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ORIGINAL ARTICLE

EFFECT OF HIP (FLEXOR, EXTENSOR) MUSCLE EXERCISE ON KNEE ROM AND FUNCTIONAL ACTIVITY IN POST OPERATIVE TOTAL KNEE REPLACEMENT SUBJECTS	Search engine: **www.ijmaes.org**

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ABSTRACT

Background: With increase age, elderly individuals often experience a decline in balance, leading to functional dependence and an elevated risk of fall. Balance issues are frequently associated with age related changes in the sensory and motor system. Postural exercise is aim to strength and stabilizes the body's posture. While gaze stability exercise focus on improving visual tracking and coordination, which are critical for balance. Comparing these two approaches could provide valuable insights into effective interventions for maintaining independence in the elderly. The aim of this study is to compare the efforts of postural exercise and gaze stability exercise on balance and functional independence in elderly individuals. Objective of the study was to determine the effectiveness of two distinct intervention postural exercise and gaze stability exercise in improving Balance, reducing falls and enhancing functional independence among elderly individuals. **Methodology:** It is a Quasi-Experimental Comparative study, with sample size of 30 [postural exercise 15], [gaze stability exercise 15]. Sampling Method was Random sampling [Lottery method] and the study conducted at Faculty of Physiotherapy, Dr. MGR Educational & Research institute for duration of 6 Months and the intervention duration was 30 Minutes per session, 4 Days per Week, 12 weeks. **Result:** Group A intervention found more effective over Group B intervention on Y Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy scale with mean score difference of 10.33, 6.99, 4.28, 28.47, and 21.60 respectively. **Conclusion:** Postural exercises are more effective than gaze stability exercises in improving independence, balance, and fall prevention confidence in the elderly.

Keywords: Postural exercise, gaze stability exercise, functional independence, balance, elderly, fall aging, rehabilitation, physiotherapy, exercise intervention.

INTRODUCTION

Knee osteoarthritis is the most commonly encountered type leading to pain of muscle skeleton and disability in the elderly patient patients generally complaints about pain, muscle weakness joint stiffness instability and decrease in physical function.

Some common causes that can lead to development of Osteo Arthritis (O.A) are age related cartilage degeneration, genetic inheritance, trauma previous inflammatory conditions, quadriceps weakness and vascular changes1.

Osteo Arthritis (O.A) of the knee may be accelerated if there is a vascular disease in the subchondral bone, either through direct ischemic effects on bone or by any alteration in the cartilage nutrition[2].

 All such complaints give raise to in physical disability and restriction in quality of life. A pharmacological and surgical therapeutic option is most commonly following. The importance of non- pharmacologic approaches and rehabilitation is becoming more and more significant at the moment because no drugs are effectiveness to change the course of the condition[3].

Reduction of pain and improvement in physical function and quality of life are the main expected outcome after total knee arthroplasty (T.K.A). Total Knee Arthroplasty scientific and clinical evidence support the success of T.K.A for the relief of knee pain and symptoms of osteoarthritis Osteo Arthritis (O.A) as well as a high rate of patient satisfaction[4].

However, the functional benefits of this surgical procedure are not a convincing, because quantitative evaluation of knee function have shown that larger functional deficits persist 1 year after surgery and even longer[4,5].

The purpose of physiotherapy rehabilitation following knee arthroplasty were to reduce pain, to increase knee range of motion, to improve muscle strength of maximize functional ability to support /advice and educate patients as necessary and encourage self-care and self-management and prevention of post-operative complications. Clinical evidence showed that progressive quadriceps muscle strengthening improves functional outcome following knee arthroplasty[6].

Incidence and Prevalence rate of osteoarthritis:

The COPCORD studies conducted in India, Bangladesh, Pakistan looked specifically for the difference between rural and urban population. In India the crude prevalence of clinically diagnosed knee O.A (Osteo Arthritis) was higher in urban (5.5%) than in rural community (3.3%). The incidence of hand, hip, knee O.A (Osteoarthritis) increases with age and women have higher incidence rates then men especially after the age of 50 years [7].

The female to male ratio varies between 1.5:4.5 incidence rate of symptomatic radiographic knee OA in the adult age >20 years and older is 240 per 100000person years. Among women adult population incidence radiographic knee OA is 2-25 %per year and incidence of symptomatic radiographic knee O.A 1% per year[8].

