



Effect Of Theraband Assisted Dynamic Stretching Versus Theraband Assisted Static Stretching On Hamstring Flexibility In Physiotherapy Students Using Sit And Reach Test: A Comparative Study.

¹ Dr. Dhanashree P. Shinde (PT), ² Nikita Subhash Karanjekar

¹ Associate Professor, ² Intern,

¹ Department of Cardiovascular and respiratory Physiotherapy,

¹ TMV's Jayantrao Tilak College of Physiotherapy, Pune, India.

Abstract : Hamstring flexibility is very important for keeping the lower legs working well, avoiding tight muscles, and lowering the chance of injuries, especially for physiotherapy students who often sit a lot and don't move much. To help with flexibility, people use stretching methods like dynamic and static stretching. Using a TheraBand, which is a type of resistance band, can also help by adding extra tension that might make muscles stretch more and activate the nervous system better. This study looked at how TheraBand-assisted dynamic stretching compared to TheraBand-assisted static stretching affected hamstring flexibility in physiotherapy students. They used the Sit and Reach Test to measure flexibility before and after the stretching sessions. There were 54 students aged 18 to 25, split into two groups: one did dynamic stretching, and the other did static stretching. Both groups saw big improvements in flexibility after the sessions ($p = 0.0001$). The dynamic group went from an average of 39.11 cm to 42.51 cm, while the static group improved from 38.83 cm to 40.14 cm. The dynamic group had a much bigger improvement, 3.40 cm compared to 1.31 cm for the static group, and this difference was confirmed by the Mann-Whitney U Test ($p = 0.0001$). The results show that while both methods help with flexibility, dynamic stretching with a TheraBand works better. The active movement and resistance from the band might help the muscles stretch more and work better with the nerves. These findings suggest that adding TheraBand-assisted dynamic stretching to warm-ups and training programs for physiotherapy students could improve flexibility, reduce injury risk, and make their performance more efficient.

Keywords – Hamstring flexibility, static stretching, dynamic stretching, TheraBand , physiotherapy students.

INTRODUCTION

Hamstring flexibility is important for improving physical performance and lowering the chance of muscle injuries. The hamstrings consist of three muscles at the back of the thigh: biceps femoris, semitendinosus, and semimembranosus. These muscles help bend the knee and extend the hip. Good hamstring flexibility is vital for keeping the lower limbs working well and reducing injury risk. Hamstring stretching exercises are key to improving muscle flexibility and easing tightness. Common exercises to improve hamstring flexibility include static stretching, dynamic stretching, PNF (Proprioceptive Neuromuscular Facilitation) stretches, and TheraBand-assisted stretches. These exercises are important because they help prevent muscle strain, lessen lower back pain, improve posture, boost physical performance, and decrease the risk of injuries. Regular hamstring stretching is essential for better mobility, balance, and overall movement, especially for those involved in activities like physiotherapy students. ⁽¹⁾

Hamstring flexibility is particularly important for sedentary individuals, who often experience reduced muscle elasticity due to prolonged periods of inactivity. Various stretching techniques—including static and dynamic methods—are available to improve flexibility. TheraBand-assisted stretching introduces an external resistance component, making these exercises more effective. Notably, physiotherapy students often spend long hours studying with limited physical activity, leading to decreased hamstring flexibility and an increased risk of complications. Incorporating TheraBand-assisted stretching techniques can significantly enhance hamstring flexibility, improve neuromuscular control, and reduce injury risk among these students. Enhanced hamstring flexibility is crucial for physiotherapy students as it increases range of motion, movement efficiency, and physical performance during practical sessions, patient handling, and exercise demonstrations. Additionally, improved flexibility helps prevent muscle strain, lower back pain, and knee injuries that can result from prolonged standing, lifting, and bending during clinical practice. Flexible hamstrings also enable physiotherapy students to perform manual therapy, stretching, and exercise demonstrations more effectively, leading to better treatment outcomes for patients. Overall, greater hamstring flexibility contributes to faster recovery after physical activities, enabling students to maintain long-term physical health and perform their professional duties without injury or discomfort. ⁽²⁾

