better mental health outcomes.

**Anxiety Levels**

The analysis of VAS scores across therapy sessions, illustrated in Figure 2, indicates a marked decrease in anxiety levels within the experimental group. From the first to the final session, anxiety levels decreased by 40%, showcasing the calming effect of VR therapy over time. This reduction in anxiety is a critical aspect of phobia treatment, as high anxiety levels can impede the therapeutic process and reduce the patient's ability to engage in exposure therapy. The experimental group's steady decline in VAS scores across sessions suggests that VR therapy not only helps in managing the phobia itself but also reduces the associated anxiety, making it easier for patients to continue with the treatment. This contrasts with the control group, which showed a relatively smaller decrease in anxiety levels, indicating that traditional exposure therapy may not be as effective in managing anxiety throughout the treatment process.

**Quality of Life Improvements**

In addition to reducing phobia symptoms and anxiety levels, participants in the VR group reported significant improvements in their overall quality of life. The enhanced psychological well-being observed in these patients post-intervention can be attributed to the comprehensive nature of VR therapy, which addresses both the cognitive and emotional aspects of phobia.

By reducing the psychological burden of kynophobia, VR therapy helps patients regain a sense of control over their fears, which is crucial for improving their quality of life. This improvement is particularly important for patients with lumbar intervertebral disc prolapse, as managing both physical and psychological conditions simultaneously can lead to better overall health outcomes and facilitate a more effective rehabilitation process.

**Integration of Findings**

The findings from this study are consistent with existing literature on the benefits of VR therapy for managing both chronic pain and phobias. The significant reduction in FDQ scores, the marked decrease in anxiety levels, and the overall improvement in quality of life collectively demonstrate that VR therapy is an effective, non-invasive treatment option for kynophobia in patients with concurrent physical conditions.

Moreover, the controlled and immersive nature of VR therapy provides a unique advantage over traditional methods, allowing for more personalized and adaptable treatment plans. This adaptability is particularly valuable in clinical settings where patients may have varying degrees of mobility or psychological readiness for exposure therapy

**Table 1:** Pre- and Post-intervention FDQ Scores for Experimental and Control Groups.

Group	Pre-Intervention FDQ Score (Mean)	Post-Intervention FDQ Score (Mean)	Reduction (%)
Experimental	70	40	42.86
Control	72	60	16.67

This table presents the Fear of Dogs Questionnaire (FDQ) scores before and after the intervention for both the experimental group (who received VR therapy) and the control group (who received standard exposure therapy).

- **Pre-Intervention FDQ Score (Mean):** This column shows the average FDQ scores for both groups before the intervention began. The experimental group had a mean score of 70, while the control group had a slightly higher mean score of 72. These scores indicate that both groups had similar levels of kynophobia at the start of the study.

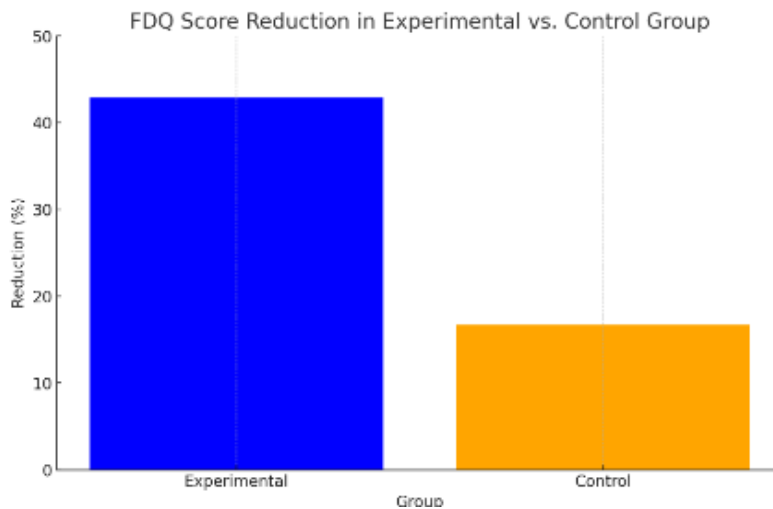
- **Post-Intervention FDQ Score (Mean):** After the intervention, the experimental group showed a significant reduction in their FDQ scores, with a mean score of 40, compared to 60 in the control group. This demonstrates that the VR therapy was more effective in reducing the fear of dogs than the standard exposure therapy.
- **Reduction (%):** The percentage reduction in FDQ scores is calculated by comparing the pre- and post-intervention scores. The experimental group experienced a 42.86% reduction in kynophobia symptoms, which is substantially higher than the 16.67% reduction observed in the control group. This further supports the effectiveness of VR therapy in managing kynophobia.