Men have 45% lower risk of incident to knee O.A and 36 % reduced risk of hip O.A (Osteo Arthritis) than women. In rural India the incidence is 5.78 % which is about 30% of all

Rheumatological problems. In India there is increased knee arthritis than western population. There is secondary endemic OA (Osteo Arthritis) in western Karnataka due to hereditary spondylo epiphyseal dysplasia[3].

O.A (Osteo Arthritis) is a worldwide cause of pain and disability with an estimated 27 million adults in the us living with this disease. The knee is the joint most commonly affected by osteoarthritis (OA), with more than30% of adult's over 60years of age experiencing functional limitations Caused by knee OA (Osteo Arthritis). OA (Osteo Arthritis) of the knee causes more clinical symptoms and disability than OA in any other joint in the body. Currently there are more than 450,000 knee arthroplasties performed each year in the United States, a number expected to nearly double by 2020[10].

Knee pain has been reported to arise from the hip and/or lumbar-spine region in a number of different conditions. Significantly more subjects with knee OA demonstrated pain with several hip clinical tests than did asymptomatic individuals[11].

According to Framingham study, among the participants who are aged over 45 years and the prevalence of radiographic knee OA was19.2%and in those over 80 years the figure raised up to 43.7 %. A data produced by Dutch institute for public health and prevalence of knee O.A in those who are aged 55 and above was 15 .6% in men and 30.5 in women [12].

METODOLOGY

Forty participants completed the study (20 per group). A randomized controlled intervention study was conducted with postoperative TKA patients aged 55–75 years. Participants were allocated into two groups; Control group: received a conventional TKA rehabilitation protocol including quadriceps strengthening, knee ROM exercises, and gait training. Experimental group: received the same conventional program plus structured hip flexor and extensor strengthening performed 5 days/week for 6 weeks under physiotherapist supervision. Primary outcomes were ROM measured with a universal Goniometer and Secondary outcomes WOMAC and TUG test. Assessments were conducted at baseline (post operative week 2) and at the 8th week.

Inclusive Criteria: Primary O.A Knee, Age -40-65 years, Patients with Uni compartmental, Bi compartmental, Tri compartmental involvement of O.A knee. Subjects who underwent unilateral total knee replacement surgery selected from outpatient deportment of Birrd Hospital, Tirupathi, for duration of 6 weeks.

Sampling method: Simple random sampling 50 subjects who met the inclusive criteria were included in the study. Before randomization subjects were completed total knee replacement surgery. Universal Goniometer was used to measure the range of motion of knee flexion and knee extension post Total knee replacement individuals. participant's functional status was assessed by means of functional independent measurement scale (FIM) it is 18 item scale who higher scores corresponds to greater level of independency

Procedure: A Prior informed consent will be obtained from all the patients after fully explaining the procedure. Subjects are who underwent post-operative total knee replacement surgery

Then the, pre operation data i.e. Age, sex, date of surgery, post-operative day, occupation,

medical conditions, medications, will be collected from all the selected subject's complete evaluation on Range of motion by using Goniometer, and Functional independency by using FIM.

Therapeutic Protocol:
Experimental Group: This group received Knee isometrics, Knee range of motion exercises, SLR'S, Along with specific Hip strength training exercises.

Control Group: This group received only Knee isometrics, Knee range of motion exercises, SLR'S

Specific Hip Strenth Training Exercises: According total knee replacement exercise guide Helpful Resources; Osteoarthritis Service Integration System(OASIS), Physiotherapy Association of British Columbia(PABC), Canadian Orthopaedic Foundation, American Academy of Orthopaedic surgeons.

1.Resisted knee straightening, 2.Resisted knee bend, 3.Sit to stand, 4.Wall slides, 5.Stepping up and down, 6.Side steps, 7.Split squat(lunge)

RESULTS

Repeated Measures ANOVA Results for Experimental:

Sl.no	Variable	Time of observation	N	Mean	SD	F-value	p-value	Remarks
1	Knee Flexion AROM	Pre	25	17.64	1.95	10264.308	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Flexion AROM in Experimental
		Post	25	25.04	2.01			
		Discharge	25	33.80	2.98			
		Follow up	25	102.28	3.82			
2	Knee Flexion PROM	Pre	25	21.44	1.71	18777.027	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Flexion PROM in Experimental
		Post	25	29.08	2.36			
		Discharge	25	38.12	3.10			
		Follow up	25	104.12	2.97			
3	Knee Extension AROM	Pre	25	24.04	1.71	698.304	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Extension AROM in Experimental
		Post	25	20.20	2.06			
		Discharge	25	17.44	1.32			
		Follow up	25	9.64	1.65			