Stretching exercises have been shown to help improve hamstring flexibility, reduce muscle tightness, and lower the chance of injuries. Two common stretching methods are dynamic stretching and static stretching, both used to increase hamstring flexibility. Dynamic stretching uses active and controlled movements that move the muscle through its full range of motion without holding a position, helping to increase muscle elasticity ⁽¹⁾. This type of stretching is great before exercise as it helps prepare the muscles for activity, reducing the risk of strain or injury. Static stretching is typically done after exercise to help relax the muscles, reduce tightness, and improve flexibility. Doing static stretching regularly can increase muscle flexibility, prevent hamstring strains, reduce lower back pain, and improve overall physical performance. It is commonly performed after physical activity to help with relaxation and recovery. ⁽³⁾ In recent years, resistance bands like TheraBand have become popular in flexibility training because they provide external resistance, which can make stretching more effective. The TheraBand is made of elastic latex and is used to provide controlled resistance during stretching, allowing muscles to stretch, activate, and strengthen gradually. When used in TheraBand-assisted dynamic stretching, the band adds resistance to the movement, making the muscle work harder and promoting increased flexibility and control. This method is especially helpful for improving dynamic flexibility, muscle activation, and functional movement, making it ideal for warming up before exercise. Combining resistance training with stretching, like using TheraBand, weights, or body weight, can offer the best results for hamstring flexibility, strength, and injury prevention, which is helpful for physiotherapy students to improve their physical performance and avoid musculoskeletal injuries. ⁽⁴⁾ Resistance training with static stretching involves using resistance exercises, like TheraBand, weights, or body weight, along with static stretches to improve hamstring flexibility, strength, and muscle control. This method starts with strengthening the hamstring through resistance exercises, followed by holding a static stretch for 30 seconds to help the muscle stretch and

become more flexible. This combination helps reduce muscle tightness, increase range of motion, and prevent hamstring strains. Resistance training builds muscle strength, while static stretching improves passive flexibility, making it effective in enhancing overall muscle performance and lowering the risk of injury. Examples of this method include doing resisted leg curls followed by a static hamstring stretch, or performing a TheraBand leg press along with a static forward bend stretch. ⁽⁶⁾ This approach helps improve flexibility, lower the risk of hamstring tightness, muscle strain, and lower back pain. ⁽⁷⁾

NEED OF THE STUDY

Because of modern work settings, long hours in front of screens, and less physical activity, people have become more sedentary. ⁽¹⁾ One big issue from staying inactive for too long is that hamstring flexibility decreases, which can cause muscle tightness, poor posture, and a higher chance of musculoskeletal problems like lower back pain, hamstring strains, and limited movement. Students who spend a lot of time sitting and not being active may not realize they lack normal flexibility and could face health issues. ⁽¹⁾ So, using TheraBand-assisted stretching techniques can make a big difference in improving hamstring flexibility. Having flexible hamstrings helps physiotherapy students do manual therapy, stretching, and exercise demonstrations more effectively, which can lead to better patient outcomes. TheraBand-assisted static stretching involves stretching muscles without movement, while TheraBand-assisted dynamic stretching uses active movements with resistance, which might help improve flexibility more. ⁽⁵⁾ This study will help identify which stretching method is best for improving hamstring flexibility in physiotherapy students. Even though these stretching methods are known to be helpful, there is not much research directly comparing their effects on hamstring flexibility. ⁽⁷⁾

RESEARCH METHODOLOGY

3.1 Population and Sample

The study population consisted of physiotherapy students from Tilak Maharashtra Vidyapeeth, Pune. A total of 54 students (both males and females) aged 18–25 years with sedentary lifestyles were selected using simple random sampling. Participants who engaged in less than 150 minutes of moderate physical activity per week were included. Individuals with a recent history of hamstring injury, lower limb or spinal surgery, or those already participating in regular flexibility training or yoga were excluded.

The sample was divided equally into two groups: Group A (n=27): TheraBand-assisted dynamic stretching. Group B (n=27): TheraBand-assisted static stretching

3.2 Data and Sources of Data

The study data were collected from physiotherapy students of Tilak Maharashtra Vidyapeeth's Jayantrao Tilak College of Physiotherapy, Pune. Primary data were obtained directly from participants through assessment using the Sit and Reach Test, conducted before and after the intervention. Each participant's demographic information (age and gender) was recorded, and individual pre- and post-test scores were documented on a structured data collection sheet prepared for the study

3.3 Theoretical framework

This study is based on the principle that stretching improves muscle extensibility and joint range of motion. Static stretching enhances passive flexibility by holding the muscle in a lengthened position, while dynamic stretching improves active flexibility through controlled movement. The use of a TheraBand adds resistance, promoting both muscle activation and elongation. Thus, combining resistance with stretching is expected to produce greater gains in hamstring flexibility.

