



Effectiveness Of Iyengar Yoga Therapy V/S Conventional Physiotherapy On Pain And Functional Activities In Knee Osteoarthritis Patients

An Experimental Study

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Abstract: Osteoarthritis of knee also known as degenerative joint disease. Osteoarthritis of knee is a condition that occurs when the cartilage in the knee joint breaks down, causing the bones to rub together. This friction can lead to pain, stiffness and swelling in the knee. The American College of Rheumatology (ACR) Guidelines for the medical management of osteoarthritis emphasize the use of nonpharmacologic interventions including exercise. In this study 30 osteoarthritis knee patients within the age group of >40 years were selected and were divided into two groups (Group A for Iyengar yoga therapy and Group B for Conventional physiotherapy). The study aims to analyze the effect of Iyengar yoga therapy v/s conventional physiotherapy on pain and functional activities in OA knee patients.

Aim: To study the effectiveness of Iyengar yoga therapy v/s conventional physiotherapy on pain and functional activities in OA knee patients.

Methodology: An Experimental study was done in which 30 osteoarthritis knee patients with the age group >40 years, diagnosed in at least one knee for 3 months before study entry using purposive sampling were divided into group A (Iyengar yoga) and group B (Conventional physiotherapy). Group A underwent Iyengar yoga training for 6 weeks on alternate days while group B underwent Conventional physiotherapy training for 6 weeks on alternate days. The test used for pain was "Numeric Pain Rating Scale" (NPRS) and functional activities assessed by "Western Ontario and McMaster Universities Osteoarthritis Index" (WOMAC). The pre and post results of pain and functional activities were recorded for both the groups. The data was collected, statistical analysis as done and resulted were tabulated.

Data Analysis and Result: The data was analyzed by parametric and non parametric test. The normality of the distribution of data as assessed by Shapiro-wilk test. p value of Group A (Iyengar yoga therapy) on pre and post NPRS and WOMAC scale is <0.0001 which is calculated by Signed Rank test because of non-normal distribution. It is conclude that there is a significant difference between the group. p value of Group B (Conventional physiotherapy) on pre and post NPRS scale is <0.0001 which is calculated by Signed Rank test because of non-normal distribution. It is conclude that there is a significant difference between the group. p value of Group B (Conventional physiotherapy) on pre and post WOMAC scale is <0.0001 which

is calculated by paired t test because of normal distribution. It is conclude that there is a significant difference between the group. p value of Group A (Iyengar yoga therapy) v/s Group B (Conventional physiotherapy) on post NPRS scale is 0.3704 which is calculated by Mann-Whitney test because of non-normal distribution. As the p value > 0.05 it is conclude that there is not a significant difference between this two groups. p value of Group A (Iyengar yoga therapy) v/s Group B (Conventional physiotherapy) on post WOMAC scale is 0.1033 which is calculated by Unpaired t test because of normal distribution. As the p value > 0.05 it is conclude that there is not a significant difference between this two groups.

Conclusion: This study concluded that the physiotherapy and iyengar yoga therapy both are effective on pain and functional activities in knee osteoarthritis patients. So any of the technique according to their interest they can take it.

IndexTerm– Osteoarthritis of knee, Iyengar yoga therapy, Conventional physiotherapy, Pain, Functional activities,

I. Introduction:

Osteoarthritis is a top cause of disability in older people and incidence of the disease increases with the age.^[1]

Knee osteoarthritis (OA) is a major public health issue because it causes chronic pain, reduces physical function and diminishes quality of life.^[13] The incidence of OA knee increases with age.^[2] Overall yearly prevalence of OA knee was found 3.62 per hundred. During four year of the study period from 2011 to 2014, prevalence rate of OA knee shows an increasing trend which raised from 3.31 to 3.91 per hundred. Females were 63%, whereas males were 37%.^[6]

Osteoarthritis of knee is a degenerative disease that worsens over time, often resulting in chronic pain and stiffness which affects on ADLs of the individual and eventually on his lifestyle.

The clinical manifestations are joint pain, stiffness, decreased range of joint movement, muscle weakness.^[1]

These symptoms significantly restrict the individuals ability to get up from chair, walk, or climb stairs.^[1]

The lack of movement also typically means of less exercise, which raises the risk for weight gain, high blood pressure, heart diseases. OA knee patient might wake during the night from the pain or find it harder to fall asleep. And lack of sleep can make pain seems worse. This raises the risk for depression.

The progression of arthritis may lead to requiring a total joint replacement.

In relation to severity, OA of the knee can be classified according to the Kellgren – Lawrence scale, which consist of five degrees of OA : 0 = No OA, 1 = Doubtful, 2 = Minimal, 3 = Moderate, 4 = Severe.^[1]

Physiotherapy is a non-pharmacological intervention for osteoarthritis of the knee that is recommended by the American College of Rheumatology and the European League against Rheumatism.^[1] A systematic review has shown that exercise reduces pain and improves function in patients with OA of the knee.^[1]

Iyengar yoga is based on the teaching of the yoga master, B.K.S. Iyengar (1976) who has taught yoga for 70 years and has applied yoga to many health problems.^[4]

The use of Iyengar approach to hatha yoga emphasizes strength, flexibility and relaxation with particular attention to alignment of body structures.^[3]

It is accessible to all is through the use of props that help the practitioner to achieve appropriate and precise positioning. It emphasizes the importance of the proper sequence of postures as important to their successful completion.^[3]

The study conducted by Sharon L Kolasinski on topic Iyengar yoga for treating symptoms of osteoarthritis of the knees is assessed the feasibility and safety of using yoga as a treatment for the symptoms of osteoarthritis of the knee.^[3]

II.METHODOLOGY:

The study was conducted on 30 osteoarthritis knee patients with diagnosed in at least one knee for 3 months before study entry, age >40 years old in PCMC. Ethical committee clearance was obtained. Written consent was taken from the subjects who fulfill the inclusion and exclusion criteria. Testing procedure was explained and demonstrated to the subjects.

These patients are randomly allocated into two groups A and B by chit method. Group A (Iyengar Yoga Therapy Group) Group B (Physiotherapy Group). NPRS and WOMAC scale were taken from every subject from both the groups before the study. Group A performed Iyengar yoga and group B performed Conventional physiotherapy exercises for 6 weeks as a 3 days/week. Pain and functional activities were

evaluated by NPRS and WOMAC scale were taken again after completing the 6 week protocol and the readings were compared by parametric and non-parametric tests.

