



Effectiveness of ChairAerobics Vs Theraband Exercises on Pain, Musclepower, and Range of motion in Subjects with Osteoarthritis of The Knee.

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ABSTRACT

Objectives: To analyse the effects of chair aerobics and Theraband on pain (NPRS) in subjects with Osteoarthritis of the Knee through the NPRS scale. To analyse the effects of chair aerobics and Theraband on muscle strength for quadriceps, and hamstrings by Manual Muscle test in subjects with Osteoarthritis of the knee. To analyse the effects of chair aerobics and Thera band on knee Range of motion through a Goniometer in subjects with Osteoarthritis of the knee.

Methods: An experimental study was conducted to find out the Effectiveness of chair aerobics Vs Thera band exercises on pain, muscle power and Range of motion in subjects with osteoarthritis of the knee. We obtained our targeted sample of 30 using simple random sampling.

Result: The results of this study showed that 6 weeks of treatment of both chair aerobics and Thera band exercises have a significant effect in reducing pain, and improving muscle power as well as Range of motion in subjects with Osteoarthritis of the knee, but the Thera band exercise group shown more significant effect than chair aerobics group.

Conclusion: The findings of the study indicate that both chair aerobics and Thera band Exercises were effective in reducing pain, and improving muscle power and range of motion in subjects with Osteoarthritis of the knee, but statistically Thera band exercises are more effective than chair aerobics.

Keywords: Osteoarthritis, Knee pain, Chair aerobics, Theraband exercises, Muscle power, Range of motion.

INTRODUCTION

Osteoarthritis is a chronic disorder of synovial joints in which there is progressive softening and disintegration of articular cartilage and is accompanied by the new growth of cartilage and bone at the joint margins (osteophytes), cyst formation and sclerosis in the subchondral bone, mild synovitis, and capsular fibrosis. ⁽¹⁾

Primarily OA is a non-inflammatory disorder but inflammation occurs eventually. Therefore generally, it occurs in weight-bearing joints such as the hip, knee, and lower back. Factors that contribute to OA include genetic disposition, age, injury, weight, and stress on the joint, previous surgery involving the joint. ⁽²⁾

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Osteoarthritis can be classified into two types 1. Primary and 2. Secondary. In primary knee osteoarthritis, the cause is unknown but factors like Obesity, Genetics, Heredity, Multiple endocrine disorders, and multiple hormone disorders contribute to the development. ⁽²⁾ The Secondary OA is caused by Obesity, Valgus-Varus deformities of the knee, Intra-articular fractures of the knee, Rheumatoid Arthritis infection, Trauma, Tuberculosis, Hyperparathyroidism, Haemophilia, Syringomyelia, diabetes, intra-articular steroid therapy. ⁽³⁾

OA affects nearly 6% of all adults, Women are more commonly affected than men. Roughly 13% of women and 10% of men 60 years and older have symptomatic knee osteoarthritis. ^(4,6) Among those older than 70 years of age, the prevalence rises to as high as 40% . Prevalence will continue to increase as life expectancy and obesity rise. ⁽⁵⁾

Among the various methods for treating Osteoarthritis, chair aerobics and Theraband exercises are two methods.

Chair aerobic exercise is a modified form of traditional aerobic workouts designed to accommodate individuals with limited mobility or those who prefer seated activities. This low-impact exercise is very beneficial for people with conditions such as osteoarthritis, joint pain ⁽²⁾

The biomechanical stress exerted on joints in obese adults is a potential factor in the onset and advancement of knee osteoarthritis (OA). ⁽³⁾Weight loss is recommended and effective for obese individuals, attained through engaging in physical activity. ⁽³⁾

The Thera band exercises involve using elastic bands of varying resistance levels for strength training. This versatile and low-impact form of exercise targets specific muscle groups, enhances flexibility, and promotes overall strength. Thera band exercises provide a safe and effective treatment of Knee Osteoarthritis. Incorporating these exercises into a routine can lead to increased strength, endurance, and joint stability.

