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## Contents

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Volume 16, Number 4

October-December 2022

---

### Page No.

---

1. Effect of IASTM vs. THERAGUN on Triceps Surae Active Range of Motion and Functional Movements in University Level Sprinters  
*Akshita Tyagi, Ambuja Bhardwaj* 1
2. To Determine the Effectiveness of Tibialis Posterior Strengthening along with Conventional Therapy on Ankle Dorsiflexion Range of Motion, Functional Status and Navicular Position in Patients with Plantar Fasciitis  
*Divya Chouhan, Sneha Joshi, Vijay Kaushik, Ramhari Meena* 7
3. To Assess Anxiety and Phobia in Female College Going Students for Resuming College after Covid-19 Confinement: A Pilot Study  
*Firdous Mohammad Ikram, Shubha Arora* 14
4. Correlation Between Body Mass Index and Cardiorespiratory Fitness in Young Healthy Males  
*G. Jency Thangasheela, V. Karthik, A.Sathishkumar* 19
5. A Comparative Study on Effect of Non-Ballistic Active Knee Extension in Neural Slump Position Versus Post Isometric Relaxation Techniques on Hamstring Flexibility in Sedentary Workers  
*Gautami Bhutada, Sucheta Golhar, Anant A. Takalkar* 24
6. Comparison of Integrated Neuromuscular Inhibition Technique versus Myofascial Release of Upper Trapezius on Neck Range of Motion and Dysfunction in Individuals with Nonspecific Neck Pain  
*Heena Dhami, Jaspreet Kaur, Manharleen Kaur* 30
7. Observing the Clinical use of Ultrasound Imaging by Physiotherapists in Saudi Arabia  
*Jaffar S. Abdrabarasol, Amin A. Algaftly, Ahmed A. Almusabbbeh, Wafa H. Almaghaslah* 36
8. Effect of Constrained Induced Movement Therapy on Functional Arm Reach Distance on Adult Hemiplegic Patients: A Pilot Study  
*R. Shyam Sundar, M. Prem Kumar, K. Kartheeswari, Mohammed Ameer Hussain* 42
9. Effect of IFT with Anterior Glide versus Posterior Glide Joint Mobilisation Technique on Shoulder External Rotation Rom in Patients with Adhesive Capsulitis: Comparative Study  
*Madhuripu, M. Prem Kumar, Radhika Gopal. S, S. Kavitha* 47

10.	Effectiveness of Sleeper and Cross Body Stretches and Muscle Energy Techniques for Periarthritis Shoulder: Comparative Study	53
	<i>Mohammed Ameer Hussain, M.Premkumar, R. Muthupandi Kumar, R.Shyam Sundar</i>	
11.	Effects of Occupational Therapy Intervention on Motor Cognitive Behavioural Development of Infant Born pre-term: A Systematic Review	58
	<i>Sadia, Rashida Begum</i>	
12.	Effect of Cardiac Rehabilitation in Percutaneous Transluminal Coronary Angioplasty (PTCA)	65
	<i>Namrata Parekh, Charusmita Badgajar, Swati Patel</i>	
13.	Physiological Cost Index among Individuals with Mild to Moderate Chronic Obstructive Pulmonary Disease and their Compliance with Pulmonary Rehabilitation	69
	<i>Namratha Shanbhag, Sangeeta Appannavar, Vijayalaxmi S Kathare, Tulasi H Kulkarni</i>	
14.	Effect of Modified Shoe with Motor Relearning Programme on Timed Up and Go Test Values and Gait Parameters in Chronic Stroke Patients: Comparative Study	78
	<i>R. Muthupandi kumar, R. Shyam Sundar, M. Premkumar, Mohammed Ameer Hussain</i>	
15.	Efficacy of Motor Imagery on Lower Extremity Functioning and Gait in Chronic Stroke Patients: Systematic Review	83
	<i>Ramananandhan Ragunath</i>	
16.	A Cross Sectional Study to Identify Perceived Barriers and Facilitators to Physical Activity and Exercise Participation of People with Post Stroke Depression	88
	<i>Reshna Ratnakumar, Jasrah Javed, K Senthil, R Vasanthan</i>	
17.	Effectiveness of Integrated Neuromuscular Inhibition Technique and Instrument Assisted Soft Tissue Mobilisation in the Management of Upper Trapezius Myofascial Trigger Points	94
	<i>Rutika Thakur, Prachi Mande, Muskaan Lokwani</i>	
18.	Comparison of Muscle Energy Technique versus Eccentric Training on Hamstrings Extensibility among Adolescent Girls	101
	<i>Smriti, Jaspreet Kaur, Amandeep Singh, Abhay Kapoor, Saloni</i>	
19.	Telerehabilitation as a Tool Given on Physical Fitness and Quality of Life in Overweight and Obese College Students Amidst Covid 19 Pandemic: Single Group Pre Post Design	107
	<i>Tamilalagan, M.Premkumar, K.Sangeetha, S. Kavitha</i>	
20.	Variability in Flexibility of Dominant and Non-Dominant Shoulder Joints among Healthy Young Adults	112
	<i>Jyoti S. Jeevannavar, Purohit Sneha Jalamsingh, Nidhi Misalankar, Kacha Priyanka Rajesh</i>	
21.	Benefit of Stability Exercise on Swiss Ball Exercise along with Treadmill Walking in Physiotherapy College Girl Students with PCOS Symptoms: Single Group Pre Post Design	117
	<i>M.Prem Kumar, S. Jeya Preethi Angela, S. Kavitha</i>	