Inclusion criteria:-

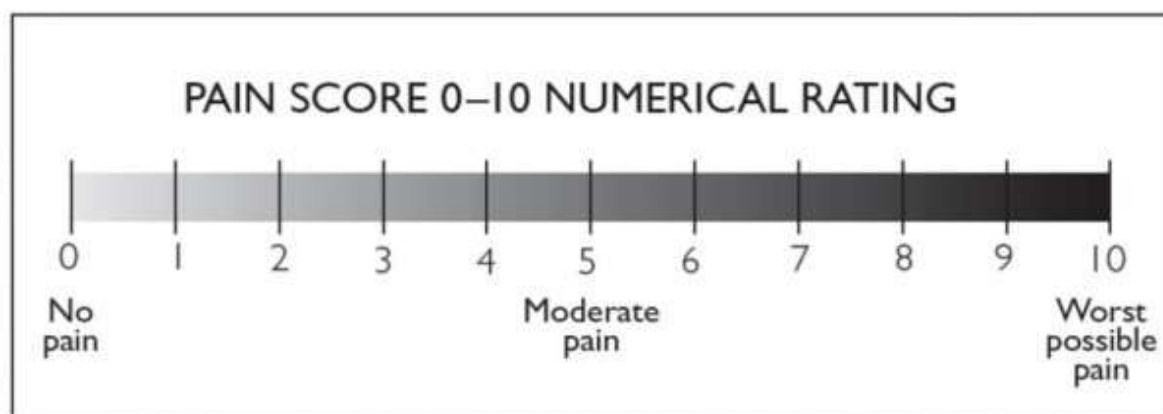
- Age is >40 with symptomatic osteoarthritis^[2] diagnosed in at least one knee for 3 months before study entry and not currently participating in an exercise program.
- Patients who had grade 1 or grade 2 of OA knee acc.to the Kellgren Lawrence scale.
- Males and females
- They have at least two of the following:
Stiffness, crepitus, bony tenderness, swelling.^[3]
- A patient who has an X-ray report.^{[2][8]}
- NPRS scale should be between 0-5 before the study.

Exclusion criteria:-

- Symptoms of locking or instability^[3]
- A corticosteroid injection in the symptomatic knee^[3]
- A hyaluronic acid injection in the symptomatic knee^[3]
- History of knee surgery within last 2 years or any joint replacement at any point, prior diagnosis of inflammatory arthritis.^[3]

Outcome measure:-

- Numerical Pain Rating Scale (NPRS scale)
Inter rater reliability – 0.95
Intra rater reliability – 0.95
- Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC scale)
Inter rater reliability with Cronbach's alpha coefficients of 0.83, 0.87, 0.96.
Intraclass correlation coefficients of 0.74, 0.58, 0.92.

NPRS Scale:-**WOMAC Scale:-**

Severity, on average, during the last 48 hours, of:

Pain

	None	Slight	Moderate	Severe	Extreme
Pain – Walking	☐	☐	☐	☐	☐
Pain – Stair climbing	☐	☐	☐	☐	☐
Pain – Nocturnal	☐	☐	☐	☐	☐
Pain – Rest	☐	☐	☐	☐	☐
Pain – Weightbearing	☐	☐	☐	☐	☐

Stiffness:

Morning Stiffness	☐	☐	☐	☐	☐
Stiffness occurring during the day	☐	☐	☐	☐	☐

Level of difficulty performing the following functions, on average, during the last 48 hours:

	None	Slight	Moderate	Severe	Extreme
Descending stairs	☐	☐	☐	☐	☐
Ascending stairs	☐	☐	☐	☐	☐
Rising from sitting	☐	☐	☐	☐	☐
Standing	☐	☐	☐	☐	☐
Bending to the floor	☐	☐	☐	☐	☐
Walking on flat	☐	☐	☐	☐	☐
Getting in/out of a car	☐	☐	☐	☐	☐
Going shopping	☐	☐	☐	☐	☐
Putting on socks	☐	☐	☐	☐	☐
Rising from bed	☐	☐	☐	☐	☐
Taking of socks	☐	☐	☐	☐	☐
Lying in bed	☐	☐	☐	☐	☐
Getting in/out of bath	☐	☐	☐	☐	☐
Sitting	☐	☐	☐	☐	☐
Getting on/off toilet	☐	☐	☐	☐	☐
Performing heavy domestic duties	☐	☐	☐	☐	☐
Performing light domestic duties	☐	☐	☐	☐	☐

The WOMAC parameters are:

0 – none, 1 – slight, 2 – moderate, 3 – severe, 4 – extreme.

The index is out of a total of 96 possible points, with 0 being the best and 96 being the worst

Procedure:-

These patients are randomly allocated into two groups A and B by chit method. Group A (Iyengar Yoga Therapy Group) Group B (Physiotherapy Group). NPRS and WOMAC scale were taken from every subject from both the groups before the study. Group A performed Iyengar yoga and group B performed Conventional physiotherapy exercises for 6 weeks as a 3 days/week. Pain and functional activities were evaluated by NPRS and WOMAC scale were taken again after completing the 6 week protocol and the readings were compared by parametric and non-parametric tests.

PROTOCOL:-**IYENGAR YOGA**

- Week 1 – Week 4

- Asanas

- | | |
|-------------------------------------|----------------------------|
| 1. Supta Padangushtasana | 10 rep. with 10 sec. hold |
| 2. Dandasana | 10 rep. with 10 sec. hold |
| 3. Paschimottanasana | 10 rep. with 10 sec. hold |
| 4. Adhomukh shwanasana | 10 sec. hold (3 times) |
| 5. Utthita Trikonasana | 10 sec. hold FES (5 times) |
| 6. Tadasana Urdhva Baddanguliyasana | 10 rep. with 10 sec. hold |
| 7. Bharadvajasana on chair | 10 sec. hold FES (5 times) |
| 8. Savasana | 5 min. |

- Week 5 – Week 6

- Asanas

- | | |
|-------------------------------------|----------------------------|
| 1. Supta Padangushtasana | 10 rep. with 10 sec. hold |
| 2. Dandasana | 10 rep. with 10 sec. hold |
| 3. Paschimottanasana | 10 rep. with 10 sec. hold |
| 4. Adhomukh shwanasana | 10 sec. hold (3 times) |
| 5. Utthit Trikonasana | 10 sec. hold FES (5 times) |
| 6. Tadasana Urdhva Baddanguliyasana | 10 sec. with 10 sec. hold |
| 7. Bharadvajasana on chair | 10 sec. hold FES (5 times) |
| 8. Utthit parsvakonasana | 10 sec hold FES (5 times) |
| 9. Janu Sirsasana | 10 sec hold FES (5 times) |
| 10. Baddhakonasana | 10 rep. with 10 sec. hold |
| 11. Savasana | 5 min. |



