



“EFFECT OF AGILITY TRAINING VERSUS PROPRIOCEPTIVE CIRCUIT TRAINING IN INDIVIDUAL WITH OSTEOARTHRITIS KNEE”

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BACKGROUND AND PURPOSE: Knee osteoarthritis is one of the most common forms of arthritis. It affects elderly population in most cases. It limits daily activities and reduces functional independence and impairment of quality of life. Today it is important to have awareness of knee OA at community level. So, this study was done to compare the effects of exercise more beneficial for OA knee.

MATERIALS AND METHODOLOGY: The research project was conducted at SPB Physiotherapy College. The study was conducted in private hospitals from different regions of Surat. Total 30 patients with OA knee had participated in the study. Patients were divided in to two groups randomly, 15 patients in each group. In group A agility exercises and in group B Proprioceptive circuit training was given. The treatment was given for 15 days and two sessions per day. WOMAC, NPRS and TUG were used as outcome measures.

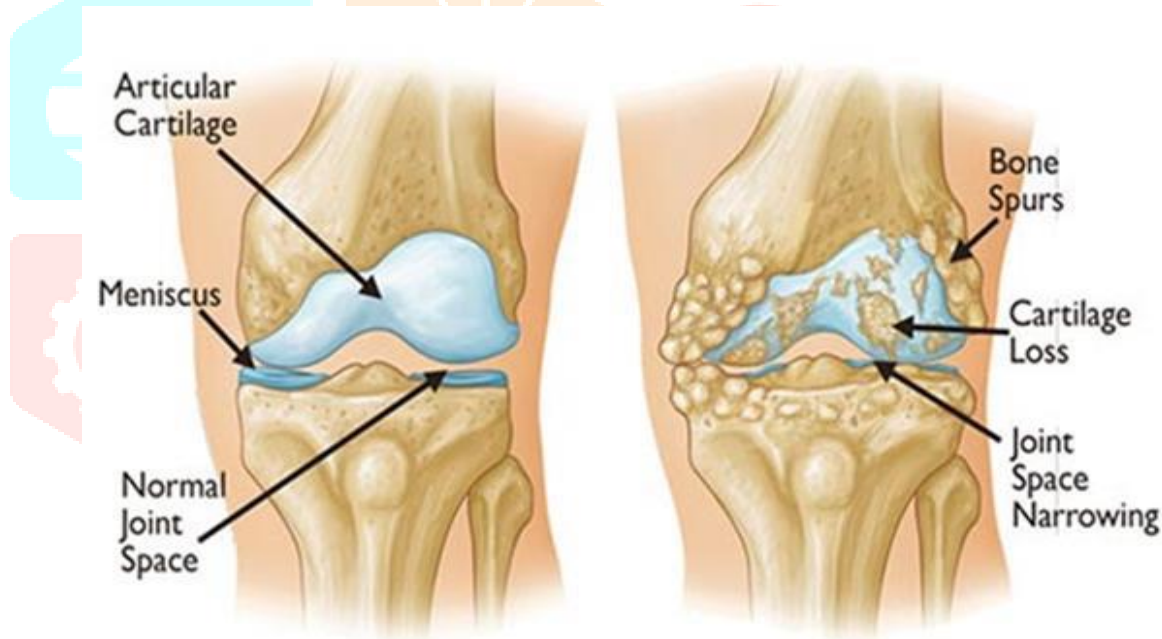
RESULT: Normality was checked by Shapiro-Wilk test. Data were not normally distributed. So, within group analysis was done by paired sample t test and between groups analysis was done by independent t test. Between group analysis shown significant difference between two groups.

CONCLUSION: This study concludes that proprioceptive circuit training is choice of treatment rather than agility exercises for OA knee.

