



**ORIGINAL RESEARCH PAPER**

**Physiotherapy**

**EFFECT OF KINESTHESIA, BALANCE AND AGILITY EXERCISE AS ADDITIONAL TREATMENT TO RESISTANCE TRAINING AMONG PATIENTS WITH KNEE JOINT OSTEOARTHRITIS**

**KEY WORDS:**

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**ABSTRACT**

**Background and Objective:** Those who are affected by osteoarthritis (OA) of the Knee have shown decreased levels of functional capacity and quality of living. This disability has been linked to decreased levels of strength and physical activity caused by pain or fatigue. Resistance training and increased levels of physical activity have shown to improve some of these deficits. However, it is not clear whether or not kinesthesia, balance and agility exercise would be beneficial over standard resistance exercise. To investigate the efficacy of KBA exercise along with RT in decreasing pain, and increasing balance, mobility and physical function, in Osteoarthritis Knee. Study design: Randomized control trial. **Methodology:** Forty eight individuals with a diagnosis of OA Knee were selected. These individuals were randomly assigned into two groups: RT Group [(n = 24)] and KBA Group [(n = 24)]. RT Group performed various resisted exercises while KBA group performed kinesthesia, balance and agility exercises in combination with resistance exercises. Both the groups were given exercises supervised by physiotherapist for 3 weeks. Data for measurements of Pain on NPRS, Physical function on WOMAC score, Balance & mobility on TUG, was collected on day 1 (pretreatment session), and at week 3. **Results:** Results indicate that both groups improved in all measures of pain, physical function. However, upon Intergroup analysis the mean changes in the score of NPRS, WOMAC, TUG, was highly significant across the testing period for the Kinesthesia Balance Agility group (KBA) with respect to Resistance training Group (RT). **Conclusion:** KBA along with RT is an effective rehabilitation program for improving functional mobility, balance, and decreasing pain in patients with OA Knee. **Key words:** Kinesthesia Balance Agility exercise, Resistance training, OA Knee, Numeric pain rating scale (NPRS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)

**INTRODUCTION**

Osteoarthritis (OA) is a chronic degenerative disorder primarily affecting the articular cartilage of synovial joints, with eventual boney remodeling and overgrowth at the margins of the joints (spurs and lipping).<sup>1</sup>

In India, Overall prevalence of knee OA was found to be 28.7% by the year 2016.<sup>2</sup>

OA is characterized by deterioration of the articular cartilage with reactive new bone formation at the joint's surface and margins. In addition to the breakdown of articular cartilage, there is subchondral bone remodeling with cyst formation, synovial inflammation, sclerosis, muscle atrophy, spasm and ligamentous involvement.<sup>3</sup>

The exact etiology of osteoarthritis is not known. Multiple factors such as heredity, Age older than 50, Obesity, Injury to the joint, High bone mineral density, History of immobilization, Crystals in joint fluid or cartilage, Joint hypermobility or instability, Peripheral neuropathy, Prolonged occupational or sports stress.<sup>4</sup>

The effects of the disease accompany secondary impairments such as: 1) Gait alterations 2) Muscle weakness 3) varus/valgus alignment deformities.<sup>5</sup>

Traditionally, strengthening exercises has been an important component of exercise programs for knee OA, because quadriceps weakness is a common finding among patients with OA knee. Kinesthesia balance and agility exercises (KBA) is designed to decrease proprioceptive impairment by using agility and balance exercises to activate, challenge, and adapt proprioceptors.<sup>6</sup>

Though strengthening programs may be effective, they do not provide the subjection to other challenges of motor function to the individual that may be experienced during daily living activities. Improvement in overall physical function might be proficient if individuals were exposed to traditional exercise therapy programs in conjunction with these challenges in motor function, this indicates that there is need for

improvement in designing OA exercise therapy programs.<sup>7</sup> Hence, the need of the study is to find effect of KBA exercise in additional to resistance training on OA knee patient and also there are Several studies which shows favorable results with regard to strengthening exercises in knee OA ,But in the case of proprioceptive sensory loss associated with knee OA, it is not certain whether or not kinesthesia, balance, agility exercises would provide additional benefit over standard strengthening exercises.