PHYSIOTHERAPY EXERCISES

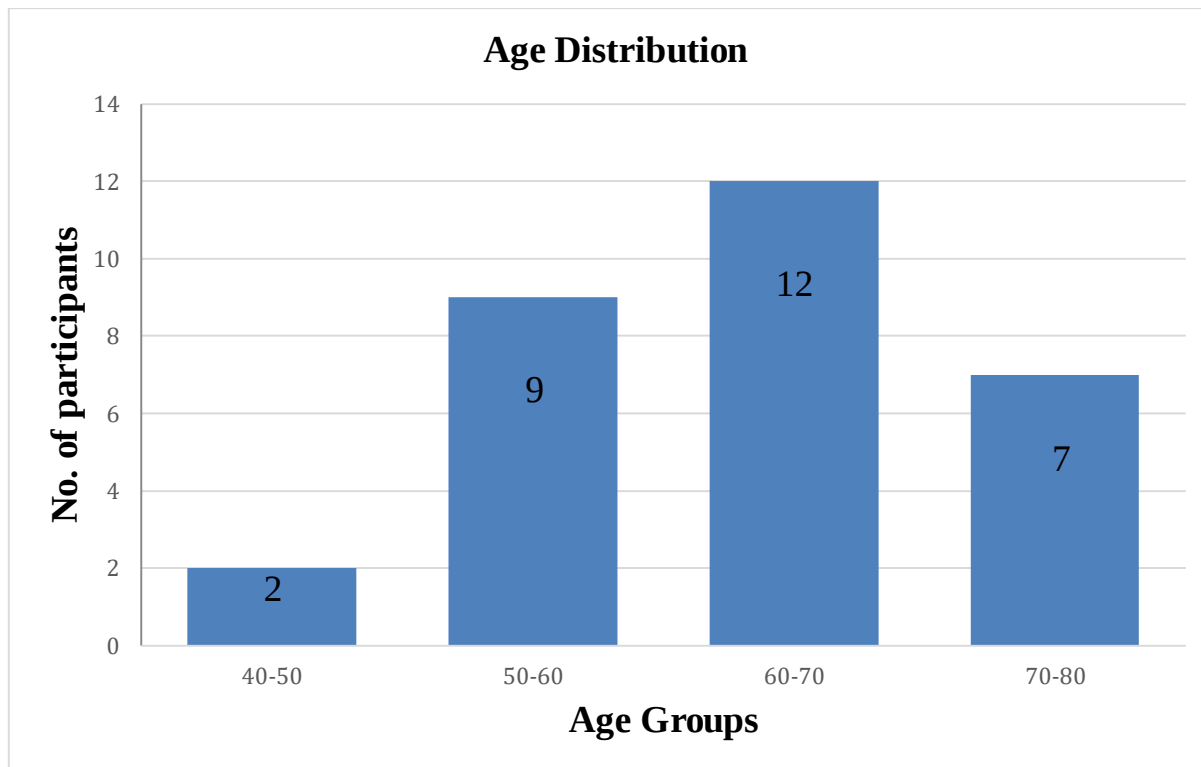
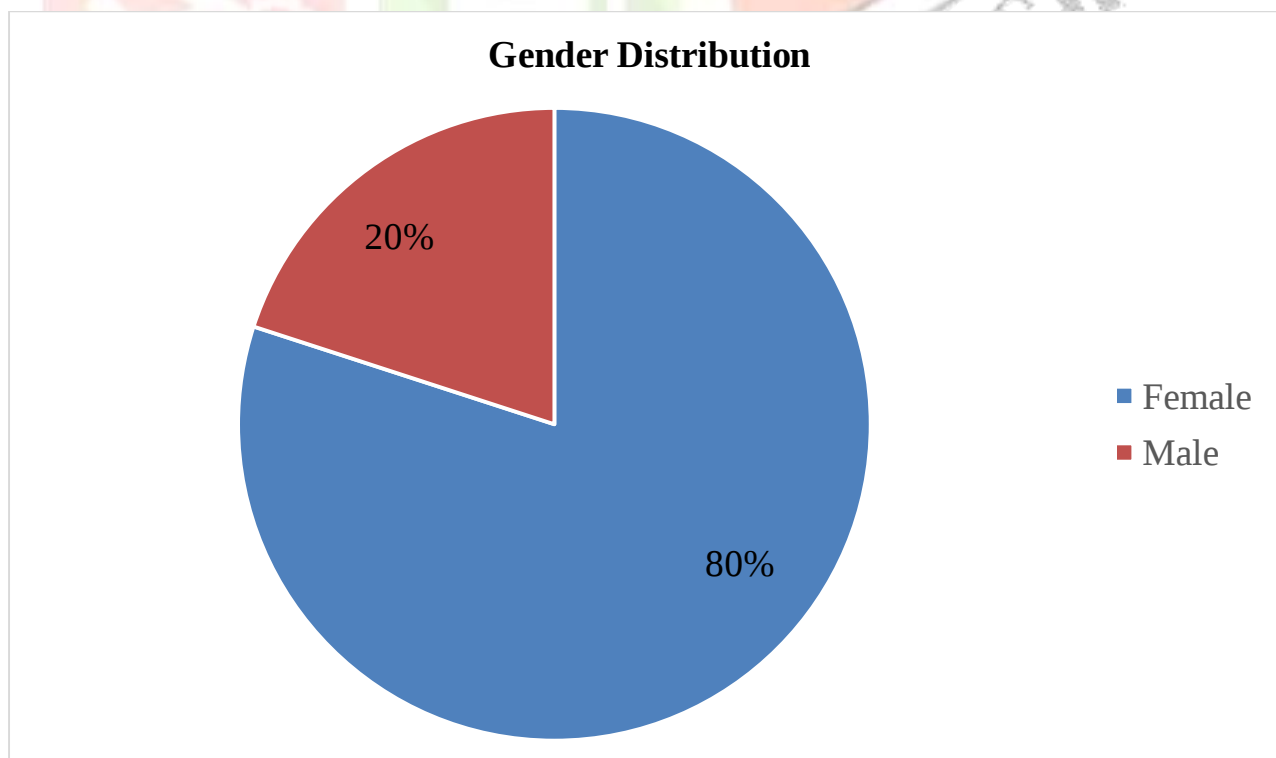
- Week 1 – Week 4

- | | |
|-------------------|-----------------------------------|
| 1. Static Quads | 10 rep. with 10 sec hold |
| 2. Static Hams | 10 rep. with 10 sec hold |
| 3. SLR in 3 plane | 10 rep. with 10 sec hold |
| 4. Heel slide | 10 times from each side (1 set) |
| 5. Dynamic Quads | 10 times from each side (1 set) |
| 6. Marching | 10 times from each side (1 set) |
| 7. Lunges | 10 times from each side (1 set) |
| 8. Cool down | 5 minutes |

- Week 5 – Week 6

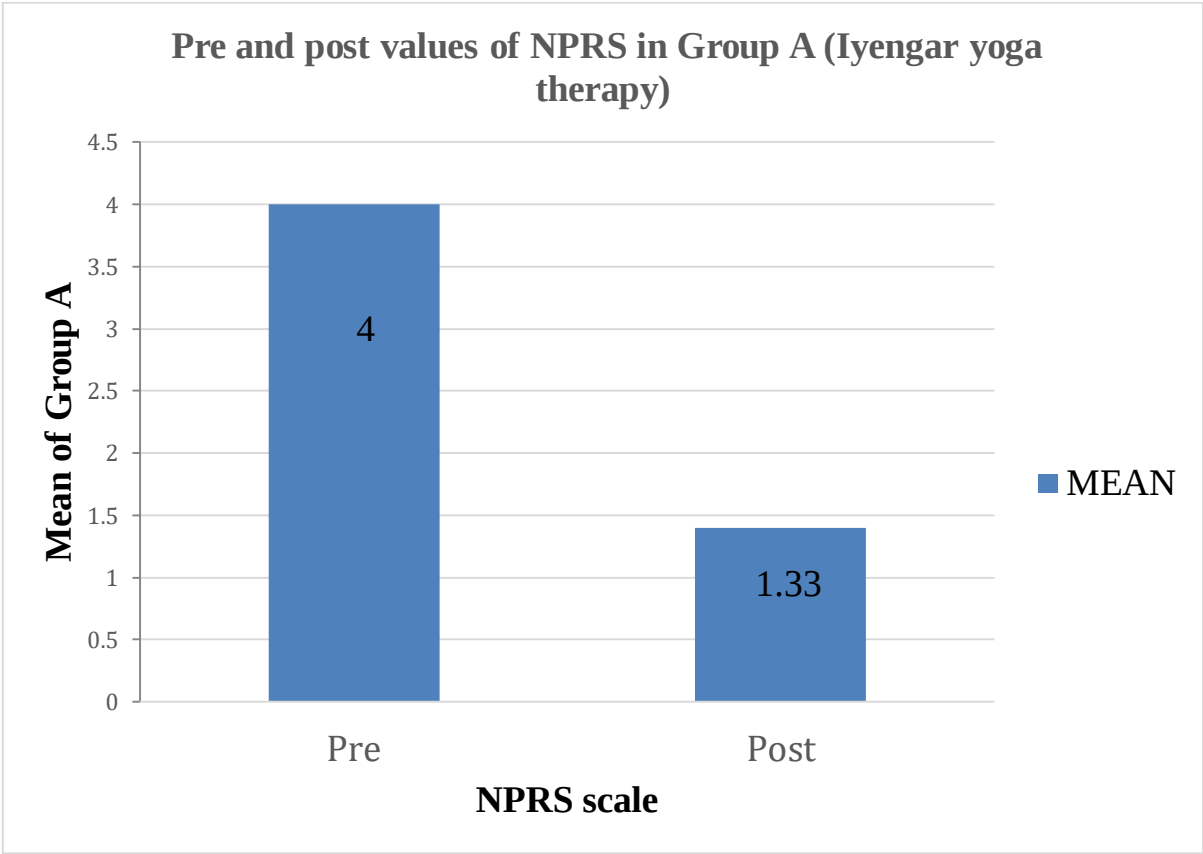
- | | |
|--------------------|-----------------------------------|
| 1. Static Quads | 10 rep. with 10 sec hold |
| 2. Static Hams | 10 rep. with 10 sec hold |
| 3. SLR in 3 plane | 10 rep. with 10 sec hold |
| 4. Heel slide | 10 times from each side (1 set) |
| 5. Dynamic Quads | 10 times from each side (1 set) |
| 6. Marching | 10 times from each side (1 set) |
| 7. Lunges | 10 times from each side (1 set) |
| 8. Squatting | 10 times (1 set) |
| 9. Bicycling | 10 Min |
| 10. Stair climbing | 5 Min |
| 11. Cool down | 5 min. |