Recently, there has been increased interest in the cost-effective and safe use of Thera bands for resistance training. Integrating Thera bands into patient exercises has proven effective in enhancing both muscle strength and quality of life. ⁽²⁾

NEED OF THE STUDY

Osteoarthritis is one of the most prevalent conditions and is the most common articular disease in the world, it occurs in weight-bearing joints such as the hip and knee. There are few studies on chair aerobics and Theraband exercises on subjects with Osteoarthritis of the knee. ^(2,3) There are no studies on the effect of chair aerobics Vs Thera band exercises on Osteoarthritis of the knee. Hence, the study determines the impact of chair aerobics exercises on Osteoarthritis of the Knee.

AIM OF THE STUDY

The study aims to know the effectiveness of chair aerobics vs Theraband exercises on pain, muscle power, and Range of motion in subjects with Osteoarthritis of the knee.

OBJECTIVE OF THE STUDY

To analyse the effects of chair aerobics and Theraband on pain in subjects with Osteoarthritis of the Knee through the NPRS scale. To analyse the effects of chair aerobics and Theraband on muscle power for quadriceps, and hamstrings by Manual muscle test in subjects with Osteoarthritis of the knee. To analyse the effects of chair aerobics and Theraband on knee Range of motion through a Goniometer in subjects with Osteoarthritis of the knee.

METHODOLOGY

MATERIALS REQUIRED:

- Chair.
- Theraband.
- Goniometer.
- Interferential therapy machine.
- Weight machine.

Study Setting	: College of Physiotherapy, SVIMS, BIRRD
Study Design	: Experimental study
Sampling Method	: Randomized sampling
Sample Size	: 30 (2 groups of 15 subjects)
Sample Collection	: Population of subjects with Osteoarthritis of knee, GRADE 1,2 (Kellgren-Lawrence grading system)
Study Duration	: 6 weeks

INCLUSION CRITERIA:

- **Osteoarthritis:** Grade 1, 2. (Kellgren-Lawrence grading system)
- **BMI:** >25.0 Overweight, >30.0 Class 1
- **Age :** >40yrs and <55 years.
- **Gender:** Only female subjects.

EXCLUSION CRITERIA:

- Osteoarthritis: Grade 3, 4. (Kellgren-Lawrence grading system)
- Previous surgeries for lower limbs.
- Neurological problems.
- Tumours and Traumatic Injuries.
- Fractures of Lower Limbs.

OUTCOME MEASURES:

- NPRS Scale.
- MRC MMT grading.
- Universal goniometer.

INSTITUTIONAL ETHICS COMMITTEE CLEARANCE

The study has been approved by the institutional ethical committee IEC No. 1540, Rec.No.AS/11/EC/SVIMS/2017.

PROCEDURE:

The study involved 30 subjects with knee osteoarthritis recruited from College of Physiotherapy at Sri Venkateswara Institute of Medical Sciences, Tirupathi, and BIRRD Hospital. They were divided into two groups one received chair aerobics with interferential therapy, while the other underwent Theraband exercises with interferential therapy, both administered five days a week for six weeks. Baseline data, including pain assessment, demographic information, and BMI were collected. Muscle power and knee range of motion were also evaluated. The study aimed to assess the effectiveness of these interventions in managing knee osteoarthritis symptoms and functional limitations.

PROTOCOL

Subjects underwent chair aerobics and Theraband sessions five days a week for six weeks, each session lasting at least 45 minutes. The routine included warm-up exercises, followed by the main exercise program, and concluded with gentle body stretching for cooling down.

WARM-UP PERIOD - 10 MINUTES (FOR BOTH GROUPS)

- **Foot pedals, Arm swings, Trunk twist, Hip circles, Forward leg swing, Lateral leg swing.**
Each Exercise was encouraged to do 10 counts in 2 sets.

