



Effect of Oculus Guided Physical Therapy in Adjunct to Conventional Therapy in Knee Osteoarthritis Patients-A Research Protocol

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Osteoarthritis is the most prevalent disorder affecting the quality of life of older people. Eventually, the protecting tissue at the ends of bones degrades. One of the commonest type is osteoarthritis of knee. Knee osteoarthritis is linked to three main symptoms: knee pain, swelling, and decreased quadriceps mobility. Knee osteoarthritis can be treated with various physical therapy interventions, physiotherapy shows effective results. Visual reality can be used for the physical rehabilitation. In this study an attempt is been made to use the oculus quest for rehabilitation of knee osteoarthritis patients in adjunct to the conventional treatment.

Objectives: To demonstrate the effect of a conventional treatment regimen on lower limb function in patients with knee osteoarthritis. To demonstrate the influence of virtual reality-based games on lower limb function in individuals with knee osteoarthritis. In patients with knee osteoarthritis, the effect of virtual reality physical therapy in addition to traditional therapy was compared to the effect of simply conventional therapy.

Methods: The aim of this study is to look at the effects of VR-based exercise as an adjunct to conventional therapy. To that aim, a pre and post experimental design will be used, with a control group receiving just conventional therapy (strengthening, ultrasound, Maitland mobilization) and an

experimental group receiving conventional treatment as well as the VR-based exercise. Data collected will be examined using the SPSS variant.

Conclusion: Conclusion will be drawn based on the effect of virtual reality based exercises and conventional exercises. Which will help the therapist as well as patient in better treatment approach towards knee osteoarthritis.

Keywords: Osteoarthritis; virtual reality; physical rehabilitation; physiotherapy.

1. INTRODUCTION

Osteoarthritis is the most prominent musculoskeletal disease affecting the quality of life of elderly people [1]. Osteoarthritis is a joint disease that affects one-third of individuals and tends to deteriorate with age [2]. The wear and tear on the articular cartilage causes knee osteoarthritis (OA), also termed as degenerative joint disease. Primary and secondary OA are the two kinds of OA.

The term primary osteoarthritis refers to articular degeneration that has no obvious cause. Secondary osteoarthritis is produced by an aberrant articular cartilage, as in rheumatoid arthritis, or by an inappropriate distribution of stress around the joint, as in post-traumatic reasons. According to the World Health Organizations Global Burden of Disease Survey, osteoarthritis of the knee will likely become the eighth most frequent reason of disability in men and the fourth most common cause of disability in women [3]. Knee weakness and swelling, knee pain that develops gradually and worsens with exercise, and pain after extended periods of sitting or sleeping are some of the clinical symptoms of osteoarthritis.

Knee osteoarthritis is associated with three main physical impairments: knee pain, swelling, and reduced quadriceps mobility, both of which are thought to lead to physical weakness and disease progression [4]. The ultimate focus of any care approach for knee OA is to reduce pain and disability. Treatment techniques that use both pharmacological and non-pharmacological interventions are often favored [5].

Physiotherapy and orthopaedic aids are among the treatment options, as are pharmacotherapy and surgery [6]. Treatment for osteoarthritis is determined by the severity of the condition. In the early phases of osteoarthritis, physical rehabilitation and pharmacological therapy can aid. Physical exercise promotes muscle strength and, as a result, life quality [7]. Lately, Knee osteoarthritis may also be treated with hyaluronic

acid [8]. Surgical procedures, such as complete joint replacement, appear to be effective in the advanced stages of knee osteoarthritis.

In virtual reality, a human interacts with an artificial three-dimensional world using electronic equipment, such as special eyeglasses along with a screen or sensor-equipped gloves, to communicate. Virtual reality gaming systems construct a simulation model that gives players the impression that they are in a real world and helps them to communicate with the computer-generated interactive environment. These systems have a computer-generated interactive world. These programmes allow task-based approaches to be used by providing a stimulating and engaging experience that maintains excitement and inspiration [9].

Virtual reality (VR), in which participants connect with a computer by moving their bodies, is a novel kind of treatment used in rehabilitation settings. It generates a three-dimensional virtual environment using a computer simulation that engages the users senses of sight and sound, creating the feeling of being lost in it. Interaction, Immersion, and Imagination are the three components of virtual reality (VR). It can be used for human anatomy classes, museum online navigation, 3D game instruction, flight training, and recovery. Virtual reality has become a therapeutic tool in several medical and treatment fields. This technology has become a valuable tool and a prevalent theme in a number of areas due to its low cost and ease of usage [10]. VR can also help in recovery by reducing discomfort, distracting from pain fears, and reducing stress [11].