Statistical analysis and Result:**Age distribution:****Gender distribution:**

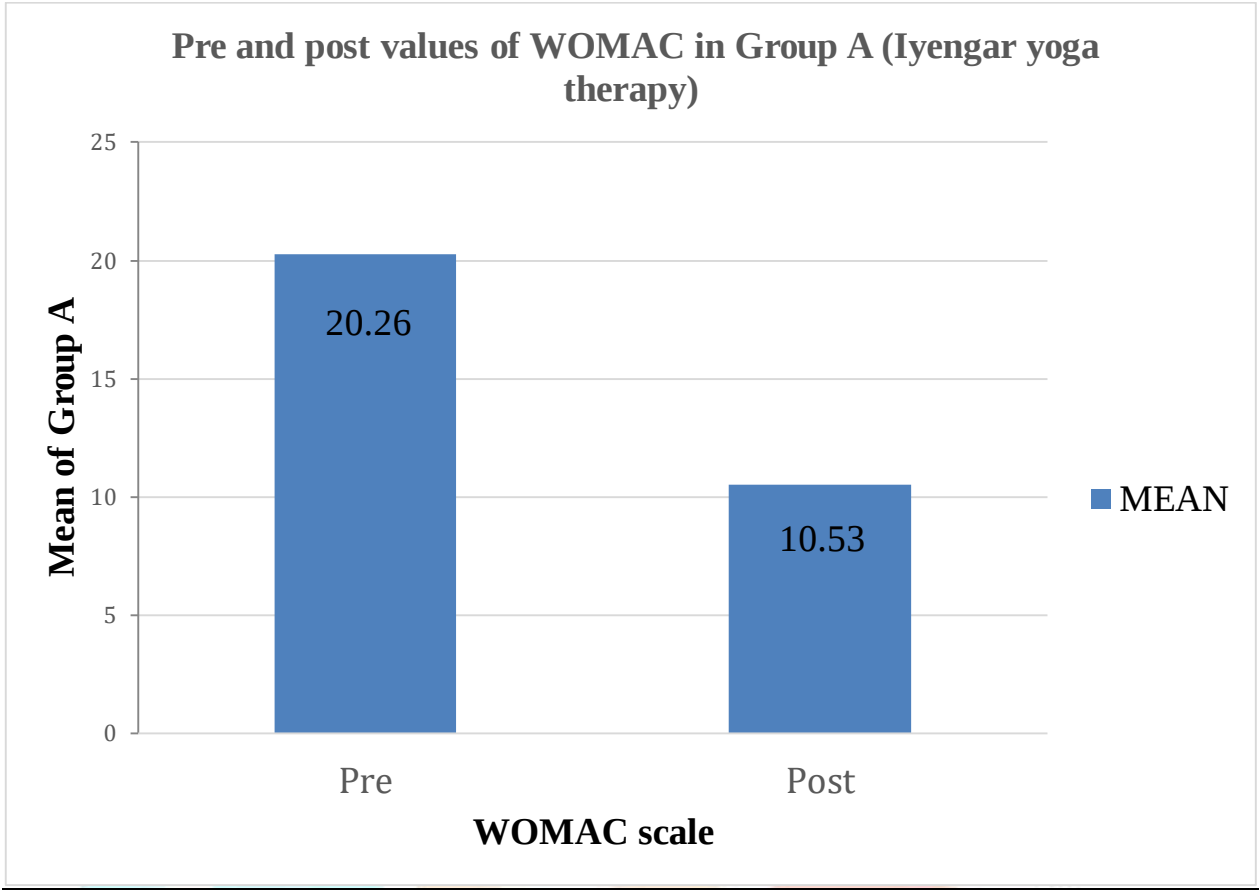
Normal distribution tested by Shaprio-Wilk test

Pre values of NPRS in Iyengar yoga therapy	Post value of NPRS in Iyengar yoga therapy
p value = 0.004	p value = 0.006
Non-normal distribution	Non-normal distribution
Pre values of WOMAC in Iyengar yoga therapy	Post values of WOMAC in Iyengar yoga therapy
p value = 0.022	p value = 0.089
Non-normal distribution	Normal distribution
Pre value of NPRS in Conventional physiotherapy	Post value of NPRS in Conventional physiotherapy
p value = <0.0001	p value = 0.05
Non-normal distribution	Normal distribution
Pre value of WOMAC in Conventional physiotherapy	Post value of WOMAC in Conventional physiotherapy
p value = 0.77	p value = 0.26
Normal distribution	Normal distribution



Pre and post values of NPRS in Group A (Iyengar yoga therapy) by Wilcoxon signed rank test