CHAIR AEROBICS: 25 MINUTES

- **Toe touch with alternate elbow extension, Step touch with side hand raise, Knee lift with raised handclaps, Quad drills with front hand raise, Diagonal leg raise with hand Swing, Half star and Roll and kick.**
Each Exercise was encouraged to do 10 counts and 4 sets.

THERABAND EXERCISES: 25 MINUTES

- **Knee Extension (Sitting), Knee Flexion (Prone), LegPress ,Squat ,.Minisquat**
Each Exercise was encouraged to Repeat for 10 repetitions for 4 sets

COOL DOWN PERIOD: 10 MINUTES (FOR BOTH GROUPS)

- **Deep breathing exercises,Calf stretch,Hamstring stretch,Quadriceps stretch.**

INTERFERENTIAL THERAPY (FOR BOTH GROUPS)

Parameters of Interferential therapy:

- **Program Number** :18
- **Wave Mode** : Triangular
- **Base** : 90Hz
- **Spectrum** : 50HZ
- **Intensity** : Patient tolerance
- **Duration** : 10 Minutes.

Ask the patient to supine lying supported with pillows. The Electrodes was placed around the painful area on the knee joint and treatment is given 4 days/week for 6 weeks.



Knee Flexion with Theraband



Toe Touch with Alternate Elbow Extension

STATISTICAL DATA ANALYSIS

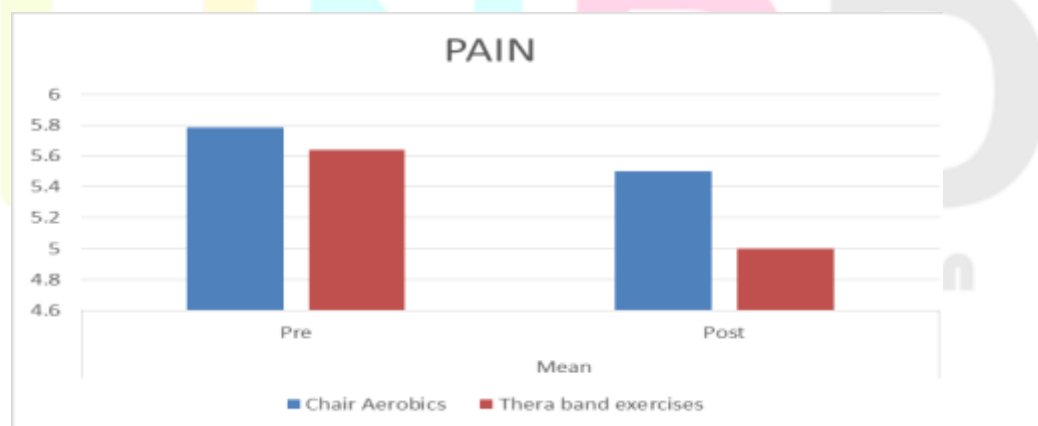
Comparison of Pain in groups in chair aerobics and Theraband exercises.

S.No	Within group	N	Mean		Standard deviation	
			Pre	Post	Pre	Post
1	Chair Aerobics	15	5.7857	5.5000	±0.80178	±0.75955
2	Thera band exercises	15	5.6429	4.0000	±0.84190	±0.78446

- It represents the pre and post-values of the Mean and the standard deviation of chair aerobics and Theraband exercises. The difference in the mean values of Numerical Pain Rating Scale score between the groups are analysed by utilizing paired sample t-test.
- The mean pre-test value of t-test 5.7857 ± 0.80178 is altered to post-test mean value of 5.5000 ± 4.0000 in group Chair Aerobics. The mean pre-test value of t-test 5.7857 ± 0.80178 is altered to post-test mean value of 5.5000 ± 4.0000 in group Theraband exercises.