**AIMS AND OBJECTIVES:**

1. To find the effect of KBA exercise plus resistance training (RT) on pain, balance, mobility among a group of individuals with knee OA.
2. To find the effect of RT on pain, balance, mobility among a group of individuals with knee OA.
3. To compare the effect of RT alone and KBA exercise plus RT on pain, balance, and mobility among a group of individuals with knee OA.

**Hypothesis**

**Null Hypothesis:** There is no significant effect of KBA exercise in addition to RT in patients with knee OA.

**Alternate Hypothesis:** There is significant effect of KBA exercise in addition to RT in patients with knee OA

**Material and Methodology:**

**Sample size:** Minimum 24 per group (total 48) were taken for present study.

**Study Design:** Randomized controlled study

**Study population:** knee osteoarthritis stage 1 & 2 (Kellgren and Lawrence scale)

**Sampling Method:** Convenient Sampling (With the use of 1:1 allotment method)

**Inclusion criteria:** Age: 45-60 years, Male and female, Patients who are diagnosed of knee osteoarthritis, Stage 1 & 2

osteoarthritis in x-ray (Kellgren and Lawrence scale), Patients who knows English or Gujarati

**Exclusion criteria:** Neurological disorders, History of knee surgery or trauma, Hip/knee/ankle Joint instability, Ligament injury.

**Method:**

Forty-eight patients, with knee osteoarthritis were recruited Based on inclusion criteria.

Informed consent was obtained from all the patients, and verbal explanation was given to patients about procedure. Pre-exercise data was collected at the baseline. Patients were allocated randomly with 1:1 ratio to either RT or RT+KBA training. Both groups have received a 3-week exercise program five times in a week. Post exercise data was collected at the baseline and after the end of the 3 week exercise program.

**Exercise program**

The study group received a Kinesthesia, balance and agility program in addition to a traditional program of resistance training. The control group received only the resistance training.

**GROUP: A (Resistance training)<sup>8</sup>**

Quadriceps-setting exercise, Straight leg raise, Hamstring-setting exercise, Quadriceps strengthening exercise, Mini-Squat

**GROUP-B<sup>7</sup>**

Group-B will receive RT+KBA exercise, RT will be same as GROUP-A

Side Stepping, Braiding Activities, Front and Back Crossover Steps during Forward Ambulation, Multiple Changes in Direction during walking on therapist Command, Balance board tainting,

**Outcome measures:**

1. The numeric pain rating scale (NPRS), 2. Time up and go test (TUG), 3. Western Ontario and McMaster Universities (WOMAC/WOMAC-G) index Questionnaire

**STATISTICAL ANALYSIS:**

- Data obtained on first day, and on the completion of three week were interpreted and SPSS statistical software was used for data analysis.
- In this study Paired t- test was used for all the three variables, namely NPRS, TUG, and WOMAC.
- Descriptive statistics like mean, standard deviation, confidence interval. Frequency, percentage etc. were obtained to summarize data.
- Data was analyzed by using Paired t-test for pre and post measurements within group
- Student –t-test was used for comparison between 2 groups

**RESULT**

On Day 1, the mean of NPRS score of Group-A was 4.13 ± 0.741. In Group-A, it reduced to 3.46 ± 0.658 at the end of 3 weeks. On day 1, the mean of NPRS score of Group-B was 4.17 ± 0.761. In Group-B, it reduced to 2.13 ± 0.68 at the end of 3 weeks.

On Day 1, the mean of TUG score of Group-A was 8.668 ± 1.3774. In Group-A, it reduced to 8.612 ± 1.424 at the end of 3 weeks. For Group B on Day 1, the mean of TUG score of Group-B was 8.65 ± 1.476. In Group-B, it reduced to 7.319 ± 1.395 at the end of 3 weeks.