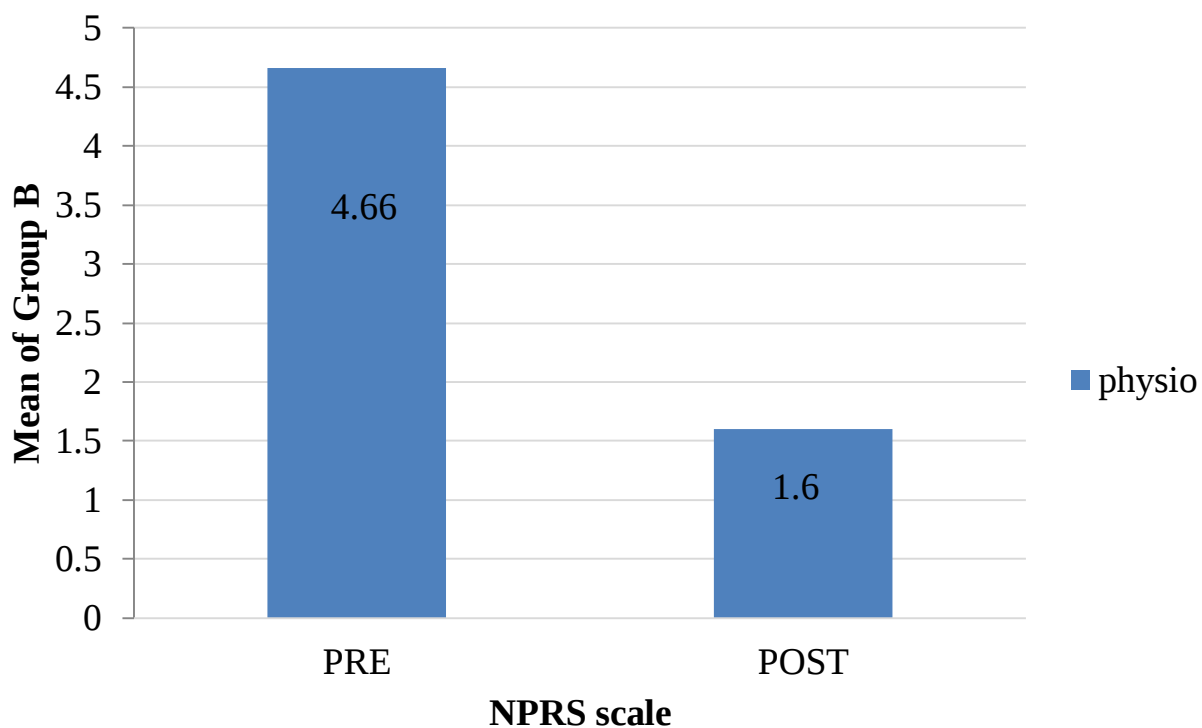
	MEAN	SD	t-value	p value
Pre	4	0.845	21.166	<0.0001 Significant
Post	1.33	0.723		
Mean Difference	2.6	0.487		



Pre and post values of WOMAC in Group A (Iyengar yoga therapy) by Wilcoxon signed rank test

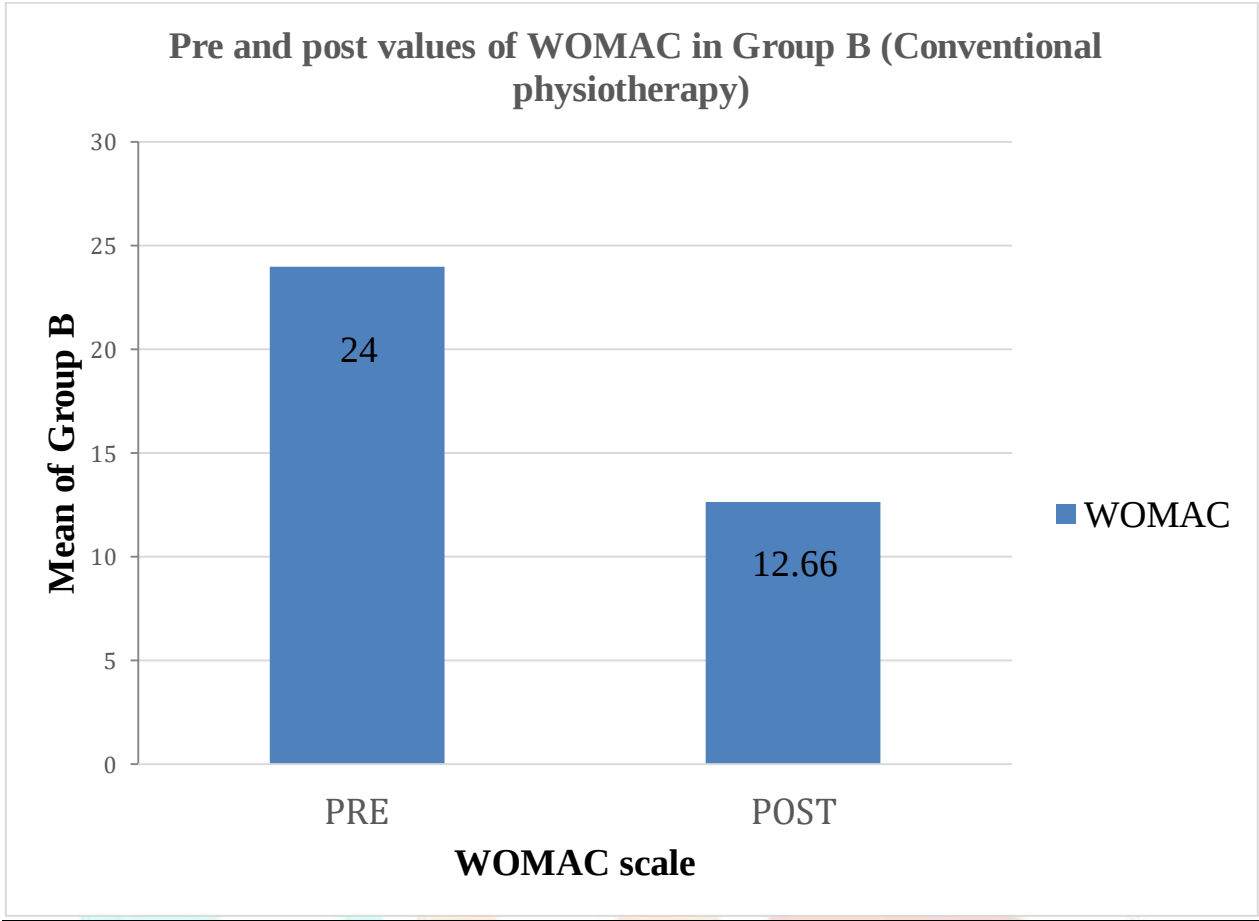
	MEAN	SD	t-value	p value
Pre	20.266	2.865	22.605	<0.0001 Significant
Post	10.533	3.502		
Mean Difference	9.733	1.667		

Pre and post values of NPRS in Group B (Conventional physiotherapy)



Pre and post values of NPRS in Group B (Conventional physiotherapy) by Wilcoxon signed rank test