AIM AND OBJECTIVES

AIM:

To compare the effects of TheraBand-assisted dynamic stretching and TheraBand-assisted static stretching on hamstring flexibility in physiotherapy students with sedentary lifestyle.

OBJECTIVES:

1. To evaluate the effectiveness of TheraBand Assisted Dynamic stretching in improving hamstring flexibility.
2. To evaluate the effectiveness of TheraBand Assisted Static Stretching in improving hamstring flexibility using sit and reach test.
3. To compare effectiveness of both Stretching techniques improving Hamstring flexibility using sit and reach test

OUTCOME MEASURES ⁽¹⁴⁾ :-

- Sit and reach test (flexibility test):
Reliability: 0.84 to 0.95
Validity: 0.46 - 0.67



INCLUSION CRITERIA:

- Physiotherapy students.
- Both male and females are included. ⁽⁸⁾
- Age: 18-25⁽⁴⁾
- Sedentary individuals with less than 150 min of moderate physical activity per week. ⁽¹⁾

EXCLUSION CRITERIA:

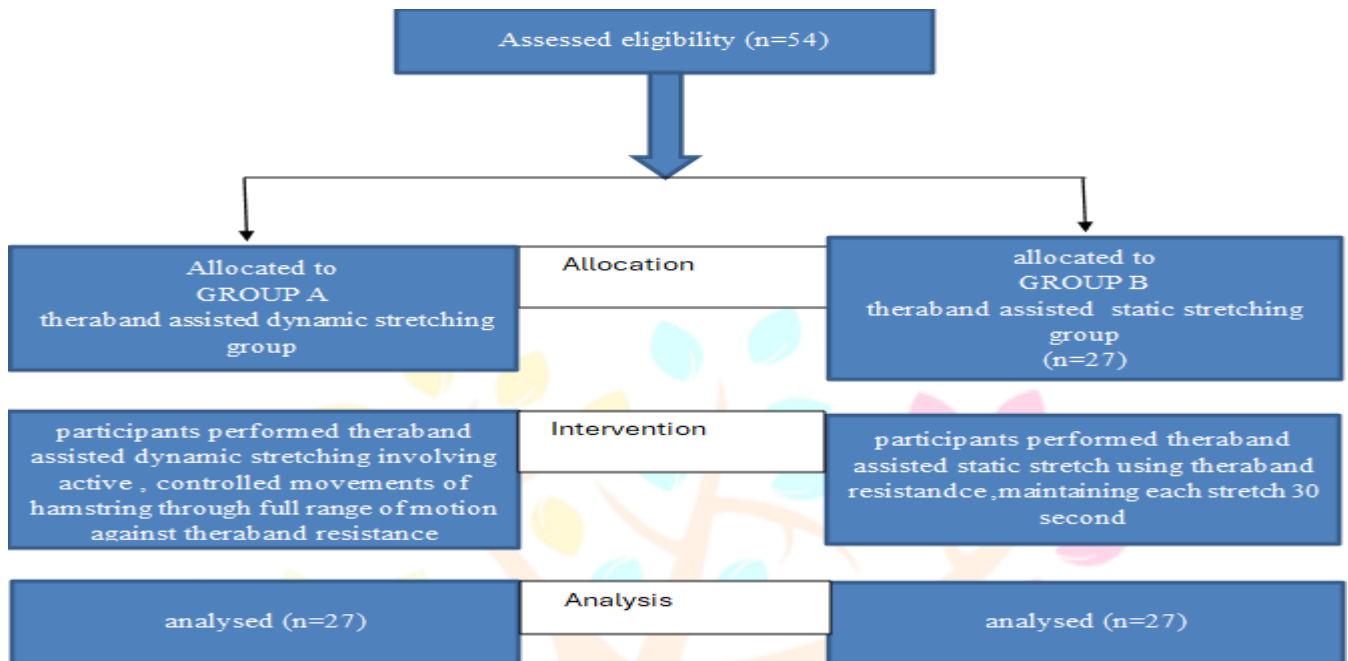
- ⑩ Any history of hamstring strain or tear within last 6 months. ⁽⁴⁾
- ⑩ Physiotherapy student not giving consent.
- ⑩ Recent lower limb or spine surgery or injury. ⁽⁴⁾ who are already engaged in regular flexibility training, yoga. ⁽⁸⁾

PROCEDURE

Firstly, permission was obtained from institutional ethical committee of Tilak Maharashtra Vidyapeeth, department of Physiotherapy and Ethical clearance was taken from institutional ethical committee of Tilak Maharashtra Vidyapeeth College of Physiotherapy.

