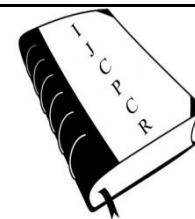




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### **EFFECTIVENESS OF IMPAIRMENT-TARGETED EXERCISE PRESCRIPTIONS IN MANAGING KNEE PAIN AND OSTEOARTHRITIS: THE TARGET-KNEE-PAIN STUDY**

**Dr Bhukya Gopilal, Dr Muralidhar S\***

Assistant Professor, Department of Orthopaedics, Katuri Medical College & Hospital, Chinakondrupadu, Guntur, India

#### **ABSTRACT**

Conservative management of knee pain and osteoarthritis often involves exercise therapy, yet tailored approaches based on individual clinical presentations are lacking in clinical trials. This study, titled TargET-Knee-Pain, aims to assess the effectiveness of impairment-targeted exercise prescriptions in improving physical impairments among older adults with knee pain. Participants from the community will be recruited, focusing on three specific impairments: weak quadriceps, reduced range of knee flexion, and standing balance issues. Customized exercise regimes will be developed by physiotherapists during six weekly home visits and six weekly phone calls, targeting individual impairments. Primary outcome measures, including standing balance on one leg, quadriceps strength, and the Four Balance Test Scale, will be assessed after 12 weeks. Secondary outcome measures, such as pain, stiffness, and daily task difficulty, will be evaluated using the WOMAC scale. Exercise status will be recorded by a blinded study nurse at three points throughout the study. The TargET-Knee-Pain study seeks to determine whether impairment-targeted exercise prescriptions are effective in improving knee pain and function in older adults, potentially paving the way for future randomized trials comparing this approach with traditional exercise methods.

**Key words:** Knee pain, Osteoarthritis, Exercise therapy, Impairment-targeted exercises, Older adults.

#### **INTRODUCTION**

OA patients often experience knee pain as a disabling condition. As a core component of primary care, exercise is often the starting point for most patients [1]. Despite widespread acceptance that exercise can treat knee and hip OA, research on the optimal way of delivering exercise is lacking [2]. Physiotherapy supervised exercises can reduce knee pain and improve function, according to studies. In systematic reviews, exercise appears to be beneficial to a limited extent [3]. One-size-fits-all exercise interventions are commonly provided in clinical trials regardless of the impairment of the participants. According to the MOVE Consensus, patients with hip or knee OA should engage in individualized exercise programming. A possible approach to achieving this goal is by engaging in exercises that target symptoms of knee OA and are associated with pain

and disability. There has been no specific evidence-based study addressing impairment-targeted exercise approaches among people with knee osteoarthritis (OA). These trials have included strengthening, stretching, and functional exercises, including standing balance, despite the fact that evidence-based recommendations include strengthening, stretching, and functional exercises. Our protocol for a proof-of-principle study (TargET-Knee-Pain) examines whether, and to what extent, home-based exercise prescription targeted at impairments can help older adults with knee pain and osteoarthritis to increase quadriceps strength and range of motion. It is first necessary to evaluate the efficacy of treatments intended to improve impairments.

Corresponding Author: - **Dr Muralidhar S**

It will also examine whether strengthening these factors reduces knee pain, stiffness, and function limitations in this study.

## **METHODS**

Observational studies assessing knee pain and osteoarthritis will serve as the sample frame for this study. There were no patients under the age of 50, neither did they report knee pain within the past year. Those who participated in the study were followed up for 18 months. In our study, 60 participants will be recruited six years after their baseline measurements for a repeat follow-up. About 314 participants will be at the repeat follow-up after the baseline measurements were taken. [4] When considering the error rate of 5% for Type 1, an effect size of 86% could be achieved with 60 participants for detecting an increase of 8° in knee flexion or an increase of 8 kg in strength based on the observed effect sizes of previous trials of exercises for osteoarthritis of the knee.

## **ELIGIBILITY CRITERIA**

A second follow-up assessment clinic will be held for CAS(K) patients experiencing knee pain for a period of six years. The lowest quartile of any age or gender-specific impairment (quadriceps strength, knee flexion, or standing balance on one leg) must be measured by participants for baseline assessments. Study participants must commit to 12 weeks of exercise in order to be considered for the study. Those with inflammatory arthritis or total knee replacements, those with a low limb weakness as a result of neurological conditions, those who take medications that affect standing balance, those with open wounds on their distal shins, or people with unstable or uncontrolled angina are ineligible for the program. The absence of a phone at work or at home, as well as hypertension and hypertension, compromises standing balance and compromises standing balance. They were potentially eligible for participation for the entire week when they were unable to move independently from lying to sitting or standing to standing. [5] Their participation eligibility was extended to the entire week if they were unavailable for weekly home visits or telephone contact.

## **RECRUITMENT**

At CAS(K) 6-year follow-up clinics, potential participants will be identified by a local community hospital. Table 1 shows thresholds for the three target impairments. We will compare their measurements with these thresholds. A participant may be considered for the program if they have one or more CAS(K) measures for impairments.