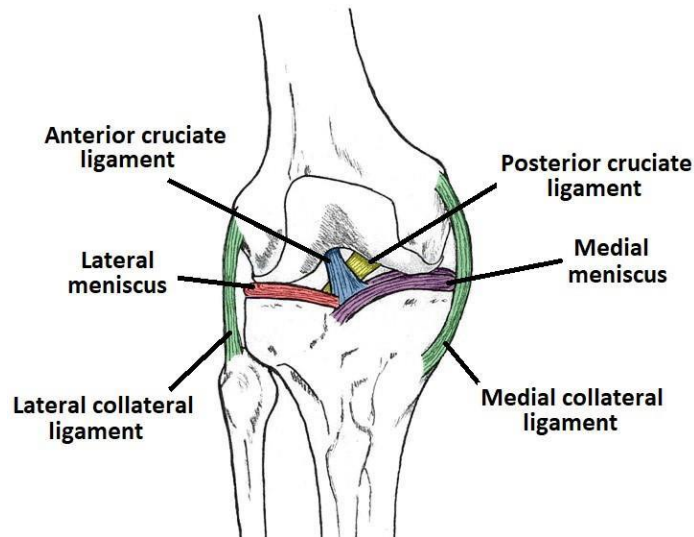
KEY WORD: Osteoarthritis, WOMAC, NPRS, TUG, Agility exercise, Proprioceptive circuit training.

INTRODUCTION

Knee osteoarthritis is one of the most common forms of arthritis. It is a chronic degenerative disease which affecting millions of people including elder as well as younger population in world today. It leads to mobility disability in elder people more than any other diseases.[1][3] It a disease of whole joint affecting articular cartilage, meniscus, ligaments and Peri-articular muscles which results due to multiple pathological mechanisms[2][3]. Pain, hyaline articular cartilage loss, bone remodeling and attrition, fibrocartilage degeneration, chondro-osteophytes and eroding, Synovium cell hyperplasia and capsular swelling, arthrogenous inhibition, muscle weakness are signature pathological features of OA.[3] Pain is the most common Symptom of OA. It is mostly occurring during specific activities like stair climbing, knee bending, and standing, walking etc. [3] OA limits daily activities and leads to reduced functional independence and impairment in quality of life [8] Knee pain, decreased quadriceps strength and decreased knee motion leads to progression of knee OA. [4-9] In a normal healthy joint, the muscles contract in a coordination pattern and provide limited joint excursion. Cartilage erosion leads to uneven joint loading and malalignment. Which leads to further damage and inflammation. [3] Obesity and old age are primary risk factors for this disease. [1]



The knee joint is stabilized by two stabilizers: The ligaments which are primary stabilizers and another is the muscles surrounding the knee joint which are secondary stabilizers. Both works congruently Fibrocartilaginous structures are also present: medial and lateral menisci are present in between two condyles. They provide good seat on tibial condyles for corresponding femoral condyles. They act as shock absorber and provides frictionless movements within the joint. [15] Injury to lateral meniscus leads to rapid development of osteoarthritis due to lateral side joint instability and makes rehabilitation more challenging. [16]



Bursas are the fluid filled cavities located at areas of high motion. They provide smooth, friction free movement by facilitating skin and tendon movement over the joint. They are filled with synovial fluid. Bursitis is one of the pathologies of knee joint occurs commonly in infrapatellar bursae as it has a key role in preventing friction between patellar tendon and tibia. It can also affect joint stability. [17]

The secondary stabilizers are the muscles surrounding the knee. Muscle's primary function is to produce motion around the joint as well a vital role in joint proprioception. They interact with neuromuscular system to control knee motion. The anterior aspect of the knee joint is consisting of rectus femoris(biarticular), vastus medialis, vastus lateralis (monoarticular), vast us intermedius which forms quadriceps group of muscles act as knee extensors. Posterior aspect of the joint is consisting of biceps femoris, semitendinosus, semimembranosus which forms hamstring group of muscles act as knee flexors. [17-18]