The aims and objectives of the research were explained to the participants and those who fulfilling the inclusion criteria were included in the study. consent was obtained from the subjects by signing the consent form. The entire procedure was explained to the subjects. After filling out the consent form, the assessment proforma was completed. subjects were then assessed for TheraBand Assisted Dynamic Stretching and TheraBand Assisted Static Stretching in 2 different groups.

CONSORT DIAGRAM



Before beginning the intervention, each participant’s hamstring flexibility was measured using Sit and Reach method with a measuring tape

Participant sat in a long sitting with knees extended. The 0 cm mark of the tape was placed at the midpoint of the patella, extending towards the toes. Participant bent forward from the hip and reached along the tape without bending the knees. The farthest point reached by the fingertips was recorded in centimetres. Three readings were taken; the best value was noted as the pre-test score. ⁽¹⁴⁾



Fig 1: Sit and reach test

Group A – TheraBand-Assisted Dynamic Stretching Position: in supine the participant lay on the mat with one leg straight and the other looped with a TheraBand around the foot. The leg was actively lifted and lowered against resistance (hip flexion and extension) through a full range of motion ⁽²⁾. Repetitions: 15 reps per leg. Rest: 30 seconds between sets.

Group B – TheraBand-Assisted Static Stretching Position ⁽³⁾: In supine, the participant raised the leg with the TheraBand until a mild stretch was felt in the hamstring and held the position for 30 seconds. Repetitions: 3 holds per leg, 30 seconds, with 15-second rest between repetitions.

Post-Intervention Assessment Immediately after the intervention, hamstring flexibility was remeasured using the same measuring tape method. The difference between pre- and post-readings represented the improvement in flexibility



Fig 2: TheraBand assisted stretching (supine position)

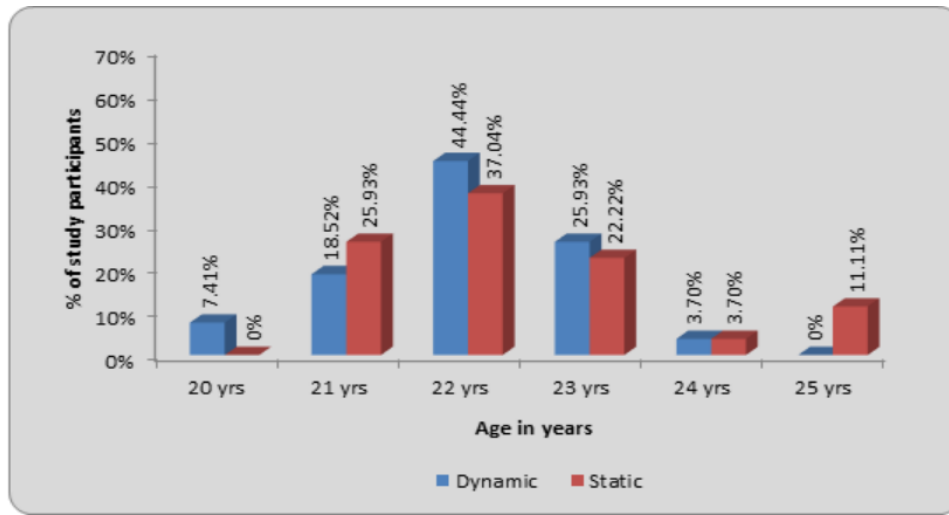
DATA ANALYSIS AND INTERPRETATION

Statistical analysis was done by using descriptive and inferential statistics using Chi-square test, Mann Whitney U test and Wilcoxon signed rank test and software used in the analysis were SPSS 22.0 version and GraphPad Prism 7.0 version and $p < 0.05$ is considered as level of significance

Table 1: Distribution of study participants according to their age in years

		Group		Total	χ^2 -value
		Dynamic	Static		
Age Group(yrs)	20 yrs	2(7.41%)	0(0%)	2(3.70%)	5.59 P=0.34, NS
	21 yrs	5(18.52%)	7(25.93%)	12(22.22%)	
	22 yrs	12(44.44%)	10(37.04%)	22(40.74%)	
	23 yrs	7(25.93%)	6(22.22%)	13(24.07%)	
	24 yrs	1(3.70%)	1(3.70%)	2(3.70%)	
	25 yrs	0(0%)	3(11.11%)	3(5.56%)	
Total		27(100%)	27(100%)	54(100%)	