4		Pre	25	21.88	1.900	746.849	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Extension PROM in Experimental
		Post	25	19.24	2.127			
		Discharge	25	13.44	2.399			
		Follow up	25	6.92	1.25			
		Post	25	79.04	3.297	1812.000	0.000	As p < 0.05, there is significant difference between the post, discharge and follow up within FIM Score in Experimental
		Discharge	25	88.32	4.776			
		Follow up	25	109.24	1.855			

*Significant at 0.05 level

Repeated Measures ANOVA is performed on each of the scores obtained at three/four time points. The mean and standard deviation are reported along with F-value for the within subjects (over the duration) contrast and the post-value of the t- test is given. Pair wise comparison of mean scores at the three/four time points is also reported along with p-value.

Sl.no	Variable	Pair	Mean Difference	p-value
1	Knee Flexion AROM	(Pre, Post)	7.400[*]	0.000
		(Pre, Discharge)	16.160[*]	0.000
		(Pre, Follow up)	84.640[*]	0.000
		(Post, Discharge)	8.760[*]	0.000
		(Post ,Follow up)	77.240[*]	0.000
		(Discharge, Follow up)	68.480[*]	0.000
2	Knee Flexion PROM	(Pre, Post)	7.640[*]	0.000
		(Pre, Discharge)	16.680[*]	0.000
		(Pre, Follow up)	82.680[*]	0.000
		(Post ,Discharge)	9.040[*]	0.000
		(Post, Follow up)	75.040[*]	0.000
		(Discharge ,Follow up)	66.000[*]	0.000
3	Knee Extension AROM	(Pre, Post)	-3.840[*]	0.000
		(Pre ,Discharge)	-6.600[*]	0.000
		(Pre, Follow up)	-14.400[*]	0.000
		(Post, Discharge)	-2.760[*]	0.000
		(Post, Follow up)	-10.560[*]	0.000
		(Discharge, Follow up)	-7.800[*]	0.000
4	Knee Extension PROM	(Pre, Post)	-2.640[*]	0.000
		(Pre, Discharge)	-8.440[*]	0.000
		(Pre, Follow up)	-14.960[*]	0.000

		(Post, Discharge)	-5.800[*]	0.000
		(Post, Follow up)	-12.320[*]	0.000
		(Discharge, Follow up)	-6.520[*]	0.000
5	FIM Score	(Post, Discharge)	9.280[*]	0.000
		(Post, Follow up)	30.200[*]	0.000
		(Discharge, Follow up)	20.920[*]	0.000
*Significant at 0.05 level				

Repeated Measures ANOVA Results for Control:

Repeated Measures ANOVA is performed on each of the scores obtained at three/four time points. The mean and standard deviation are reported along with F-value for the within subjects (over the duration) contrast and the p-value of the test is given. Pair wise comparison of mean scores at the three/four time points is also reported along with p-value.

Sl. No	Variable	Time of observation	N	Mean	SD	F-value	p-value	Remarks
1	Knee Flexion AROM	Pre	25	17.52	1.85	1695.052	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Flexion AROM in Control
		Post	25	23.96	1.94			
		Discharge	25	33.16	2.09			
		Follow up	25	83.16	8.39			
2	Knee Flexion PROM	Pre	25	20.48	1.61	1423.628	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Flexion PROM in Control
		Post	25	27.52	1.58			
		Discharge	25	36.20	3.18			
		Follow up	25	91.12	9.36			
3	Knee Extension AROM	Pre	25	13.64	1.350	141.496	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and follow up within Knee Extension AROM in Control
		Post	25	11.24	1.26			
		Discharge	25	9.48	1.63			
		Follow up	25	7.12	1.42			
4	Knee Extension PROM	Pre	25	12.12	1.26	147.908	0.000	As p < 0.05, there is significant difference between the pre, post, discharge and
		Post	25	10.24	1.09			
		Discharge	25	13.40	1.08			
		Follow up	25	5.68	0.988			

							follow up within Knee Extension PROM in Control
5	FIM Score	Post	25	77.76	3.179	885.182	0.000	As p < 0.05, there is significant difference between the post, discharge and follow up within FIM Score in Control
		Discharge	25	85.08	2.827			
		Follow up	25	105.60	4.000			

Repeated Measures ANOVA Results for Overall:

Repeated Measures ANOVA is performed on each of the scores obtained among two groups. The mean and standard error are reported along with F-value for the within subjects (over the group) contrast and the p-value of the test is given.