Proprioception is composed of joint position sense (JPS), movement control and maintaining balance. Proprioceptive system keeps our musculoskeletal system aware and protects the joints against harmful forces [19]. proprioception is affected by age, gender, severity of arthritis and muscle strength. Proprioception is demonstrated to be reduced in individual with OA due to decreased muscle strength [20-21]. Proprioception follows neuromuscular feedback system. The sensory inputs from somatosensory-visual, vestibular system received and processed by central nervous system. The processed output results in form of unconscious joint stabilization, Maintenance of balance and posture, Awareness of joint position and motion, protective spinal mediated reflexes [22]. Impaired proprioception can be a risk factor for progression of knee joint arthritis. Brimingham et al, (2001) stated that quadriceps sensory dysfunction that is decreased proprioceptive acuity has recently been demonstrated in patients with OA knee and proposed as a factor in pathogenesis or progression of OA. Unilateral OA individual may have chances to having impaired proprioception in both the knees. Exercise therapy is effective in improvement of proprioception accuracy [23]. Proprioceptive training effectively promotes pain relief and improve functional activities [24]. Proprioceptive training should be performed in weight bearing and non-weight bearing positions which can enhance joint proprioceptive acuity as well reduce pain and improves functional performance. [25]

Agility is defined as ability to change direction rapidly and start and stop quickly [26] Agility is rapid whole-body movement with change of direction or velocity in response to a “stimulus”, which is an ability to sprint, accelerate and decelerate along with change of direction [27] It is composed of change of direction, perceptual and decision-making factors [28]. According to scientific literature, agility is important physical quality and should be developed throughout childhood and adolescence [29] Agility exercises utilizes more explosive movements, so they could be help to improve muscle power, postural control and thereby improve functional capacity of an individual especially in elder people. It also improves balance, cognitive performance and thereby helps to prevent falls in elderly people. So, agility exercise training could be regarded as time efficient alternative exercise training for old aged people. [30]

METHODOLOGY

Study Design: Interventional study

Study Duration: 2 weeks (5 days a week, 1 sessions per day)

Sampling Technique: Sequential Random Sampling

Sample size: Total 30 Patients were taken

1. Inclusion criteria:

- Age group ≥ 45
- Gender = both the male and female
- Both Unilateral as well as bilateral OA knee
- Patient willing to participate
- Patient diagnosed by medical practitioner with Osteoarthritis knee

2. Exclusion criteria:

- History of neurological or vestibular disorders
- History of knee injury and surgeries.
- History of steroidal injection in last 6 months.

PROCEDURE:

Total 30 patients (males and females) falling under inclusion criteria were selected. Then informed consent form was obtained from the patients.

Then by using sequential random sampling we divided them into 2 study groups:

Group A: Agility exercise

Group B: proprioceptive circuit training

The treatment was given for 2 weeks twice in a day. Pre and post data collection were done for checking effectiveness of the exercises.

Group A:

Patients in this group were given agility exercises. [39]

Number of repetitions - 10/ Session. Exercises were given for 5 days a week for 2 weeks.

1. Wedding March:

Patients were given command to step forward and slightly to one side with leading foot. Then patients were instructed to bring trailing foot together with the leading foot; Then they were instructed to alter the leading foot.

2. Backward wedding march:

Patients were given command to step backward and slightly to one side with leading foot. Then patients were instructed to bring trailing foot together with the leading foot; Then they were instructed to alter the leading foot.

3. High knee march:

Patients were given command to walk forward while flexing hip about 90 degrees.

4. Side stepping:

Patients were given command to stand with feet together, step to side with leading foot. Then they were instructed to bring trailing foot back to leading foot. It was followed by repetition for other direction. Then patients were instructed to alter the leading foot.

GROUP B:

These are as proprioceptive Circuit exercise [38]:

Number of repetitions -10/ Session. Exercises were given for 5 days a week for 2 weeks.

1. Forward lunge:

Patients were given command to stand tall with feet hip-width apart. Then patients were asked to take big step forward with affected leg and lower their body until the thigh gets parallel to the ground and shin remains vertical.

