# Efficacy of Balance Exercises with Endurance Training on Pain, Balance in Osteoarthritis

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## ABSTRACT

**Background:** Osteoarthritis is a degenerative and progressive joint disease that mainly involves weight bearing joints such as the hip, knee and ankle. It is considered as one of the leading causes of lower limb disabilities among the elder people. Knee pain could influence balance control via effects on proprioceptive input, central processing of information In this study it is to evaluate the comparative study of two balance training programs on pain balance in osteoarthritis knee patients.

**Methods:** The 30 Subjects were chosen as per the inclusion and exclusion criteria. Intensity of pain and balance was measured before the intervention and the subjects were divided into two groups. On the first day Pre intervention data of intensity of pain and balance was collected. After this pre-intervention analysis two groups were divided as Group A and Group B in which different exercise Protocol were performed for 3 weeks and post- intervention Data was collected from both the groups and final results were concluded.

**Results:** Results of the present study revealed that there was a considerable effect of balance training with endurance protocol rehabilitation in decreasing pain and imbalance in patients with knee osteoarthritis as compared to patients who received balance program alone. Results of the study revealed that there was a significant difference in reducing pain in patients who were treated with balance training with endurance program with mean being 1.98+-0.71 on Post intervention as compared to patients treated with balance training protocol alone with mean being 2.39+-0.77.

**Conclusion:** In Conclusion ,the present study has shown that Balance training exercises are effective in osteoarthritis knee patients but Balance training exercises with Endurance training exercises improves and more effective in reducing pain and imbalance of osteoarthritis knee patients which patients faces in their daily routine tasks.

*Keywords:* Balance berg scale, Numeric pain rating scale, knee Osteoarthritis, Balance training program.

## INTRODUCTION

Balance is defined as the ability to keep the body's centre of mass within the limit of the base of support; it is required for many functional activities daily life such as mobility and fall avoidance.[1] Osteoarthritis is a degenerative and progressive joint disease that mainly involves weight bearing joints such as the hip, knee and ankle. it is considered as one of the leading causes of lower limb disabilities among the elderly. [2] Degenerative osteoarthritis of the knee is one of the most common forms of osteoarthritis worldwide. It causes major loss of function and activity. [3] Knee osteoarthritis results in progressive loss of function including: Gait, stair climbing, and other physical activities which involve lower limb. In fact .it reduces the quality of life. People with knee osteoarthritis experience loss of proprioception. [4] Proper balance is essential for maintaining postural stability while performing functional activities and for fall avoidance. [5] Falls and loss of balance most commonly occur during movement related tasks such as walking and less frequently during static activities. [5] 65% of individuals older than 60 years of age experience dizziness or loss of balance often on daily basis. Some degree of imbalance is present in all individuals older than 60 years. This is the result of generalised functional degeneration. Initially the imbalance is a situational and

manifests when lightening reflexes cannot meet demands of a challenging environment such as slippery surfaces. [1] As the functional degeneration progresses the imbalance occurs during everyday activities, independent ambulation becomes difficult and likelihood of fall increases. [1] Knee pain could influence balance control via effects on proprioceptive input, central processing of information and efferent output to activate appropriate limb and trunk muscles. [7] Several investigators have examined the effect of a single form of exercise on balance in older adults, with mixed results balance training has shown to improve the different aspects of postural control. Individualized balance training has shown improvement in balance scores such as BBS and dynamic gait index and a 9 week balance training also led to changes in balance performance. [8] The pathogenesis of Osteoarthritis has long been mainly related to changes initiated in the articular cartilage. However recent evidence has suggested the participation of subchondral bone and synovial membrane within the disease's development and progression. [9] Osteochondral changes characteristic of Osteoarthritis and accentuate during the disease progression. Recent evidence suggests subchondral bone as a possible precursor of the cartilage damage rather than being the consequences of it. [10] Endurance training is the act of exercising to increase Endurance. The term Endurance training generally refers to training the aerobic system as opposed to the anaerobic system. [11] Muscular Endurance refers to the ability of given muscle to exert force, consistently and repetitively, over a period of time. [12] In this study it is to evaluate the comparative study of two balance training programs on pain balance in osteoarthritis knee patients.