Graph 1: Distribution of study participants according to their age in years

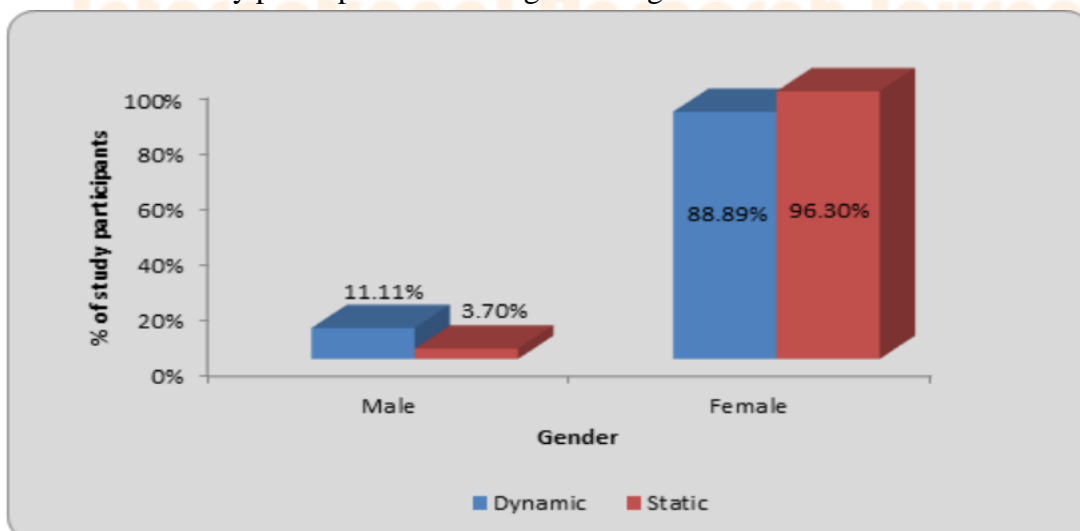


INTERPRETATION : 18.52% of the study participants in dynamic group and 25.93% in static group were in the age of 21 years, 44.44% in dynamic group and 37.04% in static group were in the age of 22 years, 25.93% in dynamic group and 22.22% in static group were in the age group of 23 years and 11.11% of study participants in static group of 25 years. By using Chi-square test statistically no significant difference was found in the age of the participants of two groups (χ^2 -value=5.59, $p=0.34$).

Table 2: Distribution of study participants according to their gender

		Group		Total	χ^2 -value
		Dynamic	Static		
Gender	Male	3(11.11%)	1(3.70%)	4(7.41%)	1.08 P=0.29, NS
	Female	24(88.89%)	26(96.30%)	50(92.59%)	
Total		27(100%)	27(100%)	54(100%)	

Graph2: Distribution of study participants according to their gender

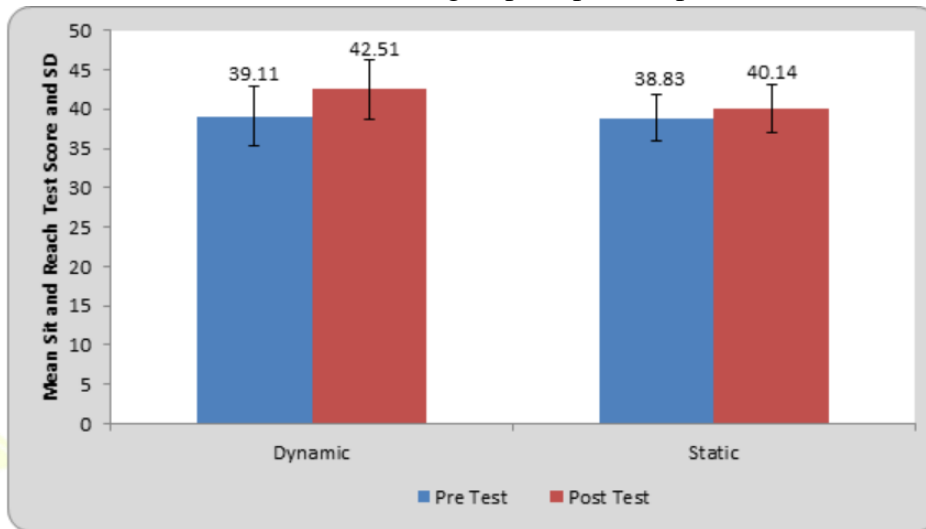


INTERPRETATION: 11.11% of the study participants in dynamic group and 3.70% in static group were males and 88.89% of study participants in dynamic group and 96.30% in static group were females. By using Chi-square test statistically no significant difference was found in the gender of the participants of two groups (χ^2 -value=1.08, $p=0.29$).