2. Side lunge:

Patients were given command to stand tall, feet hip-width distance apart. Then Patients were given command to lift affected leg and take a medium the step out to the side, bend affected knee and push down the feet on floor. Patients were instructed to keep both feet flat on the floor while performing the side lunge.

3. Partial squats:

Patients were given command to stand with back supported with wall. Patients were asked to flex hip and knee and slide the back down and then up the wall by lowering and lifting the body. As the control improved, patients were allowed to do more knee flexion, up to maximum of 60 degree.

4. One leg standing:

Patients were given command to stand on affected leg with other leg flexed at hip, knee and ankle. Patients were instructed to hold the position for one minute, followed by rest of 10 seconds.

Outcome measures:

1. WOMAC SCALE
2. NPRS scale
3. Time Up and Go test

RESULT:**TABLE 1 Normality Table****Tests of Normality Shapiro-Wilk**

Statistic	Df		Sig.
WOMAC Pre	.914	15	.158
WOMAC Post	.846	15	.015
Mean WOMAC	.655	15	.000
NPRS Pre	.915	15	.164
NPRS post	.934	15	.315
NPRS Mean	.872	15	.037
TUG Pre	.958	15	.652
TUG Post	.931	15	.285
Mean TUG	.900	15	.097

Test of normality was done by using the Shapiro-Wilk test. On the basis of table 1 the p value is >0.005 which means there is no significant difference in baseline data that suggests that data are normally distributed. So, further analysis can be done by using the parametric test.



TABLE 2**Group A (Within group by Paired Sample t Test)**

Outcome	P value
WOMAC	.446
NPRS	.628
TUG	.003

Within group analysis of Group-A was done by using paired sample t test. Which shows:

For WOMAC the p value was 0.446 i.e., >0.005 which shows there is no significant difference.

For NPRS the p value was 0.628 i.e., >0.005 which means there is no significant difference.

For TUG the p value was 0.003 i.e., <0.005 which means there is a significant difference.

TABLE 3**Group B (Within group by Paired Sample t Test)**

Outcome	P value
WOMAC	.000
NPRS	.000

Withing a Group analysis of Group B was doing using paired sample t test showed significant difference between pre and post intervention. ($p < 0.005$)

For WOMAC, the p value was 0.000 i.e., <0.005 which means there is a significant difference.

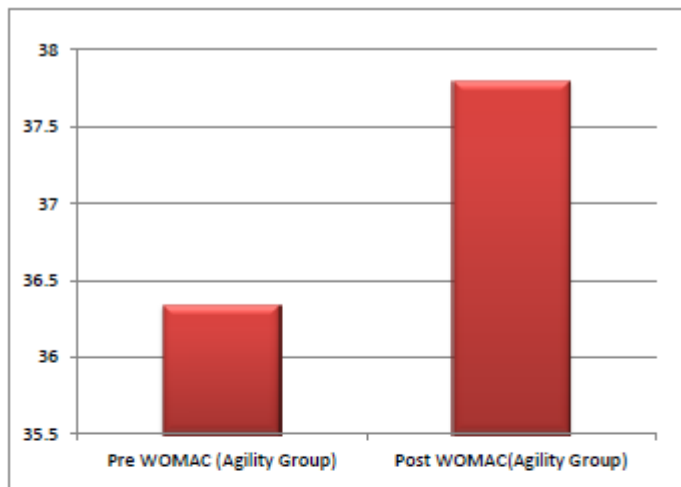
For NPRS, the p value was 0.000 i.e., <0.005 which means there is a significant difference.

For TUG, the p value was 0.000 i.e., <0.005 which means there is a significant difference.