Sl.no	Variable	Pair	Mean Difference	p-value
1	Knee Flexion AROM	(Pre, Post)	6.440[*]	0.000
		(Pre, Discharge)	15.640[*]	0.000
		(Pre, Follow up)	65.640[*]	0.000
		(Post, Discharge)	9.200[*]	0.000
		(Post, Follow up)	59.200[*]	0.000
		(Discharge, Follow up)	50.000[*]	0.000
2	Knee Flexion PROM	(Pre, Post)	7.040[*]	0.000
		(Pre, Discharge)	15.720[*]	0.000
		(Pre, Follow up)	70.640[*]	0.000
		(Post, Discharge)	8.680[*]	0.000
		(Post, Follow up)	63.600[*]	0.000
		(Discharge, Follow up)	54.920[*]	0.000
3	Knee Extension AROM	(Pre, Post)	-2.400[*]	0.000
		(Pre, Discharge)	-4.160[*]	0.000
		(Pre, Follow up)	-6.520[*]	0.000
		(Post, Discharge)	-1.760[*]	0.001
		(Post Follow up)	-4.120[*]	0.000
		(Discharge, Follow up)	-2.360[*]	0.000
4	Knee Extension PROM	(Pre, Post)	-1.880[*]	0.000
		(Pre, Discharge)	1.280[*]	0.003
		(Pre Follow up)	-6.440[*]	0.000
		(Post, Discharge)	3.160[*]	0.000
		(Post, Follow up)	-4.560[*]	0.000
		(Discharge Follow up)	-7.720[*]	0.000
5	FIM Score	(Post, Discharge)	7.320[*]	0.000
		(Post, Follow up)	27.840[*]	0.000
		(Discharge, Follow up)	20.520[*]	0.000

*Significant at 0.05 level

Repeated Measures ANOVA Results for Overall:

Repeated Measures ANOVA is performed on each of the scores obtained among two groups. The mean and standard error are reported along with F-value for the within subjects (over the group) contrast and the p-value of the test is given.

Sl. no	Variable	Time of observation	N	Mean	Standard Error	F-value	p-value	Remarks
1	Knee Flexion AROM	Experimental	25	44.69	0.474	61.07	0.00	As p < 0.05, there is significant difference between the two group basing on the within difference
		Control	25	39.45	0.474			
2	Knee Flexion PROM	Experimental	25	48.19	0.545	31.98	0.00	As p < 0.05, there is significant difference between the two group basing on the within difference
		Control	25	43.83	0.545			
3	Knee Extension AROM	Experimental	25	17.83	0.175	909.09	0.00	As p < 0.05, there is significant difference between the two group basing on the within difference
		Control	25	10.37	0.175			
4	Knee Extension PROM	Experimental	25	15.37	0.172	423.93	0.00	As p < 0.05, there is significant difference between the two group basing on the within difference
		Control	25	10.36	0.172			
5	FIM Score	Experimental	25	92.20	0.494	15.18	0.00	As p < 0.05, there is significant difference between the two group basing on the within difference
		Control	25	89.48	0.494			

DISCUSSION

This study shown, there is a significant improvement in ROM and functional activity. The findings of this study suggested that there is a significant between control and experimental groups. A total number of 50 subjects participated in the study, with 25 subjects participated in the subjects in the experimental group with 25 subjects in control group age 45-65 years and with mean age of were constituted the sample of study.

Quadriceps muscle hamstring muscles are the first and foremost factors for O. A Knee in subjects with T.K. R in studies performed a strong correlation was reported between the control and experimental group while weakening of muscle strength took place after O. A knee with in previous years, weakening

quadriceps muscle has been demonstrated to be one of the primary risk factor in reduction functional activity in subjects with T.K.R.

In literature increasing in strengthening of hip muscle were reported to have that there significantly increase in the functional activity and ROM Subjects with T.K.R.

The results indicate that hip muscle and quadriceps strengthening may be a viable option for post T.K.R .However addition strength training produce significantly greater results subjects receiving hip and quadriceps strengthening training increase the functional activity and ROM by FIM Scale and goniometry respectively increase functional activity in experimental group by FIM of 92.20 and increase functional activity in control group by FIM 89.48 more over the experimental group significantly increased more than the control group. Therefore, the experimental group = and Control group= 89.48.

Compare to the individual who received Hip and quadriceps strengthening produce excellent results than knee strengthening alone.