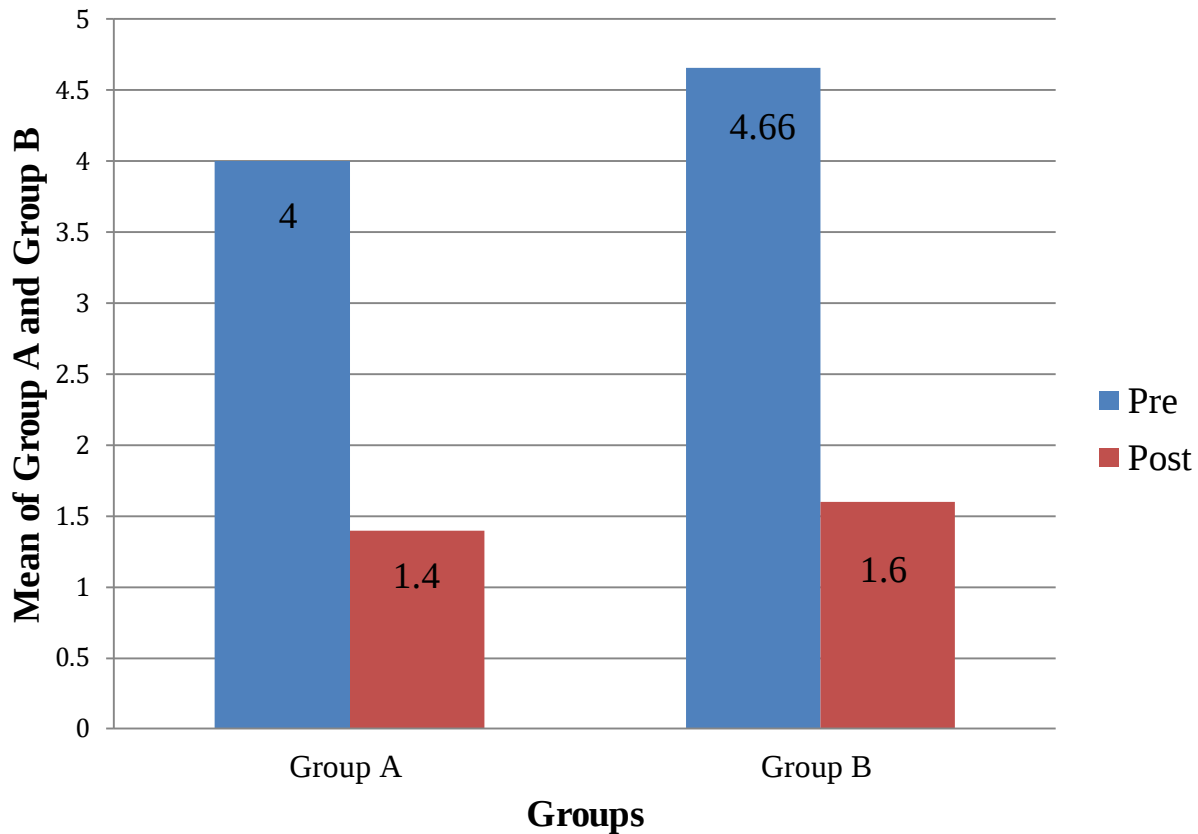
	MEAN	SD	t-value	p value
Pre	4.66	0.617	16.877	<0.0001 Significant
Post	1.6	0.8280		
Mean Difference	3.067	0.703		



Pre and post values of WOMAC in Group B (Conventional physiotherapy) by Paired t test

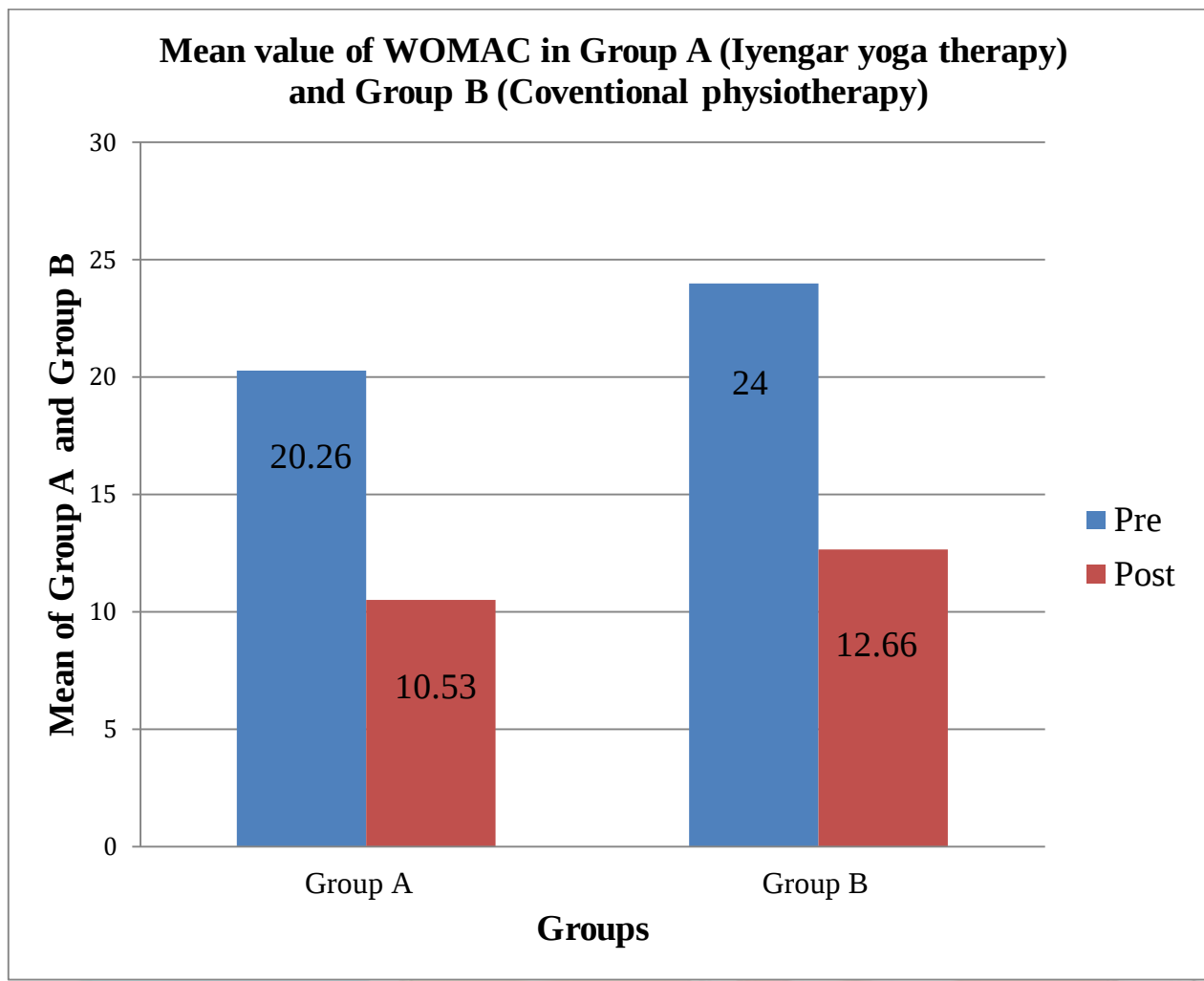
	MEAN	SD	t-value	p value
Pre	24	5.567	10.318	<0.0001 Significant
Post	12.66	3.436		
Mean Difference	11.333	4.253		

Mean values of NPRS in Group A (Iyengar yoga therapy) and Group B (Conventional physiotherapy)