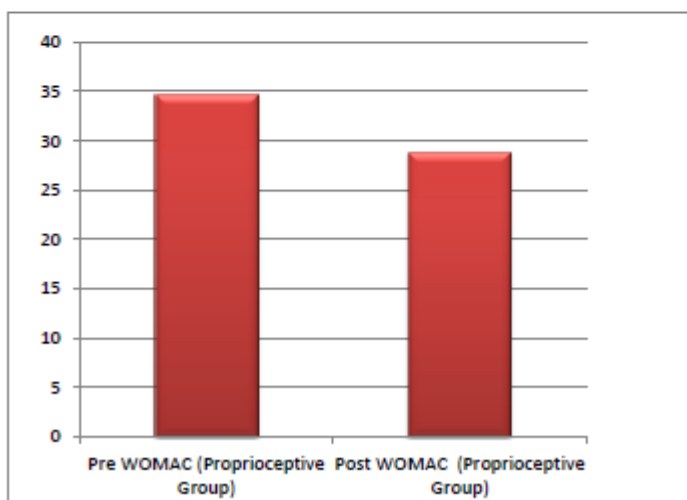
TABLE 4**Between Group by Independent Sample t Test**

Outcome	P value
WOMAC	.001
NPRS	.000
TUG	.000

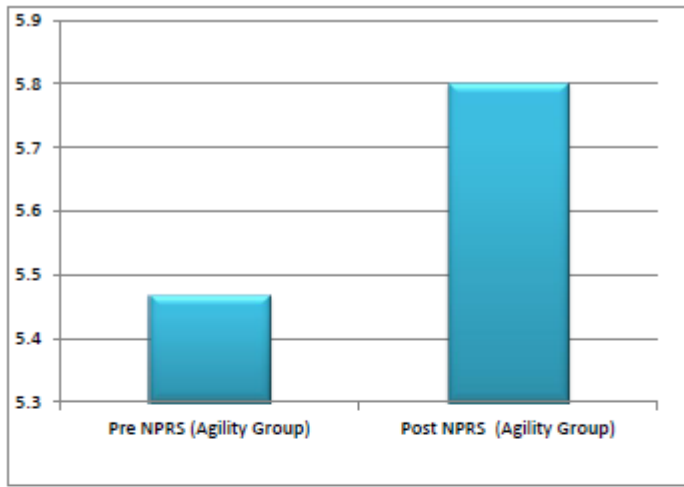
Between group analysis was done by using Independent Sample t Test, which shows there is a significant difference between two groups.



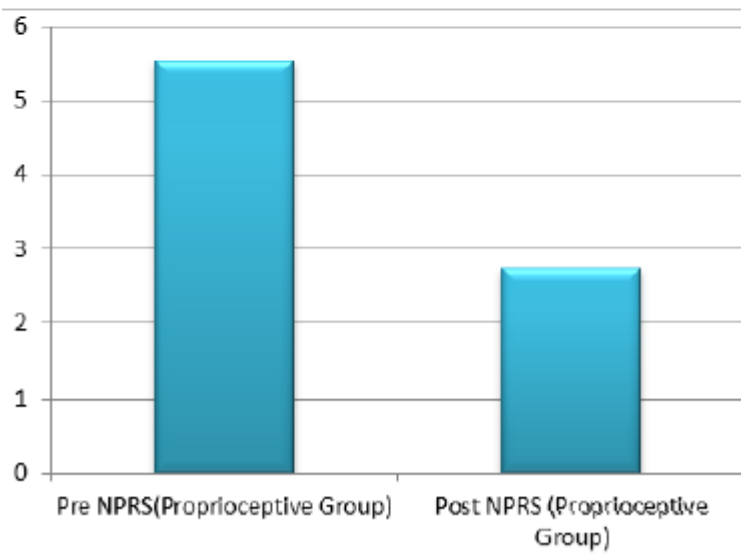
[The graph shows increased post WOMAC score.]



[The graph shows decreased post WOMAC score.]