Oculus quest is a virtual reality system that allows patients to experience a virtual reality world. Oculus quest helps you to immerse yourself in a simulated reality while also allowing you to engage with it realistically based on the patients gestures [12]. In this study an attempt will be made to use the oculus quest for rehabilitation of knee osteoarthritis patients in adjunct to the conventional treatment. To

demonstrate the effect of conventional treatment program on the lower limb function in knee OA patients. To demonstrate the influence of virtual reality-based games on the lower limb function of knee osteoarthritis patients. To compare the effect of virtual reality physical therapy in adjunct to conventional therapy with only conventional therapy in knee osteoarthritis patients.

2. METHODOLOGY

2.1 Study Setting

After receiving ethical approval from the Datta Meghe Institute of Medical Sciences Institutional Ethical Committee. Ethical Clearance number is RNPC/IEC/2020-21/0019. This research will be done at Ravi Nair Physiotherapy College, Sawangi (Meghe), Wardha, India, at the Musculoskeletal Physiotherapy Out-patient Department of Musculoskeletal Physiotherapy.

2.2 Study Design

Interventional study.

2.3 Study Population

Subjects with Knee osteoarthritis.

2.4 Sampling Technique

Simple Random Sampling Technique.

2.5 Sample Method

Envelope method.

2.6 Sample Size

70 (35 in each group) calculated using G power analysis.

2.7 Study Duration

6 Months.

2.8 Inclusion Criteria

Patients who willing to participate in the study will be included, with unilateral or bilateral involvement of age 50-65 years, Both males and females and Those who had passes at least six months after the onset of the OA with a grade 1 or grade 2 involvement.

2.9 Exclusion Criteria

Those who have any central or peripheral nervous system involvement. Severe cognitive impairments. Those with severe auditory and visual defects and the once who are engaged in another clinical trial involving physiotherapy or an experimental medicine.

2.10 Implementation

Research coordinator and principal investigator will supervise randomization. Participants will be asked to manually select from the envelope, sealed group allocation for the recruitment into either group.

2.10.1 Blinding

Tester(s) will be blinded to assign the subjects to the group. To ensure binding, subjects will be mandated not to reveal any details of their treatment to the tester.

2.10.2 Study procedure

The institutional ethics committee clearance will be obtained before the start of the study. The patient will be thoroughly evaluated at first. The patient will be enrolled in the research if he or she meets the eligibility criteria. The patient will provide his or her informed consent. The objectives of this research is to investigate the benefits of VR-based exercise as an adjunct to conventional treatment. A pre and post experimental design will be employed for this purpose, with a control group receiving just conventional therapy and an experimental group receiving both conventional therapy and the VR-based exercises.

Patients will be divided into two groups, GROUP A and GROUP B. Group A will be the control group, with subjects receiving 40 minutes of traditional rehabilitation therapy per day, five days per week for six weeks. This conventional rehabilitation provided by a hospital therapist includes physical activities such as strengthening exercises designed to enhance the force of muscle pull (e.g., straight leg raises, quadriceps strengthening mini-squats); flexibility exercises designed to improve joint ROM and muscle pliability; and (e.g., hamstring muscle stretch and gastrocnemius stretching). Maitland mobilization will be given to reduce the pain and enhance the functional range of motion. Therapeutic ultrasound of 3MHz frequency and 0.25-1 W/cm² of intensity will be applied for 5 min in each session.