Between Groups			
S.No	Variables	Chair aerobics	Theraband exercise
1	Mean	0.28571	0.64286
2	Standard Deviation	± 0.46881	± 0.63332
3	T-Value	2.280	3.798
4	P-Value	0.004	0.002

- Table represents that when compared between groups, both Chair aerobics and Theraband exercises are effective.
- At 99% confidence interval, the result, reveals a t value 2.280 and a significance of 0.004. in chair aerobics and theraband exercise reveals a t value 3.798 and a significance of 0.002, both statistically have a significant ($P < 0.005$) to reduce pain in subjects with Knee osteoarthritis but, Theraband was more effective.



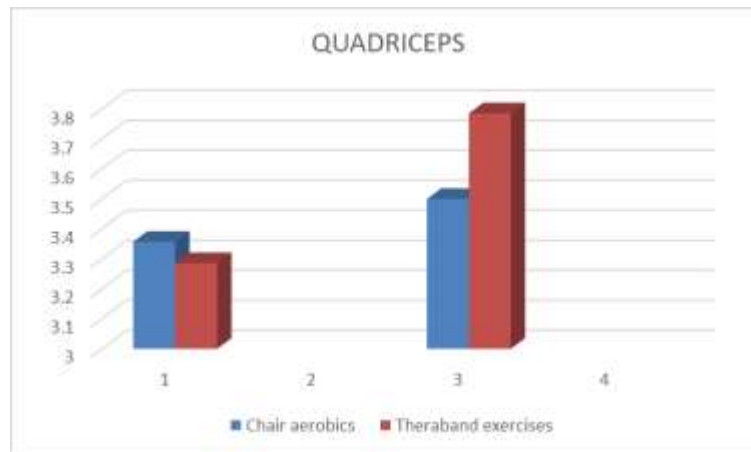
Comparison of quadriceps muscle power on chair aerobics and Theraband exercises within group and Between groups.

S.No	Quadriceps	N	Pre-intervention		Post-intervention	
			Mean	Standard Deviation	Mean	Standard Deviation
1	Chair aerobics	15	3.3571	±0.49725	3.5000	±0.4975
2	Theraband exercises	15	3.2857	±0.46881	3.7857	±0.2582

- Table represents the pre and post-values of the Mean and the standard deviation of chair aerobics and Theraband exercises on quadriceps muscle power.
- The difference in the mean values of quadriceps muscle power in the groups are analysed by utilizing paired sample t-test.
- The mean pre-test value of t-test $3.3571 \pm \pm 0.49725$ is altered to post-test mean value of 3.5000 ± 0.4975 in group Chair Aerobics. The mean pre-test value of t-test 3.2857 ± 0.46881 is altered to post-test mean value of 3.7857 ± 0.2582 in group Theraband exercises.

S.No	Quadriceps	Mean	Standard Deviation	T value	P Value
1	Mean	0.14286	±0.36314	-1.472	0.004
2	Standard Deviation	0.50000	±0.51887	-3.606	0.003

- Table , represents that when Compared with Chair aerobics and theraband exercises, both have at 99% confidence interval, the result, reveals a t value -1.472 and a significance of 0.004.in chair aerobics and theraband exercise reveals a t value -3.60 and a significance of 0.003, both statistically have a significant ($P < 0.005$) to improve muscle power in subjects with Knee osteoarthritis but, Theraband was more effective.



Comparison of Hamstrings muscle power on chair aerobics and Theraband exercises within groups and Between groups

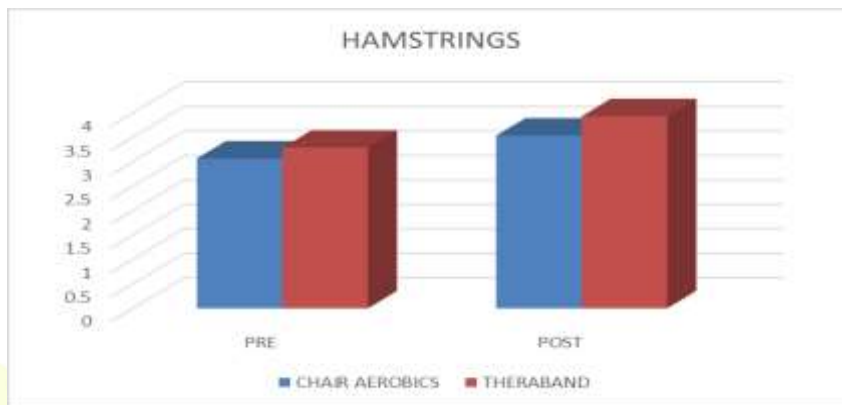
S.No	Hamstrings	N	Pre-intervention		Post-intervention	
			Mean	SD	Mean	SD
1	Chair aerobics	15	3.0667	±0.96115	3.5333	±1.06010
2	Theraband exercises	15	3.2857	±0.46881	3.9286	±0.26726