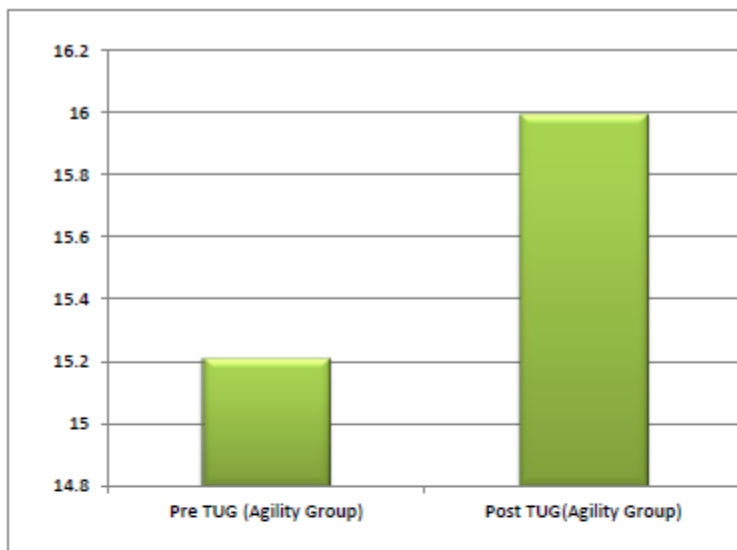


[The graph shows increased post NPRS score.]

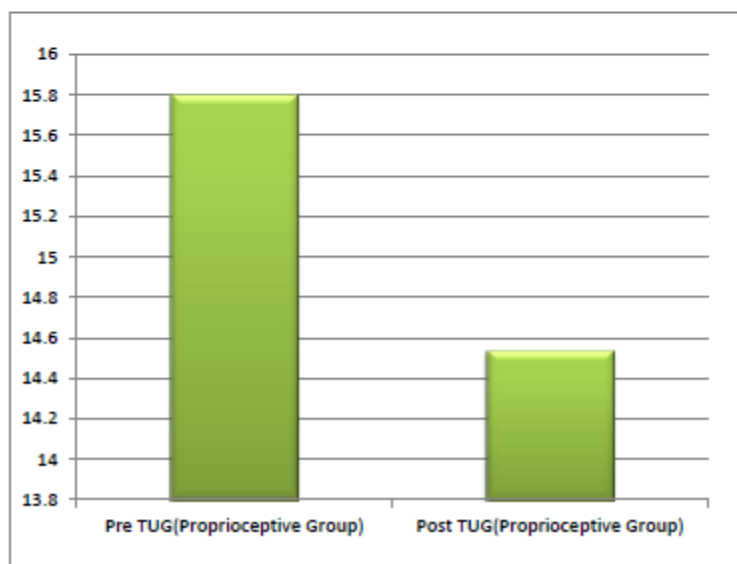


[The graph shows decreased post NPRS score.]





[The graph shows increased post TUG score.]



[The graph shows decreased post TUG score.]



7. DISCUSSION

Total 30 patients were included in the study. After taking the written consent form, based on inclusion and exclusion criteria the subjects were randomly allocated into 2 groups. Group A received agility exercise training and group B received proprioceptive training. All outcome measures were (WOMAC, NPRS, TUG) were analyzed at baseline before and after treatment. Confidence level was kept at 95% and level of significance was kept at 0.05. Normality was tested by using Shapiro-wilk test which is shown in Table No. 1 and it suggest that data is normally distributed. So, further analysis was done by using the parametric test.

Within group analysis was done by using Paired Sample t Test for both the groups. Within group analysis for Group A (agility exercise) is shown in Table No.2, the p value for WOMAC score was 0.446 which is >0.005 which means there is no significant improvement in post treatment. The p value for NPR2S was 0.628 i.e.,

>0.005 which means there is no significant difference in pre and post treatment. For TUG, the p value is 0.003 which is <0.005 means there is a significant difference in the post treatment. Within group analysis for Group B (proprioceptive exercise) is shown in Table No.3, the p value for WOMAC score is 0.000 i.e., <0.005 which means there is statistical difference in pre and post treatment. It suggests that there is significant improvement in WOMAC score. For NPRS, the p value is 0.000 i.e., <0.005 which means there is statistical difference in pre and post treatment and suggests significant improvement in score. The p value for TUG is 0.000 i.e., <0.005 which means there is a statistical difference in pre and post treatment. It suggests significant improvement in TUG score.

