

## Effects of Isotonic Training in OA knee

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### Abstract

**Objective:** To evaluate the effectiveness of isotonic quadriceps resistance training on selective functional activities and pain in patient with osteoarthritis of knee.

**Methods:** Thirty patients with unilateral osteoarthritis of knee, were randomly assigned in two groups. (Control N=15, Experimental N=15). The patient in the both groups were underwent wax therapy for 20 minutes by using clothing method in a day. The control group underwent isometric quadriceps muscle setting exercise for a period of 10 minutes, with a brief rest in between. The experimental group underwent of pain tolerable isotonic quadriceps muscle resisted exercise by using quadriceps chair for a period of 10 minutes, with a brief rest in between.

**Study duration:** 4 days in a week for 3 weeks

**Outcome measures:** Functional capacity and pain during rest were tested before and after training in both the groups by using, NPRS (Numerical Pain Rating Scale) and WOMAC (Western Ontario and McMaster university osteoarthritis index).

**Results:** The isometric training group scored a NPRS pain rating scale mean value of  $1.87 \pm 0.64$  and isotonic resisted training shows a mean value of  $2.67 \pm 0.99$  with a t value of 4.598 and a significant of p value 0.001. Also, the study revealed that the patient who received isometric training shows a WOMAC score mean difference of  $9.28 \pm 7.07$  and isotonic resisted training shows a value of mean difference of  $18.90 \pm 8.07$  with a t value of 3.474 and a significant of p value of 0.002. This shows that the isotonic resistance training and wax bath was highly effective in improving functional activity and reducing pain in patient with OA knee.

**Conclusion:** Both the training group showed a marked decrease in pain scores and increase in functional activities. When compared between the groups, the isotonic training group had a significant improvement in functional activities and pain reduction in patient with OA knee.

**Keywords:** Isotonic quadriceps; Osteoarthritis; Isometric training

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## Introduction

OA can be characterized as a condition portrayed by central regions of loss of articular ligament inside the synovial joints, related with hypertrophy of the bone (osteophytes and subchondral bone sclerosis) and thickening of the capsule. These changes may happen because of an irregularity in the balance between the breakdown and fix of joint tissue. Essential manifestations of OA incorporate joint torment, firmness and constraint of development. Infection movement was generally slow however can at last prompt joint disappointment with torment and handicap. An ongoing overview in India revealed that the pervasiveness of OA in more established grown-ups over 65 years old was 32.6% in the rustic populace and 60.3% in the metropolitan populace. Three significant actual debilitations, for example,

knee agony, solidness, and diminished quadriceps quality, are profoundly connected with knee OA and are accepted to add to actual incapacity and movement of the disease [1-3].

People with osteoarthritis (OA) of the knee joint generally show stamped shortcoming of the quadriceps muscles, with quality deficiencies of 20 to 45% contrasted and age and sex coordinated controls. Tenacious quadriceps shortcoming was clinically significant in people with OA as it is connected with debilitated unique knee security and physical function and particularly on the off chance that you don't have a solid VMO, you may encounter knee torment and annoying injuries. Additionally, the quadriceps have a significant defensive capacity at the knee joint, working unconventionally during the early position period of stride to pad the knee joint and acting to decelerate the appendage before heel strike, along these lines lessening indiscreet loading. More vulnerable quadriceps have been related with an expanded pace of stacking at the knee joint and late longitudinal information have demonstrated that more noteworthy benchmark quadriceps quality may ensure against episode knee pain.

There are two fundamental elements related with loss of quadriceps quality in patients with knee joint inflammation was decay and muscle restraint. The quadriceps has been appeared to show a 12% decrease in cross sectional region speaking to decay in patients with knee joint inflammation. This decay clearly adds to loss of solidarity, anyway hindrance of volitional control of the quadriceps has additionally been found. In this way, quadriceps quality should be considered in the investigation of knee OA [4-9].

Exploration is as yet progressing with respect to examination of the function of reinforcing in the treatment of OA of the knee. When all is said in has done, the greater part of the patients with OA knee going through isometric preparing as it permits low expansion in intra-articular weight and negligible joint development. In any case, everyday actual exercises may request more isotonic muscle work and anyway there is little proof that isometric quality will continue to isotonic strong capacity. Accepting that the isotonic opposed preparing may have a bit of leeway as the quadriceps have a significant defensive capacity at the knee joint by working unusually during the early position period of stride to pad the knee joint and acting to decelerate the appendage before heel strike, in this way diminishing indiscreet stacking. Thus, it is fundamental to break down the impact of isotonic quadriceps fortifying improving practical action and lessening torment in tolerant with OA knee [10-15].