## Effect of IASTM vs. THERAGUN on Triceps Surae Active Range of Motion and Functional Movements in University Level Sprinters

Akshita Tyagi<sup>1</sup>, Ambuja Bhardwaj<sup>2</sup>

<sup>1</sup>MPT (SPORTS) student, RIMT University, School of Physiotherapy, H. no. 245, Sahib Nagar, Their, Patiala, Punjab. <sup>2</sup>Assistant Professor, RIMT University, Department of Physiotherapy, School of Physiotherapy, P-11, Basant Vihar, Noorwala road, Ludhiana, Punjab

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### Abstract

**Background:** Sprinter is a person who runs very fast over a short distance in a race. In this study we determine the effect of Instrument Assisted Soft Tissue Manipulation (IASTM) vs THERAGUN separately on triceps surae muscle to check the Active Range of Motion and Functional Movement in sprinters of age group 18- 25 years.

**Methods:** Study design: Experimental study (pre-test and post-test design). Sampling Technique: The subjects were selected by Random Sampling. Source of Data: Universities of Patiala & Ludhiana Districts.

**Conclusion:** The study examined the effect of IASTM and THERAGUN which shows significant changes in the Active Range of Motion & functional movement.

**Key words:** IASTM, Theragun, Functional Movement.

### Introduction

Sprint running needs highest maximum running velocity, good starting ability and endurance of that velocity capacity<sup>8</sup>. Sprinting is a salient constituent of several track and field events (e.g., 100-m & 200-m, long jump, etc.). Since the last 2 decades the profession of sports rehabilitation has traversed from conventional, isolated assessment and strengthening towards combined functional and movement-based approaches<sup>1</sup>. Indeed, in 2013 the council of American Physical Therapy Association acquire the following perceiving for the profession of Physical Therapy that recognition of flawless movements in patients and athletes is the major concern for all Physical Therapists, and especially for sports medicine

specialists<sup>2</sup>. With the aim to prepare individuals for the large array of activities, the rehabilitative professional must actualize that the screening of fundamental movement is of vital importance<sup>3</sup>. The author has presented Functional Movement Screening Tests based on pre-season screening and coupled components<sup>4</sup>. This test comprised of 7 movement tests that can spot the constraints and disparity in natural movement patterns. Every test is chalk up on a 0 to 3 scale with 3 being the best score and scores of all tests are then footed up for a total score<sup>2</sup>.

Over the last few years, the analysis and treatment of myofascial pathologies has become an indispensable constituent of the rehabilitation of human neuro-musculoskeletal pathologies. In

**Corresponding Author:** Akshita Tyagi, MPT (SPORTS) student, RIMT University, School of Physiotherapy, H. no. 245, Sahib Nagar, Their, Patiala, Punjab.

**E-Mail:** akshita.akshitatyagi@gmail.com

accordance with, numerous soft tissues approach, and practice of myofascial therapy seemed to developed sighting at further integrated assessment and treatment of the human body<sup>5</sup>.

Handheld Percussive Massage Therapy is a choice of warm-up routine, it increases flexibility<sup>6</sup> and reduce post-exercise Delayed Onset of Muscle Soreness<sup>7</sup>. This treatment probably incorporates the constituents of conventional massage and vibration therapy. So, this device, has attain vogue in the past few years in therapeutic use and in sports practices. It is used with the objective of increasing flexibility but also hasten recovery<sup>9</sup>.

Instrument Assisted Soft Tissue Mobilization is a soft tissue treatment technique where an instrument is used to provide a mobilizing impulse to positively act on myofascial adhesion and scar tissue<sup>10</sup>. This technique is centered on the reasoning launched by James Cyriax instead, but it implies using uniquely cut-lined steel devices instead of cross friction massage with fingers to generate manageable micro trauma in the soft tissues (e.g., scar tissue, myofascial adhesions) with the motive of decreasing pain and improving the Range of Motion functions<sup>13</sup>. Fousekis et al. manifested that the intervention of IASTM technique on Superficial Back Line of either the superior or the underneath parts might entail to a noteworthy increase in hamstring muscle flexibility regardless of the administration area<sup>12</sup>.