Between group analysis was done by using the Independent Sample t Test which is shown in table no. 4 which suggest that the p value is < 0.005 which means there is a significant difference between two groups. So, alternative hypothesis H1 is accepted that there is a significant difference between agility and proprioceptive groups and null hypothesis H0 is rejected. As WOMAC score was used for pain and physical function outcome, if there is increase in score which means there is increased level of pain, functional disability. From above score we can say that in agility group there is increased level of pain and therefore decreased physical function outcome and in Proprioceptive group there is decreased pain in and increased physical function level. As Numeric Pain Rating Scale (NPRS) was used for pain outcome, in our research there is increased level of pain after agility exercises. Whereas there is decreased level of pain after proprioceptive exercise. Time Up and Go Test (TUG) was used to check balance and fall risk of individual. If the score increases means there is increment risk of fall in individual. From the analyzed data we can say that in agility group TUG score is increased after treatment that means post treatment the risk of fall is getting increased and balance is getting worst in agility group. In proprioceptive group there is decreased TUG score after treatment which means there is improvement in balance, control and cognitive performance of patient in OA knee patients. From between group analysis the table no.4 suggests that there is a significant difference between two groups. In which the agility exercises show increased pain among patients and proprioceptive exercises shows decreased amount of pain after treatment.

Exercise on an unstable surface might be helpful for improving the muscle strength and alignment of lower extremities as well as for improving physical function related to the knee joint. This indicates that application of proprioceptive circuit exercise improves proprioception and knee joint muscle function, thereby reducing patient pain. Additionally, pain causes reflex arthrogenous muscle inhibition, reduces activation of the thigh quadriceps, and weakens the quadriceps. Therefore, strengthening knee joint muscle function likely helps reduce pain. This study showed that proprioceptive circuit exercise in patients with degenerative knee osteoarthritis can be an effective way of strengthening knee joint muscle function and reducing pain. 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. [38] Peeyoosh Shah Gurudutt et al in 2018 who did a comparative study the effect of calisthenic and proprioceptive exercise on pain a proprioception and balance and function in chronic knee OA. Their research concluded that proprioceptive exercises are more effective than calisthenic exercise in improving pain, proprioception deficit and balance and functional disability. The reason was that the

proprioceptive exercise teaches our body to control the position of joint. Since proprioceptive exercise brings asynchronies activities of knee muscle and mechanoreceptor that might have better improvement balance, proprioception, and function [47].

Saloni Viralbhair Shah, Yagna Unmesh Shukla et al did research on effect of kinesthetic versus agility exercise in unilateral osteoarthritis knee on pain, function and proprioception. They used WOMAC, NPRS, joint position sense error as outcome measure. After the data analysis they conclude that agility exercises are effective and reducing pain and improving proprioception and functional in osteoarthritis knee. [39] However, present study showed the contrast result. As pain, disability is increased and functionality is reduced after giving agility exercise in patients with OA knee. So, further study can be recommended.

8. CONCLUSION

This study concludes that there is increased level of pain, functional disability and increased risk of fall after agility exercises in osteoarthritis knee. It also concludes that proprioceptive circuit exercises are helpful in reduction of pain, increased functional ability and decreased risk of fall in osteoarthritis of knee. For OA knee proprioceptive circuit training should be included in rehabilitation protocol rather than agility exercises.

LIMITATIONS AND FURTHER RECOMMENDATIONS

- Sample size is limited; in future larger sample size can be taken.
- Study duration is limited; in future longer study duration can be taken.
- The results cannot be generalized to individual age; larger age group can be included in future.
- Short duration study in which follow up was not done, in future long term effects can be analyzed.

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