- Table represents the pre and post-values of the Mean and the standard deviation of chair aerobics and Theraband exercises on Hamstring muscle power. The difference in the mean values of quadriceps muscle power in the groups are analysed by utilizing paired sample t-test. The mean pre-test value of t-test 3.0667 ± 0.96115 is altered to post-test mean value of 3.5333 ± 1.06010 in group Chair Aerobics.
- The mean pre-test value of t-test 3.2857 ± 0.46881 is altered to post-test mean value of 3.9286 ± 0.26726 in group Theraband exercises.

Comparison of hamstring muscle power on chair aerobics and theraband exercises between groups.

S.No	Hamstrings	Mean	Standard Deviation	T- value	P-value
1	Chairaerobics	-0.46667	±0.51640	-3.500	0.004
2	Theraband exercises	-0.64286	±0.49725	-4.837	0.000

- Table represents that when Compared with Chair aerobics and Theraband exercises, both have shown significant ($p < 0.005$) impact on hamstring muscle power, but Theraband was more effective.
- At 99% confidence interval, the result, reveals a t value -3.500 and a significance of 0.004 in chair aerobics and theraband exercise reveals a t value -4.837 and a significance of 0.000, both statistically have a significant ($P < 0.005$) to improve muscle power in subjects with Knee osteoarthritis but, Theraband was more effective.



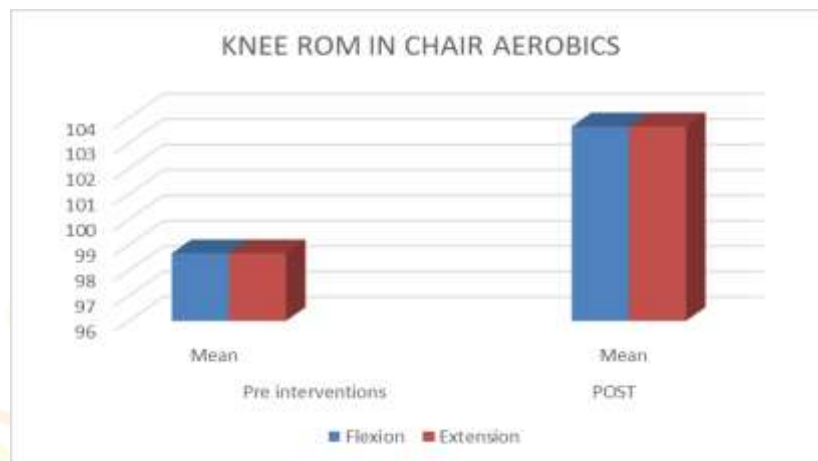
Comparison of Range of motion of knee flexion and extension in chair aerobics exercises.

S.No	Chair aerobics	N	Pre interventions		Post-intervention	
			Mean	SD	Mean	SD
1	Flexion	15	98.6667	± 28.3767 2	103.6667	± 29.66881
2	Extension		98.6667	± 28.3767 2	103.6667	± 29.49980

- The difference in the mean values of knee ROM in the groups are analysed by utilizing paired sample t-test.
- The mean pre-test value of t-test 98.6667 ± 28.37672 is altered to post-test mean value of 103.6667 ± 29.66881 in group Chair Aerobics for Flexion. The mean pre-test value of t-test 98.6667 ± 28.37672 is altered to post-test mean value of 103.6667 ± 29.49980 in group Chair Aerobics for Extension.