## Material and Method

**Study design:** Experimental study (pre-test and post-test design).

**Sampling Technique:** The subjects were selected by Random Sampling.

**Source of Data:** Universities of Patiala & Ludhiana Districts

### Eligibility:

#### Inclusion Criteria

- Age of the players should be 18-25 years.
- BMI – 21+- 2.5.
- Genders preferably males to create homogeneity and by a corroboration exists when measured by dint of shear

wave elastography that males reveal more gastrocnemius tightness than females.

- At least more than 3 years of training age.
- University level players (sprinters).

#### Exclusion Criteria

- Subject with lower extremity constructive surgery in the past two years.
- Subject undergoing treatment for any lower limb injury.
- Subject with ankle instability measured with Cumberland Ankle Instability tool.
- Subject with respiratory and cardiovascular diseases.
- Subjects those were smokers and drinkers and users of medications known to affect cardiorespiratory functions.
- Declined to participate.

## Procedure

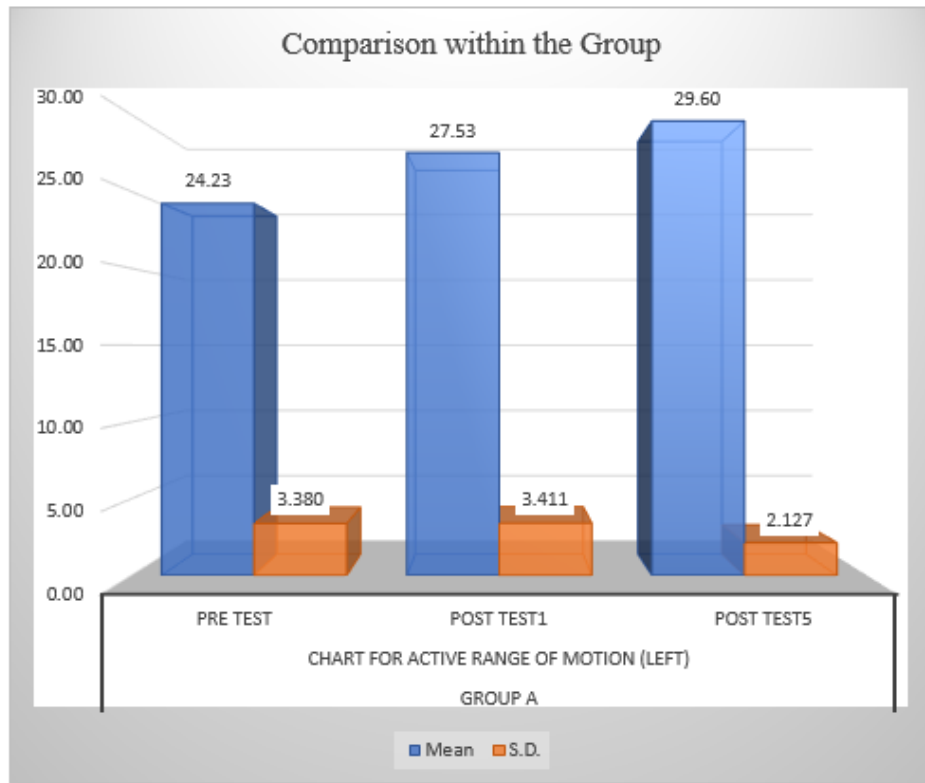
All participants who fulfilled the inclusion criteria were enrolled into the study after signing prior informed consent. All 60 (N=60) male sprinters between the age group of 18-25 were randomly assigned into two (30 in each group) treatment groups mainly GROUP A: Subjects received five sessions IASTM on triceps surae muscles with three days gap in between consecutive sessions, GROUP B: Subjects received five sessions of Handheld percussive massage therapy on triceps surae muscles with three days gap in between consecutive sessions. All subjects agreed not to change or increase their current exercise habits during the course of the study. All the subjects were made to perform warm-up protocol including on spot marching and heel digs before Pre- treatment measurements of Active Range of Motion, Functional Movements on triceps surae muscles.