**Aim of study**

To investigate comparative effects of two balance training programs on pain and balance in osteoarthritis knee patients.

**Need of the Study**

➢ Previous studies analysed effects of balance exercises on pain balance and functional performance in osteoarthritis.
➢ Previous study also analysed comparison of two balance training programs on balance of geriatric population of M.P. India.
➢ But the need is to analyse the efficacy of balance exercises with endurance training program on Osteoarthritis knee patients on their pain and balance.

## METHODOLOGY
**Sample size**
▪ No. of subjects: Minimum 30 no.
▪ Source of subjects: Various hospitals and nursing homes of Dehradun.

**Study Design**
Comparative study

**Sampling Method**
Convenient Sampling

**Inclusion Criteria**
1. Osteoarthritis knee patients with both genders between 50-60 yrs
2. Patients having osteoarthritis in between 5-8 yrs unilateral or Bilateral.

**Exclusion Criteria**
1. Patients with other musculoskeletal disorders.
2. Patients with any systemic illness.
3. Patients with any braces or knee support.
4. Patients with any neurological impairments.
5. Any related steroid injections (previous 3-4 months).

**Outcome Measures**
1. Numeric pain rating scale (NPRS).
2. Paper/ forms.
3. Pen.
4. Chair.
5. Stationary cycle
6. Couch
7. BBS (Berg balance scales).
8. Balance board

**FLOWCHART OF PROTOCOL**
30 Subjects with O.A. Knee age between 50-60 yrs were selected on the basis of inclusion and exclusion criteria subjects were divided into two groups and Pre

intervention data was collected from the groups

Informed consent form were obtained from subjects

**Group A     Group B**
Balance Exercises Balance Exercises
With Endurance
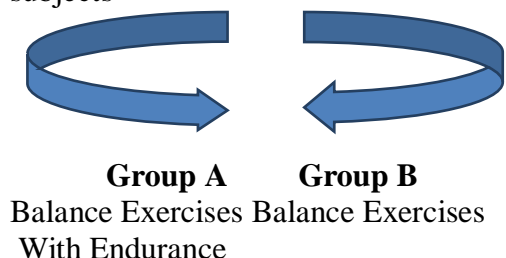
Final Data was collected after 3 wks of session and Analysis was done and Results were concluded.

## Procedure

The 30 Subjects were chosen as per the inclusion and exclusion criteria, and informed consent was obtained from all the subjects after the procedure was explained to them. Subjects with other causes of pain fulfilling any exclusion criteria were excluded. Intensity of pain and balance was measured before the intervention and the subjects were divided into two groups. On the first day Pre intervention data of intensity of pain and balance was collected. After this pre-intervention analysis two groups were divided as Group A and Group B in which different exercise Protocol were performed for 3 weeks and post-intervention Data was collected from both the groups and final results were concluded. The protocol given in both the groups are as follows:

GROUPA: Balance training exercise program was given to the patients which includes:-

1. Sideways walking-Stand with your feet together, knees slightly bent. Step sideways in a slow and controlled manner, moving one foot to the side first, move the other to join it.

2. Simple grapevine-Involves walking sideways by crossing one foot over the other.

3. Heel to-toe walk

4. One leg stand

5. Step-up and squatting

6. Flexibility exercises-Includes Hamstring exercises, glutei and hip flexor stretch, Gastrocnemius and soleus stretch. Strengthening exercises of lower limb.

7. Sitting down and standing up from high chair.

8. Balance board training

9. Ascending and descending stairs.

GROUP B: Balance training exercises are given as performed in Group A with endurance training protocol which includes:

1. Stationary cycling for nearly 20 repetitions in a session for 3 wks.

2. Brisk walking was performed in the O.P.D department for 10 minutes.

3. Climbing stairs at work for 10 minutes was performed by the patients.

4. Ball activities were performed by the patients about for 10 minutes in 3 wks.

Post-intervention Data was collected after 3 weeks and estimated time for Data collection was 3-4 months.