To evaluate the effectiveness of isotonic quadriceps resistance training on selective functional activities and pain in patient with osteoarthritis of knee.

## Materials and Methods

A 30 minutes treatment session comprises of 20 minutes of wax therapy and 10 minutes of corresponding exercise regimen for 4 days in a week for 3 weeks .

The patient in the both groups were underwent wax therapy and

it was applied over the affected knee, for a period of 20 minutes by using clothing method in a day.

Followed by wax therapy, the controlled group underwent 10 minutes of isometric quadriceps muscle setting exercise session.

Long sitting with hands at side. A role of towel was placed below the affected knee. The participant was asked to press the back of the knee downward through the towel , while dorsiflexing the ankle. Ask the patient to feel the quadriceps contraction and to maintain it for 10 seconds and then to relax for 5 seconds. One set comprises of 10 repetition and the patients were asked to do 3 sets with a brief rest between every set.

Followed by wax therapy, the experimental group underwent 10 minutes of pain tolerable isotonic quadriceps muscle resisted exercise by using Quadriceps chair [16-20].

High sitting in quadriceps chair. The patient was positioned in quadriceps chair and a suitable pain tolerable weight resistance was selected. Instruction was given to the patients to perform the movement in a smooth controlled manner. They were asked to extend the knee against this resistance from 90° to 0° (concentric) and then to lower it down (eccentric work). One set comprises of 10 repetition and the patients were asked to do 3 sets with a brief rest in between every set.

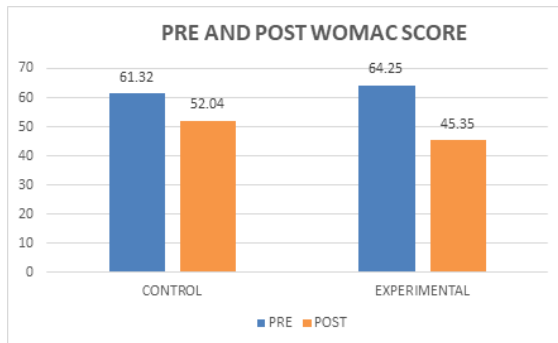
## Results

The collected data were statistically analyzed to find out the effect of isotonic resisted exercise.

Control group shows the mean pretest value of  $61.32 \pm 3.53$  and posttest mean value of  $52.04 \pm 6.91$ , with a t value of 5.086 and a significant of p value 0.001. This shows the conventionally used isometric training and wax bath were significantly improved the functional activity in patient with OA Knee.

Experimental group shows the mean pretest value of  $64.25 \pm 4.46$  and post mean value of  $45.35 \pm 6.39$  with a 't' value of 9.075 and a significant of 'p' value of 0.001. This shows the experimentally used isotonic resistance training and wax bath were highly significant in improving functional activity in patient with OA.

The control group training shows a WOMAC score mean difference of  $9.28 \pm 7.07$  and the experimental group training showed a value of mean  $18.90 \pm 8.07$  with a t value of 3.474 and a significant p value of 0.002. This shows the isotonic resistance training and wax bath was highly effective than the conventionally used isometric training in improving functional activity in patient with OA knee shown in **Figure 1**.

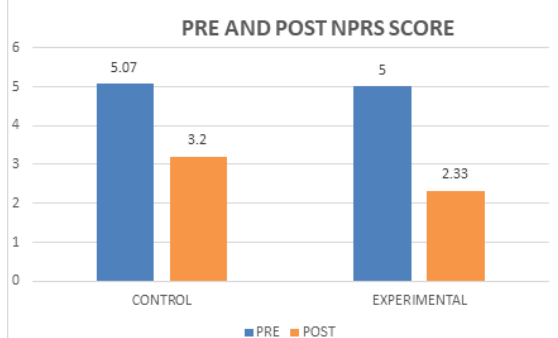


**Figure 1:** Pre and post WOMAC score for control and experimental group.

The NPRS pain rating pre-test mean value of  $5.07 \pm 0.88$  and post-test mean value of  $3.20 \pm 0.86$  with a t value of 11.297 and a significant of p value 0.001. This shows the conventionally used isometric training and wax bath was effective in reducing pain in patient with OA knee.

The experimental group showed a pre-test value NPRS pain rating scale mean of  $5.00 \pm 0.76$  and post-test value of mean  $2.33 \pm 0.98$  with a t value of 14.270 and a significant of p value 0.001. This shows the experimental used isotonic resistance training and wax bath was effective in highly improving pain in patient with OA Knee.

The control group training shows a NPRS pain rating scale mean value of  $1.87 \pm 0.64$  and experimental group training shows a mean value of  $2.67 \pm 0.99$  with a t value of 4.598 and a significant of p value 0.001. This shows the isotonic resistance training and wax bath was highly effective than the conventionally used isometric training in improving pain in patient with OA knee shown in **Figure 2**.



