

Case Report

## Effectiveness of Modified Agility and Perturbation Training In Patients with Osteoarthritis Knee- A Case Control Study

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**Objectives:** To check and compare the effectiveness of modified agility and perturbation training over conventional physical therapy in patients with knee osteoarthritis.

**Methods:** Subjects were screened on the basis of inclusion and exclusion criteria and a total of 50 subjects were recruited for the study. They were randomly divided into Group A and group B with n= 25 each.

**Results:** Group receiving conventional knee exercises with modified agility and perturbation training showed statistically significant results.

**Discussion:** It was found that supplementing rehabilitation programs for people with knee OA with a modified agility and perturbation training program assist them in returning to higher levels of physical activity with less pain and instability following rehabilitation.

**Keywords:** Osteoarthritis knee; Modified agility and perturbation training; proprioception; strengthening exercises

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### Introduction

Osteoarthritis (OA), also known as degenerative joint disease is the most common form of arthritis and a leading cause of disability worldwide. Osteoarthritis of the knee is one of the five leading cause of physical disability in non-institutionalized elderly men and women. OA knee, along with osteoarthritis of the hip affects the ability to walk and climb stairs more than any other disease. The risk for disability attributable to OA knee is as great as that attributable to cardiovascular disease and greater than that due to any other medical condition in elderly. The incidence of symptomatic knee osteoarthritis is 1% per year, with a radiographic incidence of 2% per year. The rate of radiographic progression has been estimated at about 4% per year.<sup>1-4</sup>

Knee osteoarthritis contributes significantly to functional limitations and disability in elderly. Physical impairments associated with knee OA include pain, loss of motion, and decreased quadriceps femoris muscle strength. These impairments are believed to

contribute to physical disability and the progression of the disease. Quadriceps weakness and arthrogenic quadriceps inhibition can directly influence joint stability, alter the coordination of neuromuscular reflexes, and cause early fatigue in lower limb muscles. Traditional exercise programs for people with OA knee have focused primarily on addressing limitations in lower extremity muscle strength, joint mobility, and aerobic capacity. A recent meta analysis of randomized clinical trials showed that tested interventions aimed at addressing these impairments demonstrated modest improvements in reduction of pain and self-report measures of function.<sup>5-18</sup>

Patients with OA knee commonly complain of knee instability during activities of daily living. Specifically they report episodes of "slippage" or "giving way" of their knees during activities such as walking, stair climbing or standing from a sitting position. The knee instability appears to be similar to that reported by younger individuals with knee

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ligament injuries. Therefore it can be presumed that incorporating agility and perturbation training techniques that have been shown to be beneficial in improving knee stability for patients with ligament injuries might also be beneficial for patients with knee OA. Since OA affects elderly individuals such training can be given at a reduced intensity for safety. A single case report study by G K Fitzgerald in which a reduced intensity agility and perturbation training was given to a 73 year old woman along with the traditional strengthening, flexibility and endurance exercises (18). It was found that supplementing rehabilitation programs for people with knee OA with a modified agility and perturbation training program may assist them in returning to higher levels of physical activity with less pain and instability following rehabilitation. Since this was a single case report study the purpose of this study was to evaluate the effectiveness of agility and perturbation training programme in a large group of subjects with osteoarthritis knee.

## Methods

A case control study was conducted during the period of February 2009 and march 2009 while the subjects were recruited from old age home YWCA and ONGC hospital, Dehradun, India. Subjects were selected on the basis of random sampling. All the subjects in the age group between 50 to 65 years of age with bilateral OA knee diagnosed according to the American college of rheumatology criteria and not undergoing any kind of exercise programme for the last one month were selected for the study. Prior to testing the purpose and procedures of the study were explained to the subjects. Each of the subjects was asked to read and sign an informed consent form. A subject was excluded from the study if he or she had a ligament or meniscal injury around the knee, acute synovitis, neuromuscular disorders and cognitive impairments. A total of 50 subjects were recruited for the study. Knee outcome survey-activities of daily living scale (ADLS) and the Western Ontario and McMaster universities osteoarthritis index (WOMAC) were used as outcome measures.

ADLS measures how symptoms like pain, swelling and weakness following OA knee affects the activities of daily living. ADLS was given in the form of a questionnaire to the subjects and the subjects were asked to circle the number which best described their condition. A lower score indicated greater difficulty in managing daily activities and a

higher score indicated improvement in performing daily tasks. The WOMAC index was used to assess patients with OA knee. A total of 24 parameters which includes pain, stiffness, physical and social function were evaluated using WOMAC. A higher score indicated a greater limitation of physical and social function while a lower score indicated improvements in physical function, pain and stiffness. A wobble board and foam were used to perform agility and perturbation training. Hot packs were used to warm up the muscle before initiating the exercise programme.

Two groups were formed i.e. Group A = control group (n=25), conventional physical therapy exercises were given) and Group B = exercise group (n=25), conventional physical therapy exercises with modified agility and perturbation training). A 4 week exercise protocol of 4 days a week was given to the subjects of both the groups. Conventional physical therapy exercises included static quadriceps and straight leg raising (SLR). The agility training techniques in the program included side stepping; braiding; front crossover steps during forward walking; back crossover steps during backward walking; shuttle walking (forward and backward walking to and fro from designated markers) and a multiple change-in-direction drill, in which the therapist provided hand signals at random to prompt the patient to change directions during walking (forward-backward, right-left lateral steps, diagonally backward-forward). The perturbation training consisted of 3 perturbation techniques involving standing on foam with single limb support, standing on a stationary platform with a single limb support and standing on a wobble board with double limb support. After 10 to 30 seconds of perturbations on each leg, the patient switched feet and the technique was repeated. A hot pack was applied to the knee prior to the exercises. Before administering the 4 week exercise protocol both the groups were assessed using WOMAC and ADLS for pain, stiffness and physical function. At the end of 4 weeks both the groups were assessed using the scales mentioned above.

## Results

The mean scores of post knee outcome survey ADL and post Womac were 68.32 and 10.56 respectively for group B. This indicates that subjects in group B had a greater improvement in knee pain, stiffness and physical function compared to subjects of group A. The comparison of mean values of pre-post knee

outcome survey ADL and pre-post Womac for both the groups were statistically significant (Table 1). The result shows that conventional knee exercises along with modified agility and perturbation training

had a greater improvement in the symptoms of subjects with OA knee.

**Table 1.** Comparison of (Pre vs Post) ADLS and (Pre vs Post) WOMAC scores

Variables	Group A		Group B	
	Mean	SD	Mean	SD
Pre knee outcome survey- ADLS	48.44	8.73	46.20	11.22
Post knee outcome survey- ADLS	59.04	7.78	68.32	8.52
Pre-post knee outcome survey- ADLS	10.60	6.85	20.92	15.63
Pre Womac	40.12	13.33	41.56	13.59
Post Womac	26.12	12.41	10.56	6.22
Womac (Pre-post)	14.00	5.85	31.00	9.89
(Pre vs Post) ADLS	<b>z value</b>	<b>p value</b>	<b>z value</b>	<b>p value</b>
	-4.381	P < 0.05	-3.796	P < 0.05

### Discussion

Poor knee joint proprioception is related to limitations in functional ability and poor proprioception aggravates the impact of muscle weakness on limitations in functional ability in osteoarthritis of the knee. Supplementing rehabilitation programs for people with knee OA with a modified agility and perturbation training program may assist them in

returning to higher levels of physical activity with less pain and instability following rehabilitation.

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