### Data Analysis

-SPSS 13 was used for Data analysis.

-The Statistical significance was set at 0.05 at 95% confidence interval.

-Paired t-test was used for analysis of Data within the group and independent t-test was used for the analysis of Data between the groups.

| TOTAL SUBJECTS | 30 |
|---|---|
| GROUP A | 15 |
| GROUP B | 15 |
| LEVELOF SIGNIFICANCE | 95% |

$P \leq 0.05$-Significant
$P \geq 0.05$-Non significant

**Table 1 Mean and Standard Deviation of NPRS at Pre, Post for subjects of Group A and Group B.**

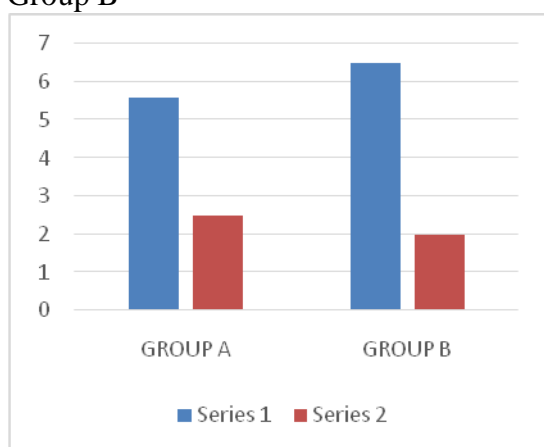| NPRS SCORE | GROUP A MEAN | GROUP A S.DEVIATION | GROUP B MEAN | GROUP B S.DEVIATION |
|---|---|---|---|---|
| PRE | 5.46 | 0.95 | 5.64 | 0.95 |
| POST | 2.39 | 0.77 | 1.98 | 0.71 |

**Table 2 Comparision of Mean value for NPRS at Pre, Post within Group A and Group B.**

| NPRS | GROUP A t-value | GROUP A p-value | GROUP B t-value | GROUP B p-value |
|---|---|---|---|---|
| PRE V/S POST | 25.014 | P≤0.05 | 24.528 | P≤0.05 |

**Table 3 Comparision of Mean value for NPRS at Pre, Post between Group A and Group B.**

| NPRS SCORE | GROUP A V/S GROUP B t-value | GROUP A V/S GROUP B p-value |
|---|---|---|
| PRE | 0.5 | P≥0.05 |
| POST | 1.56 | P≥0.05 |

## Comparision of Mean value for NPRS SCORE at Pre, Post within Group A and Group B



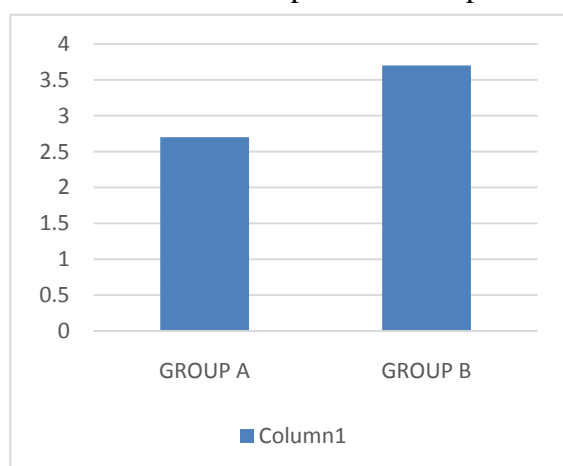## Comparision of improvement for NPRS SCORE between Group A and Group B



**Table 4 Mean and standard Deviation of BBS at Pre and Post for the subjects of Group A and Group B.**

| BBS | Group A Mean | GROUP A ST.DEVIATION | Group B Mean | GROUP B ST.DEVIATION |
|---|---|---|---|---|
| PRE | 47.22 | 6.96 | 49.48 | 7.20 |
| POST | 26.11 | 3.67 | 25.76 | 2.99 |