Table 3: Comparison of Sit and Reach test in two groups at pre and post exercise.

Group	Pre Test	Post Test	Mean Difference	z-value
Dynamic	39.11±3.81	42.51±3.75	3.40±0.55	4.58, p=0.0001, S
Static	38.83±2.96	40.14±3.05	1.31±0.34	4.64, p=0.0001, S

Graph 3: Comparison of Sit and Reach test in two groups at pre and post treatment

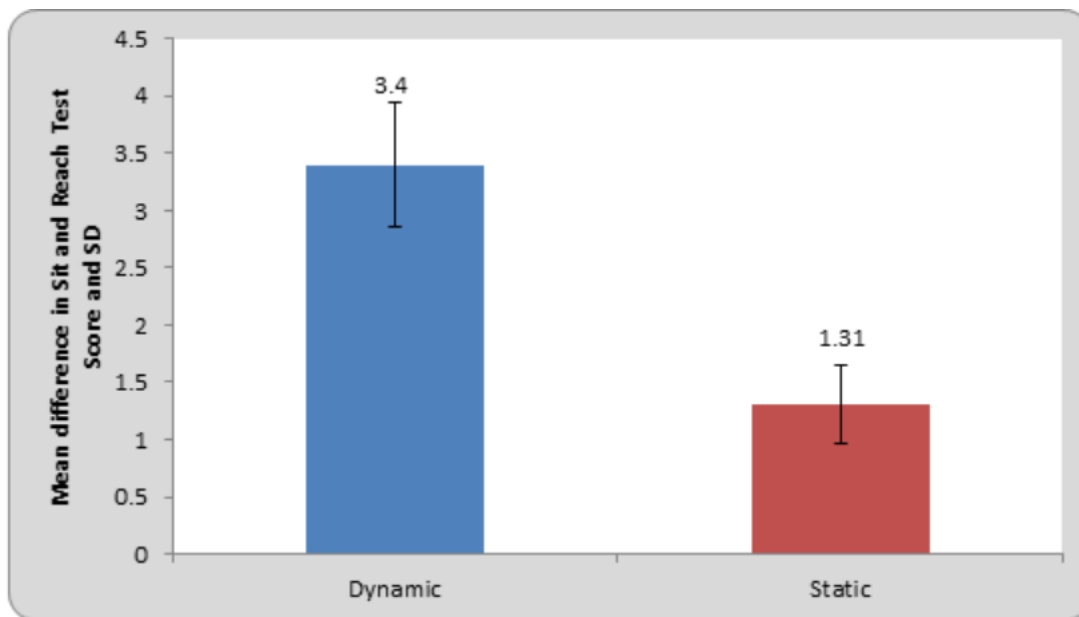


INTERPRETATION: Mean sit and reach test score among the participants in dynamic group at pretest was 39.11±3.81 and at posttest it was 42.51±3.75. By using Wilcoxon Signed Rank Test, statistically significant difference was found in sit and reach test at pre and post treatment (z=4.58, p=0.0001). Mean sit and reach test score among the participants in static group at pre test was 38.83±2.96 and at post test it was 40.14±3.05. By using Wilcoxon Signed Rank Test, statistically significant difference was found in sit and reach test at pre and post treatment (z=4.64, p=0.0001).

Table 4: Comparison of Sit and Reach test in two groups at pre and post treatment

Group	Mean	SD	Standard Error of mean	z-value
Dynamic	3.40	0.55	0.10	16.64, p=0.0001, S
Static	1.31	0.34	0.06	

Graph 4: Comparison of Sit and Reach test in two groups at pre and post treatment.



INTERPRETATION: Mean difference in sit and reach test score at pre and post treatment in dynamic group was 3.40 ± 0.55 and in static group it was 1.31 ± 0.34 . By using Mann Whitney group statistically significant difference was found in mean difference in sit and reach test score among patients of two groups ($z=16.64$, $p=0.0001$).