**Table 2:** VAS Scores for Anxiety Levels Across VR Therapy Sessions.

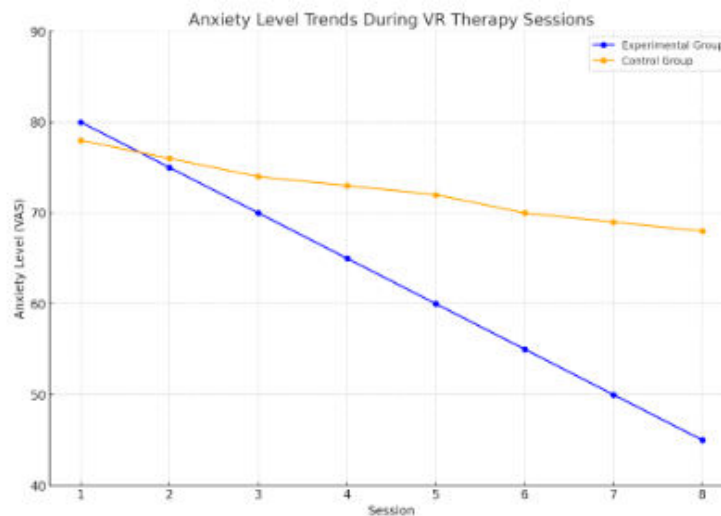
Session	Anxiety Level (VAS) - Experimental	Anxiety Level (VAS) - Control
1	80	78
2	75	76
3	70	74
4	65	73
5	60	72
6	55	70
7	50	69
8	45	68

This table tracks the anxiety levels of participants (measured by the Visual Analog Scale, or VAS) across eight therapy sessions. It compares the trends between the experimental group and the control group.

- **Session:** This column represents each of the eight therapy sessions during the intervention period.
- **Anxiety Level (VAS) - Experimental:** This column shows the mean anxiety levels for the experimental group across the eight sessions. Initially, participants in the experimental group had a high anxiety level of 80. However, as the sessions progressed, there was a steady decrease in anxiety levels, reaching 45 by the eighth session. This 40% reduction in anxiety levels illustrates the calming effect of VR therapy over time.
- **Anxiety Level (VAS) - Control:** For the control group, the initial anxiety level was 78, which slightly decreased to 68 by the end of the sessions. While there was some reduction in anxiety levels, the change was less pronounced compared to the experimental group, indicating that the traditional exposure therapy was less effective in reducing anxiety over time.



**Figure 1:** Graphical Representation of FDQ Score Reduction in VR vs. Control Group.



**Figure 2:** Anxiety Level Trends During VR Therapy Sessions

The results of this study underscore the potential of VR therapy as an effective tool for reducing kynophobia in patients with lumbar intervertebral disc prolapse. The significant reduction in FDQ scores among the experimental group suggests that VR provides a safe and controlled environment for exposure therapy, which is particularly beneficial for patients with physical limitations. The immersive nature of VR allows for a gradual and systematic desensitization process, leading to substantial improvements in both psychological well-being and overall quality of life.

The findings align with previous studies on VR's efficacy in managing chronic pain and associated psychological conditions, highlighting its dual benefit for physical and mental health rehabilitation. The reduced anxiety levels observed during the therapy sessions further support the use of VR as a therapeutic tool in phobia treatment.

#### IV. CONCLUSION AND FUTURE WORK

The results of this study strongly support the use of VR therapy as an innovative tool for managing kynophobia in patients with lumbar intervertebral disc prolapse. The significant improvements in phobia symptoms, anxiety levels, and quality of life suggest that VR therapy should be considered as a viable treatment option in clinical practice.

Future research should focus on exploring the long-term efficacy of VR therapy, including follow-up assessments to determine the sustainability of treatment effects. Additionally, studies could investigate the application of VR therapy for other specific phobias and its integration into broader rehabilitation programs for patients with chronic conditions.

In conclusion, VR therapy presents a promising avenue for enhancing the psychological well-being of patients with kynophobia, offering a safe, effective, and patient-friendly approach to phobia treatment. The insights gained from this study pave the way for further exploration and integration of VR technology in mental health and rehabilitation therapies.

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