S.No	Chair aerobics	Mean	Standard Deviation	T-Value	P-value
1	Flexion	5.00000	5.00000	-3.873	4.6667
2	Extensions	4.6667	3.99404	-4.525	0.000

- Table shows that when Compared with flexion and extension on chair aerobics exercises, both are effective. The chart shows that when Compared with flexion and extension on chair aerobics exercises, both have shown significant ($p < 0.005$) impact on knee ROM.



Comparison of Range of motion of knee flexion and extension in Theraband exercises within groups.

S.No	Theraband exercises	Pre-intervention		Post-intervention	
		Mean	SD	Mean	SD
1	Flexion	99.000	±27.91569	102.000	±28.64811
2	Extension	98.333	±27.57316	103.5316	±28.64811

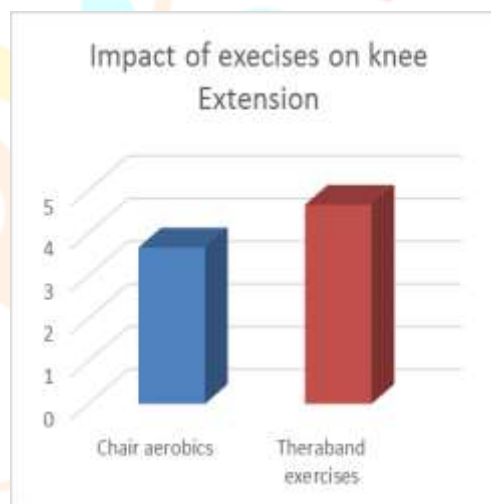
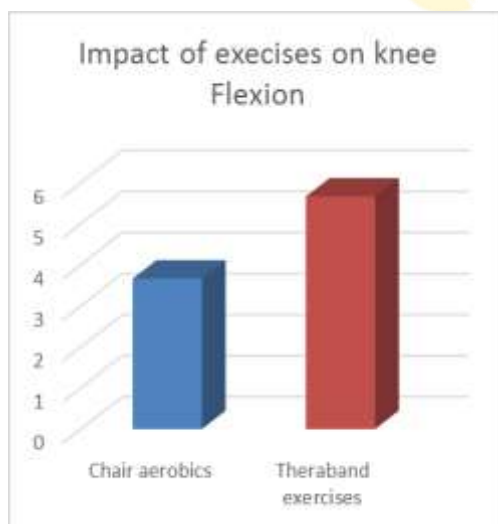
- Table represents the pre and post-values of the Mean and the standard deviation in Theraband Exercises of knee flexion and extension.

Comparison of Range of motion of knee flexion and extension on chair aerobics and Theraband exercises between groups.

S.No	Knee flexion	Mean	Standard Deviation	T-Value	P-Value
1	chair aerobics	3.00000	5.7380	-3.873	0.004
2	Theraband exercises	5.00000	3.68394	-3.154	0.002

From Table 1, it is seen that when comparing the range of motion of knee flexion on chair aerobics and Theraband exercises, both are effective.

- At 99% confidence interval, the result, reveals a t value -3.873 and a significance of 0.004 in chair aerobics and theraband exercise reveals a t value -3.154 and a significance of 0.002, both statistically have a significant ($P < 0.005$) to improve knee flexion in subjects with Knee osteoarthritis but, Theraband was more effective.
- Table 2 it is seen that when comparing the range of motion of knee extension on chair aerobics and Theraband exercises are effective.
- At 99% confidence interval, the result, reveals a t value -4.525 and a significance of 0.003 in chair aerobics and theraband exercise reveals a t value -3.556 and a significance of 0.002, both statistically have a significant ($P < 0.005$) to improve knee extension in subjects with Knee osteoarthritis but, Theraband was more effective.