During the research assessment clinic, the study nurse will contact you if you fall below one of the thresholds. An explanation of the study will be provided by the study nurse before discussing their potential participation in the study in greater detail. Potential

participants will be contacted by the study nurse for a further assessment of their suitability and willingness to participate if verbal consent has been provided to further telephone contact after a 24-hour cooling off period. Study nurses visit the homes of participants and obtain participants' written consent before determining their eligibility and willingness to participate.

## **INTERVENTIONS**

The study will consist of 12 weeks during each intervention period. For each of the three impairment categories, three exercise packages were developed: quadriceps strength training, knee flexion stretches, and balance retraining. A picture illustrates each stage of the exercises in these packages. A description of the packages is provided in files 1, 2 and 3. Each participant will receive one or more of these exercise packages depending on their measurements for their corresponding target impairments. The exercises will be selected and the level of difficulty adapted based on the assessment performed by the study physiotherapist during the first home visit. Along with the target impairment(s), there will be a standardised clinical history and physical evaluation. [6] Clinical notation booklets with standardized clinical history, physical examination findings, and progress notes will be distributed to all participants in accordance with good clinical governance. Physiotherapists will keep track of all interactions with participants.

## **OUTCOME MEASURES**

There will be no outcome measures administered by physiotherapists. In week six and week twelve of the study, participants will have their first nurse home visit following their completion of a written consent form. The following outcomes will be assessed during each phase:

Primary outcome measures – impairments

- Quadriceps strength (continuous scale) was measured using a custom stabilization rig.
- Active end-range knee flexion is measured on a continuous scale.
- An anatomical position is determined by using a 10-inch universal perspex goniometer to determine the ankle and femur's positions.
- A normative scale of 0 to 5 is used on the balance tests.
- A person is tested in four postures: feet together, semi-tandem, tandem, and single leg to determine their ability to stand on one leg for a ten-second period.
- An individual leg stance with hands on hips, a maximum of 30 seconds, was used as the basis for the timed standing balance test (continuous scale) by Franchignoni and colleagues. Secondary outcomes include symptoms
- A self-report measure and measures of physical function are provided on the WOMAC LK 3.1.

- An evaluation of how persistent knee pain is after a month (measured by a Likert scale).

It was perceived as 'bothersome' to have knee pain according to one Likert response-type question.

**Table 1: Inclusion criteria for studies based on age and gender**

	Male	Female
Range of knee joint flexion		
55-64 years	< 64°	< 64°
65-74 years	< 63°	< 61°
75+ years	< 60°	< 58°

**Table 2: Isometric quadriceps strength (kilograms force)**

55-64 years	< 18.1	< 11.3
65-74 years	< 17.2	< 9.4
75+ years	< 13.9	< 9.0

**Table 3: Single-leg standing balance (seconds)**

55-64 years	< 16	< 10
65-74 years	< 6	< 6
75+ years	< 4	< 4

### Data analysis

To assess whether exercise can improve knee pain impairments, exercise that targets them will be selected. During the 12-week study period, raw changes for each impairment will be calculated for each participant. A measure of mean differences between impairment groups can be derived from the distribution of change values. [8] To compare mean differences between those receiving non-tailored exercise programs for treating that impairment and those receiving non-tailored exercise programs for treating that impairment, participants receiving non-tailored exercise programs will be compared. An independent sample t-test or a nonparametric t-test will be used for our tests.

### Sensitivity analyses

A baseline measurement of impairment was obtained at baseline, 3 years after treatment, and 6 years after treatment ended for the TargET-Knee-Pain study. In comparison with the first nurse visit, these results will be compared. [9] We will assess each impairment against age-gender norms to determine which requires the least impairment. Higher impairment measures may lead to more improvement than lower impairment measures in a comparison group. In this study, we compare those without a particular impairment at recruitment with those without it at follow-up to determine the proportion of participants without it at recruitment. [10]

A subgroup analysis of efficacy will be used to determine why exercise programs are not adhered to. To compare adherents to non-adherents, we will repeat our analyses on adherents to exercise programs.

### Secondary analyses

As a result of the change in WOMAC subscale scores from baseline to 12 weeks (or its nonparametric equivalents, depending on its distribution), no matter what impairments have been treated, it is calculated (or nonparametric equivalents, based on its distribution of change values). [11] In order to determine whether changes in target impairments are associated with changes in WOMAC subscales, we will compute Pearson's product-moment correlation coefficients (or the equivalent non-parametric result). [12] The aim of this study is to determine if participants who receive exercises designed to improve performance will benefit more than those who receive exercises designed to improve pain, stiffness, and physical function. The WOMAC change test shows that exercising for a single impairment reduces the effects of more than one impairment on the three subscales. [13] The differences will be calculated based on the distribution of change values. With the help of free-text and Likert-response questionnaires, we will evaluate the feasibility and acceptability of this intervention. [14] There will also be a discussion of potential solutions to overcome barriers, in addition to exercising programs. After the 12 week questionnaire has been completed, free-text responses will be analyzed based on frequency counts and thematic analysis.

### CONCLUSION

Exercise programs aimed at improving muscle weaknesses, reduced flexibility, and poor balance are investigated for their ability to positively influence TargET-Knee-Pain impairments. According to the researchers who conducted this study, prescribing impairment-targeted exercise prescriptions may benefit older adults with knee pain. This approach could be

compared to more traditional one-size-fits-all exercises in future clinical studies.

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