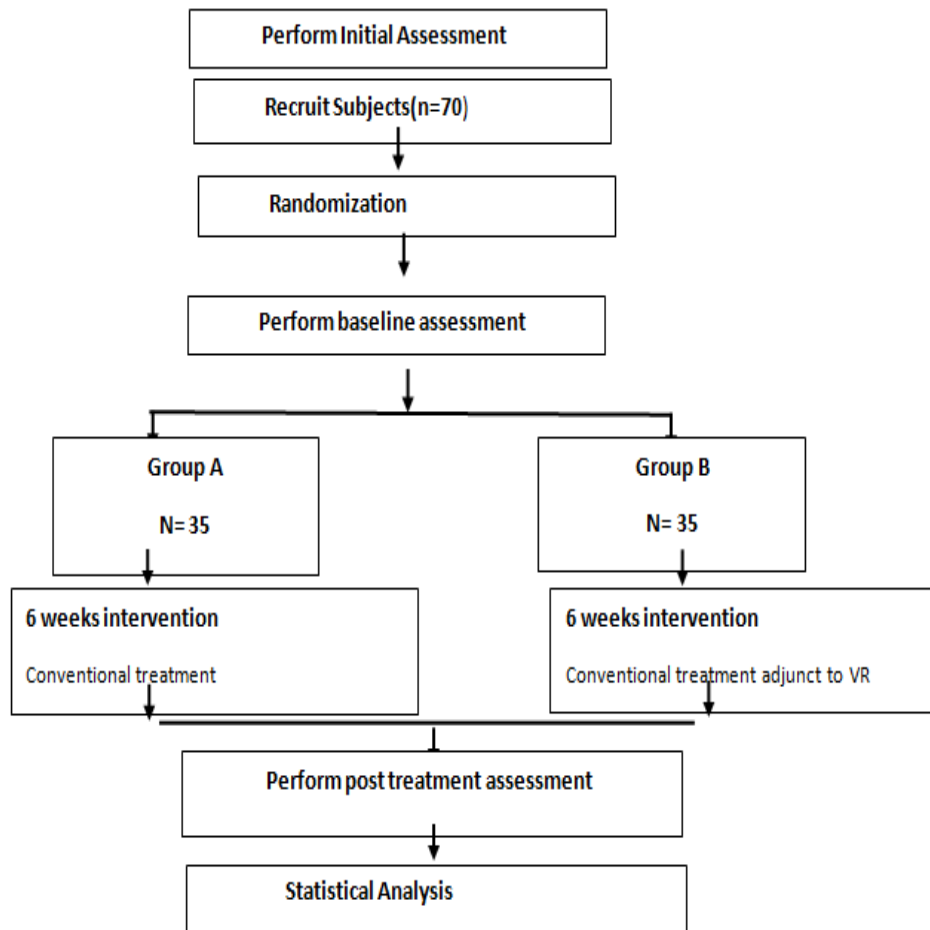


Fig. 1. Schematic diagram of study assessment

A standard therapy session of 20 minutes a day, five days a week for four weeks is administered to individuals in the experimental group (Group B) and VR rehabilitation for 20 minutes per day for the same period. ExrcsBike Games will be played in a virtual environment throughout the daily 20-minute VR rehabilitation sessions for individuals in the experimental group.

Data will be collected and analyzed statistically and the results will be interpreted and the graphs will be drawn.

2.11 Outcome Measures

2.11.1 Primary outcomes

Numerical Pain Rating Scale (NPRS)- It is a pain rating scale in which zero indicates absence of pain while 5 indicate moderate pain and 10 indicate unbearable pain the patient is asked to mark a number on the scale.

Western Ontario and McMaster University Osteoarthritis Index (WOMAC).

2.11.2 Secondary outcomes

Range of motion (ROM) - Range of motion will be assessed using a universal goniometer and the pre and post values will be recorded.

Manual muscle testing (MMT)- Manual muscle testing will be done using kendals method rating will be given from 0 that is no movement to 5 that is full range of motion against maximum resistance.

2.13 Data Collection and Management

2.13.1 Data collection

Information about study given at time of recruitment (elaborating the purpose, nature, procedure, benefits and after effects of the

intervention) with all baseline tests and assessment will be repeated on 2 more occasions.

2.14 Statistical Analysis

Data collected will be noted down and then will be placed in a tabular format. It will be analyzed with the help of SPSS latest version paired t- test will be done. Both statistical analyzes should be conducted with a 95% confidence interval (p -value < 0.05) to assess effect of two measures.

3. DISCUSSION

To the best of our knowledge, this will be the first study to examine the impact of oculus guided physical therapy as an addition to conventional therapy in patients with knee osteoarthritis. According to the previous studies the effect of conventional physiotherapy in management of knee osteoarthritis is proven, but to our knowledge, this will be the first study to compare the effect of oculus-based rehabilitation adjunct to conventional rehabilitation[13]. Moreover, this study will employ well established and widely used methods with appropriate reliability and validity to assess the pain, strength, ROM. Therefore, this study intends to compare effect of oculus guided physical therapy in adjunct to conventional therapy in knee osteoarthritis patients. Yilmaz Demiriz et al concluded that in patients with knee osteoarthritis, the results indicate that a VR-based approach performed better than a traditional therapy program [14]. Brian T. Maurer, MS, investigated the benefits of isokinetic exercises vs a patient educational programs on pain and function in elderly people with knee OA. According to the study, isokinetic exercise was proved to be an excellent and well-tolerated treatment for knee osteoarthritis, while an education program also had some advantages [15].

4. CONCLUSION

Conclusion will be drawn post the study. Samples will be collected and statistical analysis will be done and the conclusion will be drawn based on the data collected

ETHICAL APPROVAL AND DISSEMINATION

The participant individuals of the study and DMIMSU who will fund it will be able to retrieve

findings of study. After completion of study and publication of results data will be stored in the DMIMSU data repository

PATIENT CONSENT

Principal Investigators will obtain the written informed consent from the participant on a printed form (local language) with signatures and give the proof of confidentiality.

CONFIDENTIALITY

The study program will be explained to the participant, the principal investigator will take subjective information. The consent form will include the confidentiality statement and signatures of the principal investigator, patient and a witness. If required to disclose some information for the study, consent will be taken from the patient with complete assurance of his confidentiality

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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