According to a study Hip impairments with O.A Knee are independent form results in gait alterations and altered knee function. (2) The comparison of a knee flexion AROM means of pre value in experimental group 17.64 and in control group 17.52. The comparison of a knee flexion AROM means of post value in experimental group 25.04 and in control group 23.96 [13].

The comparison of a knee flexion AROM means of at time of discharge value in experimental group 33.80 and in control group 33.16. The comparison of a knee flexion AROM means of

at time of follow-up value in experimental group 102.28 and in control group 83.16.

The comparison of a knee flexion AROM means of pre value in experimental group 17.64and in control group 17.52 The comparison of a knee flexion AROM means of post value in experimental group 25.05 and in control group 23.96 The comparison of a knee flexion AROM means of at time of discharge value in experimental group33.80 and in control group 33.16. The comparison of a knee flexion AROM means of at time of follow-up value in experimental group 102.28 and in control group 83.16.

The comparison of a knee flexion PROM means of pre value in experimental group 21.44and in control group 20.48 The comparison of a knee flexion PROM means of post value in experimental group 29.08 and in control group 27.52 The comparison of a knee flexion PROM means of at time of discharge value in experimental group38.12 and in control group 36.20 The comparison of a knee flexion PROM means of at time of follow-up value in experimental group 104.12 and in control group 91.12.

The comparison of a knee Extension AROM means of pre value in experimental group 9.64and in control group 7.12 The comparison of a knee extension AROM means of post value in experimental group 17.44and in control group 9.48 The comparison of a knee extension AROM means of at time of discharge value in experimental group20.20 and in control group 11.24. The comparison of a knee extension AROM means of at time of follow-up value in experimental group 24.04 and in control group 13.64

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The comparison of FIM means of post value in experimental group was 109.24 and in control group 77.76. The comparison of FIM means of at time of discharge value in experimental group was 88.32 and in control group 85.08.

The comparison of FIM means of at time of follow-up value in experimental group 79.04 and in control group 105.60The comparison of a knee flexion AROM means of pre value in experimental group 44.69and in control group 39.45. The comparison of a knee flexion PROM means of value in experimental group 4819 and in control group 43.83. The comparison of a knee Extension AROM means of value in experimental group 17.83and in control group 10.37. The comparison of a knee Extension PROM means of value in experimental group15.37and in control group 10.36. The comparison of FIM score means of value in experimental group 92.20 and in control group 89.48.

A study concluded that hip influence the osteoarthritisof knee according to this study. Muscle-activation level is another area of concern regarding the interdependence of the hip and knee. Because subjects with knee OA have demonstrated increased hamstring-muscle activation while executing activities of daily living,64 exercise interventions focusing on not only quadriceps strengthening but also increased quadriceps/hamstring muscle balance have been recommended[14].

This recommendation is made primarily because altered muscle activation might interfere with the normal load distribution in the knee in these subjects. Hip and knee strength and power have been unequivocally correlated with gait speed, stair climbing, and transfers. These tasks all require weight bearing movements that simultaneously involve the hip and knee. Adequate strength and neuromuscular coordination from many lower extremity muscles, especially the quadriceps and hamstrings, are therefore needed to facilitate this type of function. In a study performed with 113 knee O. A Patients, A study performed home exercise program including 6-week quadriceps strengthening exercises and determined a significant decrease in pain and improvement physical function [15].

Another study concluded that in patients with knee O. A, articular damage may reduce quadriceps motor neuron excitability, which decreases voluntary quadriceps activation thus contributing to quadriceps weakness, and diminish proprioceptive acuity. The main aims of in this study physiotherapy rehabilitation following knee arthroplasty were to reduce pain, to maintain /improve muscle strength, to maximize functional ability [16].

in this study significantly deference was observed between the experimental and control group on outcome measures. At six week fallow up after total knee replacement surgery. Where the previous studies used typical joint ROM and muscle strengthening exercise following TKR to our knowledge this

study is thought to be the hip muscle strength also be effect the knee ROM and functional activity on the postoperative T.K.R subjects[17].

CONCLUSION

This study supports in post op T.KR Subjects hip muscles also will help the to improve knee ROM and functional activity along with the knee muscles in post op T.K.R subjects. Individually both experimental and control groups were found to be effective in improving knee ROM and Functional activity. However, when both groups were compared, there was a significance of experimental group with greater mean than control group.

Implications of future research: Further studies can be focused on evaluating the strength and range of motion by using Isokinetic analyser. Further studies can be focused on comparing the male and female population.

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