RESULTS

The collected data was tabulated and analysed using descriptive and inferential statistics. To all parameters mean and standard deviation was used. Paired t-test was used to analyse significant changes between pre and post test measurements. Unpaired t-test was used to analyse significant difference between the groups. P value < 0.05 was considered as statistically significant. Data analysis was done using SPSS software (version 29)

DISCUSSION

Our present study is “EFFECTIVENESS OF CHAIR AEROBICS Vs THERABAND EXERCISES ON PAIN, MUSCLE POWER, AND RANGE OF MOTION IN SUBJECTS WITH OSTEOARTHRITIS OF THE KNEE.” Aerobics and Theraband exercises have been recommended widely and consistently by various medical organisations for the management of OA knee,^(2,3) but there are few studies on the effectiveness of chair aerobics and Theraband exercises on pain, muscle power and Range of motion. According to the results, the study found

that 6 weeks of chair aerobics and Theraband exercises can reduce pain and improve muscle power, and Range of motion. Exercise can reduce the recurrence of pain, and improve muscle power and as well as Range of motion. The study findings revealed notable improvements in pain reduction, improvement of muscle power, and knee range of motion among participants engaging in both chair aerobics and Theraband exercises. Comparing pre-assessment and post-assessment values, subjects in both groups showed significant enhancements. However, Theraband exercises emerged as the more effective intervention for pain reduction and improving range of motion and musclepower. These results underscore the therapeutic benefits of both exercise modalities in managing knee osteoarthritis, with Theraband exercises exhibiting particular efficacy in improving key outcomes.

According to Navid Kalani¹, Shahnaz Shahrbanian^{2*}Zahra Riahi³ J Bas Res concluded that engaging in resistance exercises using a Theraband has been associated with pain reduction. Incorporating exercise into one's routine has demonstrated the potential to decrease the likelihood of chronic pain recurrence, enhance physical performance, and alleviate symptoms of anxiety and depression.⁽²⁾ Utilizing Therabands in resistance programs is recognized as an effective method to enhance an individual's functional capacity and alleviate knee pain.⁽⁷⁾

Mary Ann Sevick et al concluded that education control, and resistance training for seniors with knee osteoarthritis is more economically efficient than aerobic exercise in improving physical function. However, the magnitude of the difference in efficiency between the two approaches is small.⁽⁸⁾

The correlation between the onset of joint pain and diminished muscle strength and mobility has been acknowledged. It is understood that pain contributes to incorrect joint utilization, and the weakened muscles surrounding the joint can result in abnormal movements consequently, improper joint usage can further exacerbate pain.⁽⁸⁾

Dr. Manisha Rathi (PhD) 1, *Dr. Rajlakshmi Shah et al concluded ChairAerobics was effective in reducing pain, physical disability, BMI and waist circumference in older adults with OA knee.⁽³⁾

Utilizing resistance programs with a theraband is recognized as an approach to enhance individuals' functional capabilities. This is achieved by lessening the strain on the knee, thereby reducing pain. Additionally, it involves heightening sensitivity in the sensory-motor structure of the quadriceps muscle, encompassing the muscular spindle and Golgi. This, in turn, contributes to alleviating pain in individuals suffering from knee osteoarthritis.⁽⁹⁾

Further research can be done by increasing the sample size and examining the effects of chair aerobics on different aspects like balance in different populations.

CONCLUSION

The study findings revealed both chair aerobics and Theraband exercises as effective treatments for knee osteoarthritis. However, statistically, Theraband exercises demonstrated greater effectiveness compared to chair aerobics. Over the six-week treatment period, both interventions significantly reduced pain on the Numeric Pain

Rating Scale, improved muscle power, and increased range of motion in knee osteoarthritis patients. A notable strength of these exercises is their cost-effectiveness and accessibility, requiring only a chair and Theraband, allowing individuals to perform the exercises anywhere without negative side effects.

LIMITATIONS

- Long duration follow up may be required to find out the further advantageous effect of Chair aerobics and Theraband exercises on a large group of population.

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