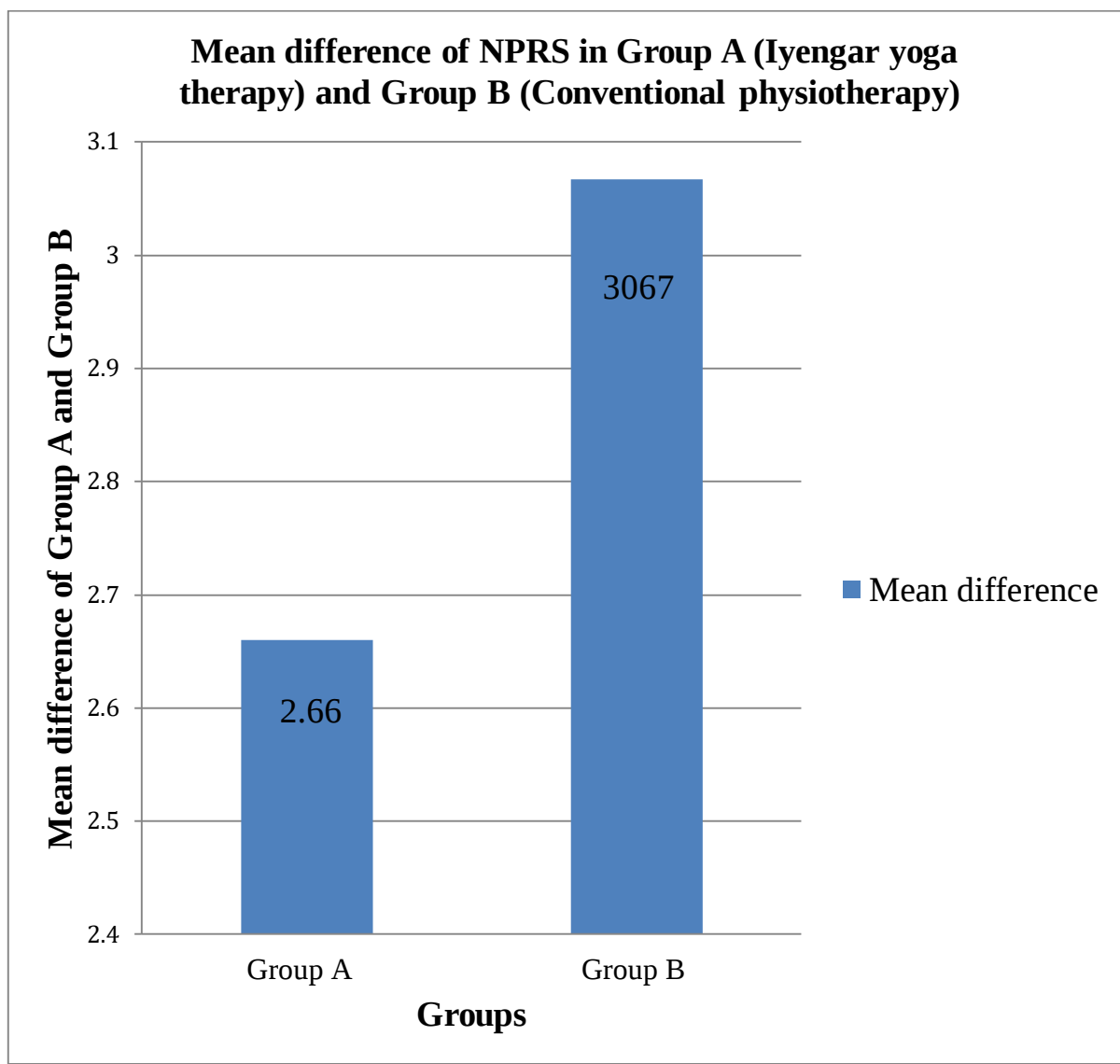


Mean values of NPRS in Group A (Iyengar yoga therapy) and Group B (Conventional physiotherapy)

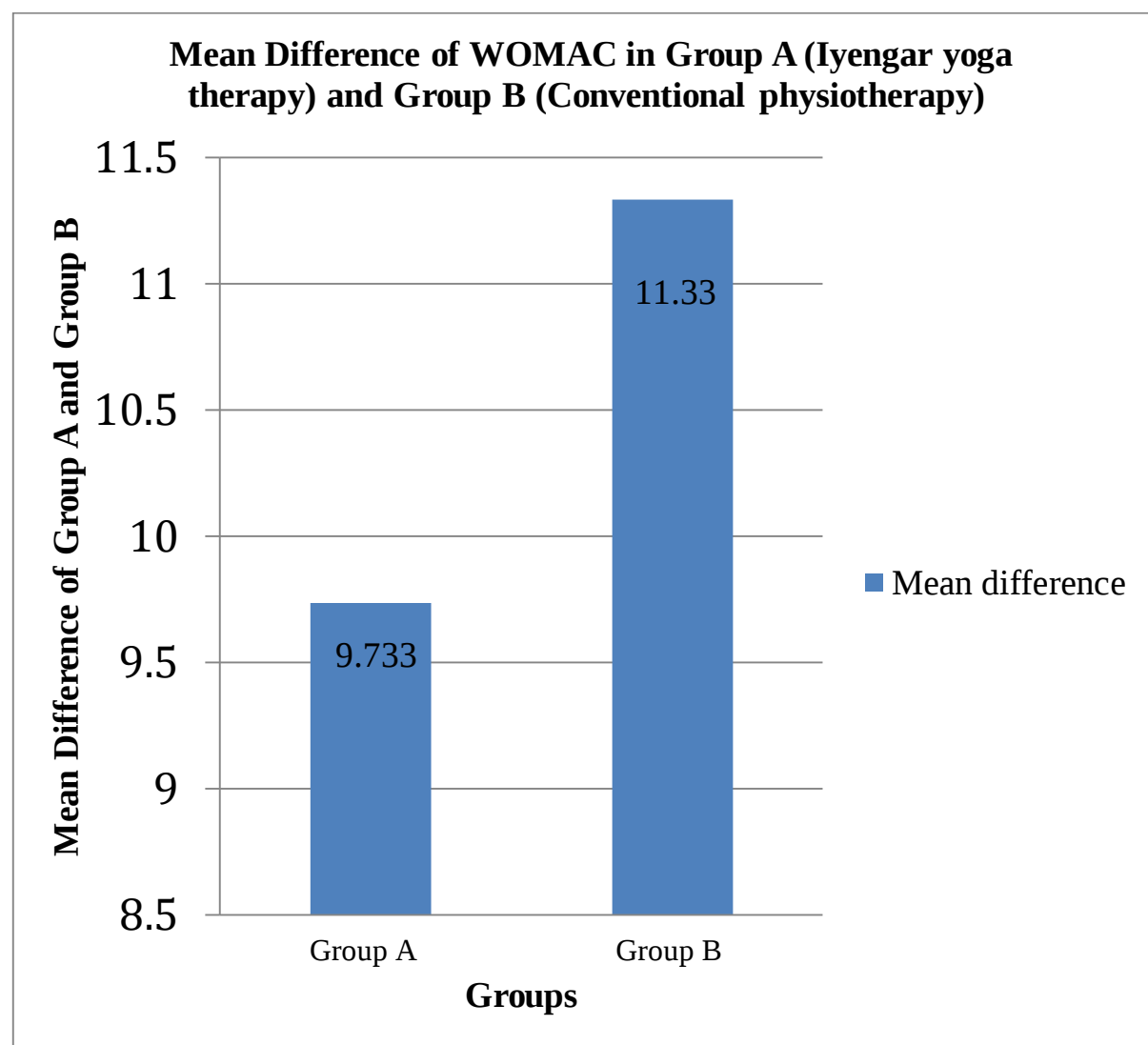
	Group A	Group B
Pre	4	4.66
Post	1.4	1.6



Mean values of WOMAC in Group A (Iyengar yoga therapy) and Group B (Conventional physiotherapy)		
	Group A	Group B
Pre	20.266	24
Post	10.533	12.66



Mean difference of NPRS in Group A (Iyengar yoga therapy) and Group B (Conventional physiotherapy)		
	Group A	Group B
Mean difference	2.66	3.067