**Table 5 Comparision of Mean value for BBS Score at Pre and Post within Group A and Group B.**

| BBS | GROUP A t-value | GROUP A p-value | GROUP B t-value | GROUP B p-value |
|---|---|---|---|---|
| PRE V/S POST | 22.194 | P≤0.05 | 21.079 | P≤0.05 |

**Table 6 Comparision of Mean value for BBS score at Pre and Post between Group A and Group B.**

| BBS | GROUP A V/S GROUP B t-value | GROUP A V/S GROUP B p-value |
|---|---|---|
| PRE | 0.8 | P≥0.05 |
| POST | 0.290 | P≥0.05 |

## Comparision of Mean value for BBS at Pre, Post within Group A and Group B
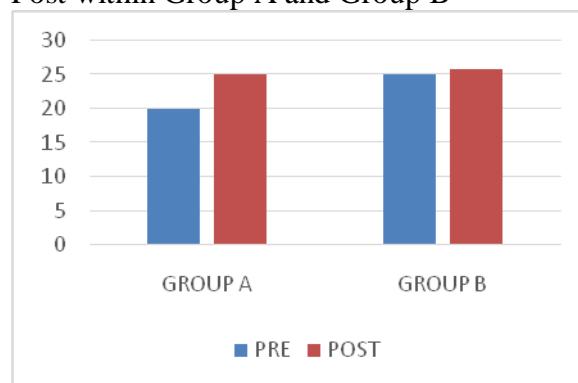


## Comparision of improvement for BBS Score between Group A and Group B
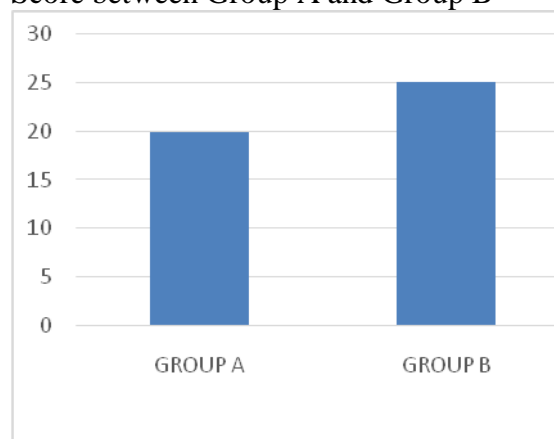


## RESULTS

The assumption of difference in the effects of Group A training and Group B training in reducing pain, balance in patients with knee Osteoarthritis were tested [13] by comparing values between the groups. it was observed that there was almost equal NPRS Scores for both Group A and Group B with means (5.46+-0.95 and 5.64+-0.95) respectively. The mean BBS (Balance berg score) for both groups was 47.22+-6.96 and

49.48+-7.20. Results of the present study revealed that there was a considerable effect of balance training with endurance protocol rehabilitation in decreasing pain and imbalance in patients with knee Osteoarthritis as compared to patients who received balance program alone. Results of the study revealed that there was a significant difference in reducing pain in patients who were treated with balance training with endurance program with mean being 1.98+-0.71 on Post intervention as compared to patients treated with balance training protocol alone with mean being 2.39+-0.77. So, it was clear that Balance training program with Endurance training is effective than Balance training rehabilitation.

### Limitations and future research
-Sample Size was small.
-Gender based study can be done.
-Osteoarthritis of hip joints can be assumed and performed in future.
-Some other variations for Balance training can be conducted.

### CONCLUSION
Dynamic muscular stabilization is increased by Balance exercises. Factors as age, family history, obesity, hypermobility increase susceptibility to Osteoarthritis. In addition to these, local biomechanical factors like congenital anomalies, trauma and Occupational injuries affect the occurrence and localization of Osteoarthritis.[13] In Conclusion, the present study has shown that Balance training exercises are effective in Osteoarthritis knee patients but Balance training exercises with Endurance training exercises improves and more effective in reducing pain and imbalance of Osteoarthritis knee patients which patients faces in their daily routine tasks and Endurance training exercises not only improves fitness in lungs and Heart but also effective in reducing pain and balance in these patients with Balance training exercises. So, we can recommend Balance training with endurance exercises to Osteoarthritis knee cases to improve pain and Balance in future.

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