**Figure 2:** Pre and post NPRS score for control and experimental group.

## Discussion

This study was aimed to evaluate the effect of isotonic quadriceps resisted training in improving functional activity and reducing pain in patient with OA knee. Based on the selection criteria

thirty patients with primary OA knee were randomly recruited for this study and they randomly assigned in control (n=15) and experimental (n=15) groups. All the subjects were informed about the possible risk and discomfort during therapy and an oral informed consent was obtained. None of the subjects in the groups complained pain during treatment session and no one stopped the training during 3 weeks of training and they completed the whole training schedule.

Before starting the treatment program, the initial level of functional capacity and knee pain of the patient were assessed by using WOMAC scale and NPRS. The study didn't attempt to assess the objective muscle strength by repetition maximum (RM) as this procedure may induce pain. All the patient were attended a 4 treatment session in a week for 3 weeks. Initially, both the groups underwent wax therapy and it was applied over the affected knee, for a period of 20 minutes by using clothing method in a day. Followed by wax therapy, the controlled groups will undergo isometric quadriceps muscle setting exercise (15 Repetition) and the experimental group will undergo 10 min of pain tolerable isotonic quadriceps muscle resisted exercise in a range of  $90^\circ$  to  $0^\circ$  knee extension by using quadriceps chair. We didn't attempt strenuous strength exercise programmer presuming that they might be harmful to knee, another consent might be the pain could limit to the outcome. At the same time this protocol appeared to have a positive physiological adaptation to isotonic resisted training without an exacerbation of his knee OA symptoms.

The study result reveals that both the control and experimental group showed a significant improvement in functional activity and reduction of pain. In functional activity the control group attained a WOMAC pretest value of  $61.32 \pm 3.53$  and posttest mean value of  $52.04 \pm 6.91$ , with a t value of 5.086 and a significant of p value 0.001. And the experimental group attained pretest value of  $64.25 \pm 4.46$  and post mean value of  $45.35 \pm 6.39$  with a 't' value of 9.075 and a significant of 'p' value of 0.001. Thus, the both the groups showed a significant improvement in functional activity. On pain reduction the control group showed NPRS pain rating pretest mean value of  $5.07 \pm 0.88$  and posttest mean value of  $3.20 \pm 0.86$  with a t value of 11.297 and a significant of p value 0.001. And the experimental group showed a pre test value NPRS pain rating scale mean of  $5.00 \pm 0.76$  and posttest value of mean  $0.47 \pm 0.99$  with a t value of 4.010 and a significant of p value 0.001. Thus, the both groups showed a significant reduction of pain. Our findings concur with those obtained in previous studies that have demonstrated the benefits of isometric exercise in strength training, while compared the effect of isokinetic training in patients with osteoarthritis of the knee showed significant improvement in muscle strength at the end of the trial.

While comparing the WOMAC score between the patient groups, the control group training shows a value of the pre and post mean difference of  $9.28 \pm 7.07$  and experimental group

training shows a value of the pre and post mean difference of  $18.90 \pm 8.07$  with a t value of 3.474 and a significant of p value of 0.002. This shows that patient recorded the largest improve in the WOMAC score, and improves favorable response to isotonic resisted exercise when compared with conventionally used isometric training. On comparing pain reduction, the control group training shows a NPRS pain rating scale mean value of  $1.87 \pm 0.64$  and experimental group training shows a mean value of  $2.67 \pm 0.99$  with a t value of 4.598 and a significant of p value 0.001. This shows the experimentally used isotonic resistance training and wax bath was effective in highly reducing pain in patient with OA Knee. The isotonic group showed a significant improvement. This trend is similar to the previous study showed that the patients with OA in each treated by isotonic exercise had the greatest effect on pain reduction after treatment, and they suggest isotonic exercise was suggested for initial strengthening in patients with OA knee pain.

In summary both training group showed marked decrease in pain scores and increase in functional capacity. While comparing between the groups the experimentally used isotonic resistance training and wax bath had a significant improvement in functional capacity and pain reduction.

However, in this study the improvements were in self-reported measure of pain and functions, these improvements might not be related to strong specific bio-mechanical adaptations and muscle strength. So, there is a need for the future trial with a specific objective evaluation, serial standardized radiography examination, and larger sample sizes to confirm these results.

## Conclusion

Both the training groups showed a marked decrease of pain and increase in functional capacity. On comparing between the groups, the isotonic training group has a better influence on improving functional capacity and pain reduction. So, the study concluded by delivering the isotonic resisted exercise of quadriceps without over stressing the joints was a heavy element for successful program.

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