RESULT

The study included 54 physiotherapy students, split evenly into two groups: one that did Dynamic Stretching and another that did Static Stretching. The average age of the students was similar in both groups, with most being between 21 and 23 years old. A Chi-square test showed no big difference between the groups in terms of age or how many were male or female. Since the data wasn't normally spread out, the researchers used non-parametric tests. Before the stretching program, the Dynamic Stretching group had an average Sit and Reach Test score of 39.11 ± 3.81 , but after the program, their score went up to 42.51 ± 3.75 , which is an increase of 3.40 ± 0.55 ($z = 4.58$, $p = 0.0001$). The Static Stretching group started with an average score of 38.83 ± 2.96 and improved to 40.14 ± 3.05 , which is a gain of 1.31 ± 0.34 ($z = 4.64$, $p = 0.0001$). When comparing the two groups using the Mann-Whitney U Test, the Dynamic Stretching group showed much bigger improvement than the Static group. The Dynamic group had a mean gain of 3.40 ± 0.55 , while the Static group had a mean gain of 1.31 ± 0.34 ($z = 16.64$, $p = 0.0001$). These results suggest that both stretching methods improved hamstring flexibility, but Dynamic Stretching, especially when using a Theraband, led to better results than Static Stretching.

DISCUSSION

The current study aimed to compare how TheraBand-assisted dynamic stretching and TheraBand-assisted static stretching affect hamstring flexibility among physiotherapy students. The Sit and Reach Test was used to measure flexibility. Participants were split into two groups, each doing a different stretching method. The results showed that both stretching methods improved hamstring flexibility, but the dynamic stretching group had a much bigger improvement compared to the static group. A statistical test called the Mann-Whitney U test found a very significant difference ($z = 16.64$, $p = 0.0001$), which means dynamic stretching with TheraBand is better at improving flexibility. The dynamic stretching group had better results because dynamic movements are more active and functional. These movements help warm up the

muscles, improve blood flow, and activate the nervous system. During TheraBand-assisted dynamic stretching, muscles are moved through their full range of motion while facing elastic resistance. This helps the muscles stretch more, activates more motor units, improves body awareness, and helps the muscles work better together. The continuous movement also makes the muscle-tendon unit more flexible and helps control the stretch reflex in a safe way, leading to better dynamic flexibility and joint movement. The TheraBand adds extra resistance, helping muscles stretch and contract more effectively. This resistance also simulates the natural stretch-shortening cycle used in everyday activities and sports, making dynamic stretching more relevant. The resistance from the band ensures that muscles are actively used throughout the movement, which is probably why the dynamic group had better results. The static stretching group also showed improvements in flexibility, but the changes were smaller. Static stretching involves holding the muscle at its stretched position for a while, which helps muscles relax and become more comfortable with being stretched. This helps lower muscle tightness and makes tissues longer by causing them to stretch and change shape slowly. But, static stretching mainly helps with passive flexibility and doesn't help as much with neuromuscular activation or dynamic control, which dynamic stretching does better. Some research says that while static stretching is good for recovery and keeping flexibility over time, doing it right before activity might reduce muscle strength and power. So it's better used after exercise rather than before. The improvements in both groups might also be because of muscle plasticity, where repeated stretching helps muscles and connective tissues get longer. But the active stretching with TheraBand probably caused more changes because it involved more mechanical stress and activated stretch receptors more, leading to more changes in the muscle-tendon unit. ⁽⁷⁾

Another thing to think about is that physiotherapy students often sit a lot, which can cause hamstring tightness, changes in the pelvis, and lower back pain. Using TheraBand for stretching, especially dynamic types, can be a good way to prevent these posture and musculoskeletal problems. Better hamstring flexibility can help reduce discomfort, improve posture, walking, and how well they function. This is important for students both in their studies and when they work. The results also show that TheraBand stretching is practical. TheraBands are easy to use, not expensive, and can be used anywhere like clinics, gyms, or at home. Adding stretching routines into everyday warm-ups or exercise can help keep flexibility, lower injury chances, and improve physical performance. This study shows that both dynamic and static stretching with TheraBand help improve hamstring flexibility, but dynamic stretching has much better results. The active movement and resistance from the TheraBand lead to better muscle stretch, coordination, and movement. These results are especially useful for physiotherapy students, as better flexibility can improve their posture, movement efficiency, and help them do their work safely and well. Thus, the results of this study back up the idea that using TheraBand for dynamic stretching is better than using it for static stretching when it comes to improving hamstring flexibility. This suggests that physiotherapists and students should think about including resistance-based dynamic stretching methods in their warm-up sessions and rehab plans to help with flexibility, strength, and injury prevention.

CONCLUSION

In this study we conclude that Both TheraBand-assisted dynamic and static stretching help improve hamstring flexibility in physiotherapy students. However, dynamic stretching with TheraBand leads to more improvement in flexibility compared to static stretching. So, adding dynamic TheraBand stretching to regular warm-up routines can help increase range of motion, make movements more functional, and reduce the risk of injury among physiotherapy students.