Mean difference of WOMAC in Group A (Iyengar yoga therapy) and Group B (Conventional physiotherapy)

	Group A	Group B
Mean difference	9.733	11.333

Group A and Group B on post NPRS scale (Mann-Whitney test)

Group A	MEAN	SD	t-value	p value
Pre	4	0.845	21.166	0.3704 Not significant
Post	1.33	0.723		
Mean Difference	2.6	0.487		
Group B	MEAN	SD	t-value	
Pre	4.66	0.617	16.877	
Post	1.6	0.8280		
Mean Difference	3.067	0.703		

Group A and Group B on post WOMAC scale (Unpaired t test)

Group A	MEAN	SD	t-value	p value
Pre	20.266	2.865	22.605	0.1033 Not significant
Post	10.533	3.502		
Mean Difference	9.733	1.667		
Group B	MEAN	SD	t-value	
Pre	24	5.567	10.318	
Post	12.66	3.436		
Mean Difference	11.333	4.253		

RESULT:- In this study 30 patients were participated out of which 24 were female and 6 were male. 2 patients were between age group of 40-50 years, 9 patients were between age group of 51-60 years, 12 patients were between age group of 61-70 years and 7 patients were between age group of 71-80 years.

After conducting this study, reduction in pain and improvement in functional activities was noticed using NPRS and WOMAC scale.

Data analysis was done using statistical software GraphPad InStat 3.1. The normality of data was tested using Shapiro-Wilk test. It indicates that the Pre-test and post-test NPRS and WOMAC score in post WOMAC scale in Group A (Iyengar yoga therapy), post NPRS scale in Group B (Conventional physiotherapy), pre WOMAC scale in Group B (Conventional physiotherapy) and post WOMAC scale in Group B (Conventional physiotherapy) were normally distributed and in pre NPRS scale in Group A (Iyengar yoga therapy), post NPRS scale in Group A (Iyengar yoga therapy), pre WOMAC scale in Group A (Iyengar yoga therapy), pre NPRS scale in Group B (Conventional physiotherapy) were non-normally distributed.

p value of Group A (Iyengar yoga therapy) on pre and post NPRS and WOMAC scale is <0.0001 which is calculated by Signed Rank test because of non-normal distribution. It is concluded that there is a significant difference between the group.

p value of Group B (Conventional physiotherapy) on pre and post NPRS scale is <0.0001 which is calculated by Signed Rank test because of non-normal distribution. It is concluded that there is a significant difference between the group.

p value of Group B (Conventional physiotherapy) on pre and post WOMAC scale is <0.0001 which is calculated by paired t test because of normal distribution. It is concluded that there is a significant difference between the group.

p value of Group A (Iyengar yoga therapy) v/s Group B (Conventional physiotherapy) on post NPRS scale is 0.3704 which is calculated by Mann-Whitney test because of non-normal distribution. As the p value > 0.05 it is concluded that there is not a significant difference between these two groups.

p value of Group A (Iyengar yoga therapy) v/s Group B (Conventional physiotherapy) on post WOMAC scale is 0.1033 which is calculated by Unpaired t test because of normal distribution. As the p value > 0.05 it is concluded that there is not a significant difference between these two groups. In this study, 30 players participated among which 21 were male and 9 were female. After conducting the study the experimental group of players showed improvement in eye hand coordination and footwork skills. The normality of the distribution of data as assessed by Shapiro-wilk test. As the p value as <0.05 the data for both the group states to be normally distributed.

According to the paired t test the p value for eye hand coordination is <0.05 ($p=0.0042$) that interprets that there is a significant difference in the experimental group. According to paired t test the p value for footwork skills is <0.05 (0.00014) that interprets that there is significant difference in experimental group.

Unpaired t test for eye hand coordination depicts a p value 0.019 that interprets that there is significant difference in experimental group of players than that of the control group. Unpaired t test for footwork skills depicts p value 0.0001 that interprets that there is significant difference in experimental group of players than that of control group.

IV.DISCUSSION:

This study aimed to study the effect of Iyengar yoga therapy v/s Conventional physiotherapy on pain and functional activities in knee osteoarthritis patients. The result of this study showed significant improvement on pain and functional activities in knee osteoarthritis patients.

Physiotherapy tends to improve functional activities and reduces pain in knee osteoarthritis patients. Physiotherapy focuses on training the body to perform movements that are natural and essential for everyday activities. The goal of physiotherapy is to reduce pain and increase the flexibility, range of motion, strength, balance and endurance to improve overall functional mobility and enables the individual to carry out their daily tasks more efficiently and with reduced risk of injury. Physiotherapy will recommend specific sets of exercises to assist to improve functional mobility.

In a study conducted by Nilza Aparecida de Almeida Carvalho, (2010) on topic Manual for guided home exercises for osteoarthritis of the knee and used printed manual written in simple language that contained photographs and guidance. It was noticed that use of guidance manual for physical exercises, along with monthly reassessment by a physiotherapist enabled patients with OA of the knees to achieve a significant improvement in pain, ROM, knee flexion, muscle strength and functional capacity.

Iyengar yoga therapy tends to improve functional activities and reduces pain in knee osteoarthritis patients. Iyengar yoga encourages the use of props to assist practitioner within asanas without putting them at risk of injury. Iyengar yoga focuses on 3 aspects : Alignment which help to achieve balance between

body, mind and breath. Sequencing which enables a safe and structured progression of the poses and timing which helps to achieve stability in a pose, its then possible to safely intensify the depth of the posture. This helps to improve strength and flexibility, posture.

In a study conducted by Sharon L Kolasinski (2005) on topic Iyengar yoga for treating symptoms of osteoarthritis of the knees. It was noticed that yoga provides safe and feasible exercise option for previously yoga-naïve, obese patients over >50 years of age and offers potential reductions in pain and disability caused by knee OA.

Both therapies are drug free treatment and doesn't have any side effects hence both are important components of recovering from any injury. They helps to relieve pain and help to strengthen weakened muscles. They help to restore the functions and return to the activity and hence promote independently maintained healthy physical lifestyle.

The study suggest that there is no significant difference between Group A (Iyengar yoga therapy) and Group B (Conventional physiotherapy) on NPRS and WOMAC scale. Physiotherapy and Iyengar yoga therapy both are equally effective in reducing pain and improving functional activities in knee osteoarthritis patients.

V.CONCLUSION:

This study concluded that the physiotherapy and iyengar yoga therapy both are effective on pain and functional activities in knee osteoarthritis patients.

So any of the technique according to their interest they can take it.

VI. LIMITATION OF THE STUDY:

Balance was not evaluated in participants before the study entry.

VII.FUTURE SCOPE OF STUDY:

This study can be done on a larger population size. The study can be undertaken for longer duration of weeks so that long term effects of the physiotherapy and iyengar yoga therapy can be measured.

This study can be done in the population who have grade 3 to grade 4 (moderate to severe) according to Kellgren-Lawrence scale.

This study can be done by using other forms of exercises.

This study can be done in the population who have other musculoskeletal condition.

IX.ACKNOWLEDGEMENT:

I express my deep sense of gratitude to my project guide Dr. Shweta Pachpute, professor and HOD of Musculoskeletal Physiotherapy department at LSFPEF's College of Physiotherapy, for her guidance, precious time and contributions made during the course of the study. I express my sincere thanks to the badminton academy and all the subjects who participated and gave their full cooperation for the study.

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