On Day 1, the mean of WOMAC score of Group-A was 40.79 ± 6.248. In Group-A, it reduced to 33.46 ± 6.164 at the end of 3 weeks. For Group B, on Day 1, the mean of WOMAC score of Group-B was 38.25 ± 7.356. In Group-B, it reduced to 25.38 ±

8.064 at the end of 3 weeks.

**DISCUSSION**

Regardless of the training module, both the RT and KBA group demonstrated significant decreases over time for pain from baseline to the completion of the study. However Group A shows more reduction in pain as comparison to Group B.

Exercise causes the knee cartilage to be compressed frequently and the joint fluid to repeatedly get in and out the matrix, which helped cartilage growth and joint repair, and reduced knee pain; Proper exercise encouraged the metabolism of the knee's blood circulation and inflammatory factors, which in turn, reduced inflammation and decreased pain; Exercise improved muscle strength in the lower extremities and improved the maximum load and stability of the knee, which reduced wear of the articular cartilage and relieved knee pain. Study done by Nejati P et al. Suggest that, patients with knee OA in exercise group had significant improvement in pain.<sup>9</sup>

For Group A it did not show improvement significantly in TUG score, while Group B shows significant improvement.

The chances of the difference appear to be related to the type and intensity of exercise performed in the KBA group. Specifically, activities practiced by this group required greater repetitions of balance activities, which may have helped in better performance. Faster rise times noted for the KBA group may indicate improvements in postural stability required to accommodate to larger changes in the center of gravity associated with this activity. A study done by Meenakshi Chauhan et al. support the result<sup>10</sup>

In this study no improvement was found in balance for Group-A, which goes in parity with Study done by Holden et al. reported that a time exceeding eight weeks is necessary for satisfactory balance results for traditional exercise.<sup>11</sup>

Both the RT and KBA group demonstrated significant improvement over time for WOMAC score from baseline to the completion of the study but larger improvement was shown by KBA group.

Resistance training has been shown to increase the -motor discharge or tone of the muscles trained even among older adults. This α-motor neuron activity is reciprocally influenced by muscle spindles and Golgi complexes within the muscle. Thus, resistance training may attenuate the impact and impulsive loads through the knee joint, not by only increasing the strength of the muscles surrounding the knee but also by increasing the sensitivity and coordination of the proprioceptors within the quadriceps muscle during walking and other weight-bearing activities.

In the KBA group, parameters of functional status and motor control improved better, this might be the result of the improvement of dynamic stabilization by the synergistic and synchronous working of the muscle groups. Similarly, repetitive movements that are used in the daily life exercises might have contributed to this improvement. This result is magnified with the study of Ahmad Reza et al. which concludes that the role of proprioception acuity is somewhat closely related to disability due to osteoarthritic changes.<sup>12</sup> Decrease in pain in KBA group may be due to appropriate contribution of various balance receptors and their interactions with postural and motor control.

The association between OA and loss of proprioceptive sense has been demonstrated. As a consequence of the insufficient working of the proprioceptive system, neuromuscular control cannot be maintained, protective muscle activities cannot be performed, and joint stabilization cannot be provided. In this condition, the joint is vulnerable to external traumatic

stimulations. Exercise regimens containing repetitive movements increase the ability of the person's control over joint movements in all positions. Dynamic stability may help to control abnormal joint translation that occurs during daily movements and may provide increased motor control through a reflex route.

A combined application of KBA exercise and strengthening exercise is more effective than a single muscle strengthening training program in terms of improving balance and mobility. Also, combining resistance and KBA training resulted in greater pain relief and improved knee joint muscle function. The logic behind the combined treatment was that the different factors addressed in physical and psychological treatments might produce an additive effect if administered together.

The results are expected to provide a useful basis for future efforts to enhance knee joint functions and improve pain control in patients with knee osteoarthritis.

**Limitations**

The first limitation of this study is small sample size. Secondly the BMI criteria were not taken for the selection of subjects for this study. And the small and limited geographic range from which the subjects were recruited, may limit the generalizability of findings.

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