ACKNOWLEDGEMENT

The success and result of this project required a lot of guidance, I am extremely privileged to have got this all along the completion of my project. I owe my deepest gratitude to my project guide Dr. Dhanashree P.

Shinde (PT), who took keen interest on our project work and guided me along, till the completion by providing all the necessary information throughout numerous consultations. I will forever be grateful for the knowledge and skills; I gained working under you. I respect and thank our Principal Dr. Gajanan Bhalerao sir, who gave me the opportunity to do this wonderful project on the topic “Effect of TheraBand Assisted Dynamic Stretching Versus TheraBand Assisted Static Stretching on Hamstring Flexibility in Physiotherapy Students Using Sit and Reach Test: A Comparative Study”. I am thankful to and fortunate enough to get constant encouragement, support and guidance from all teaching staff at TMV’S Jayantrao Tilak College of Physiotherapy, Pune, which helped me in successfully completing my project work.

References

- 1) Kang JH, Kim SG, Kang EH, Kim JS, Jeon JW, Lee DY, et al. Effects of active static stretching and eccentric exercise of hamstring muscles on flexibility, strength, and agility performance. *J Korean Soc Integr Med.* 2022;10(2):115-123
- 2) Iwata M, Yamamoto A, Matsuo S, Hatano G, Miyazaki M, et al. Dynamic stretching helps keep the range of motion and passive stiffness of the hamstring muscles improved over time. *Journal of Sports Science and Medicine.* 2019;18(1):13-20.
- 3) Rosenfeldt M, Stien N, Behm DG, Saeterbakken AH, Andersen V. A study comparing resistance training and static stretching on flexibility and maximum strength in healthy, active adults. *BMC Sports Science, Medicine and Rehabilitation.* 2024;16(1):142-143.
- 4) Behm DG, Kay AD, Trajano GS, Alizadeh S, Blazevich AJ. How stretching affects the risk of injury and balance. *Journal of Clinical Exercise Physiology,* 2021;10(3):106-116.
- 5) Delvaux F, Schwartz C, Decréquy T, et al. How a hamstring eccentric training program in real-world settings impacts muscle strength and flexibility. *International Journal of Sports Medicine,* 2020;41(4):233-241.
- 6) Gunaydin G, et al. The long-term effects of different stretching exercises on hamstring flexibility and performance. *Science & Sports,* 2020;35(6):386-392.
- 7) Barbosa GM, Trajano GS, Dantas GA, and others studied the long-term effects of static and dynamic stretching on the strength and performance of the hamstrings. Their findings were published in the *Journal of Strength and Conditioning Research* in 2020, pages 2031 to 2039.
- 8) Afonso J, Rocha-Rodrigues S, Clemente FM, Aquino M, Nikolaidis PT, Sarmento H, and others explored the different shapes and functions of the hamstrings and how these might relate to the risk of injury. This research was published in *Frontiers in Physiology* in 2021, pages 604 to 694.
- 9) Naweed J, Razzaq M, Sheraz S, Anwar N, Sadiq N, and Naweed S compared two stretching techniques, active isolated stretch and post isometric relaxation, to see which one improves hamstring flexibility better in young healthy adults. Their study was published in the *Pakistan Armed Forces Medical Journal* in 2020, pages 770 to 775.
- 10) Gunaydin G, Citaker S, and Cobanoglu G examined how different stretching exercises affect hamstring flexibility and performance over time. Their research was published in the *Science of Sports journal* in 2020, pages 386 to 392.
- 11) Naqvi R, Arshad N, Mohammed I, Aftab AA, and Batool S looked at how common it is for university students in Lahore, Pakistan, to have tight hamstrings. Their findings were published in the *Rawal Medical Journal* in 2019, pages 853 to 855.
- 12) Behm DG, Chaouachi A. A review of the effects of static and dynamic stretching on performance. *Eur J Appl. Physiol.* 2011;111(11):263-265.
- 13) Warneke K, Alejo B, Yu J, Cuadra C, Laczko L, Morawietz L, et al. Using long-duration static stretch training to counteract strength and flexibility deficits in moderately trained participants. *Med Sci Sports Exerc.* 2022;54(12):1951-1960
- 14) Shephard RJ, Berridge M, Montel pare W, et al. On the generality of the "sit and reach" test: an analysis of flexibility data for an aging population. *Res Q Exerc Sport.* 1990;61(4):326-330.