## Result

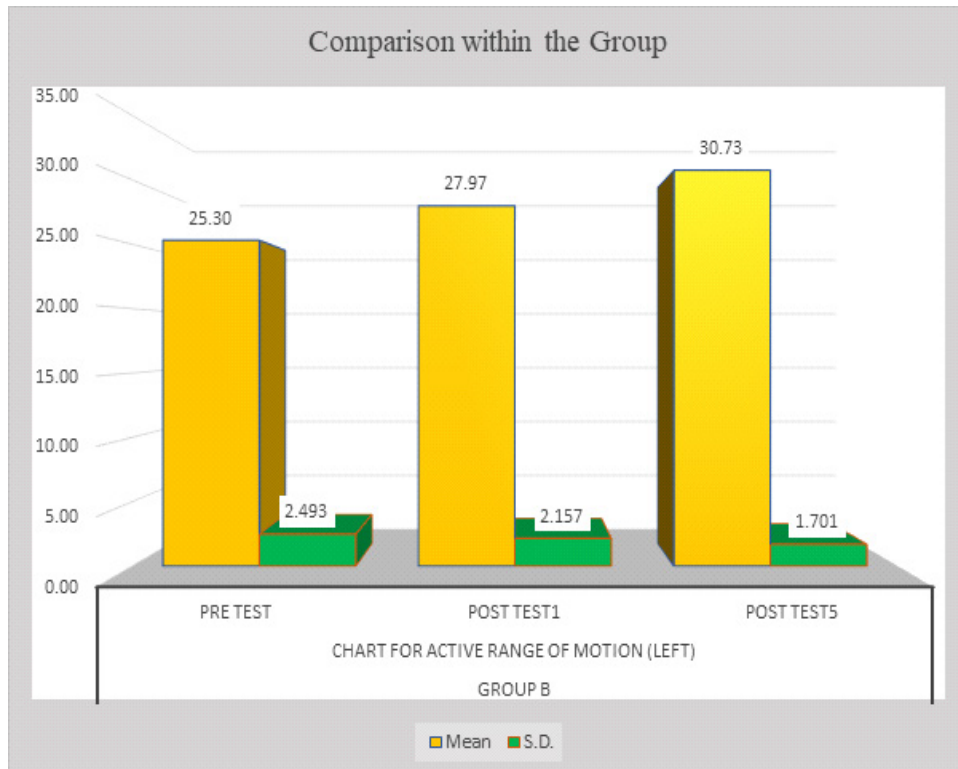
60 males participated in the study with no subjects lost to follow up. 50% subjects received IASTM, and 50% subjects received THERAGUN application. Across the two intervention groups, the subjects were of 18-25 years of age group and an average body mass index BMI 21+- 2.5 Kg/ m. sq.

Graphs (1.1 & 1.2) shows that individuals in the IASTM group exhibited a significant improvement in the performance of the ACTIVE RANGE of MOTION

when compared to those in the THERAGUN group at immediate post testing ( $p = 0.0065$ ) and testing on the 5<sup>th</sup> test day later ( $p = 0.0078$ ).



(Graph 1.1)

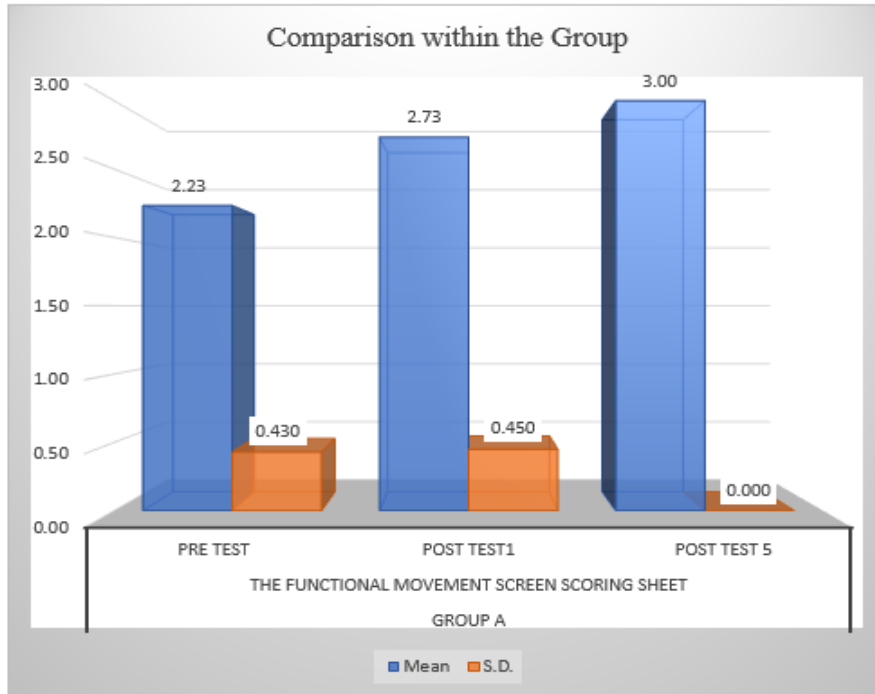


(Graph 1.2)

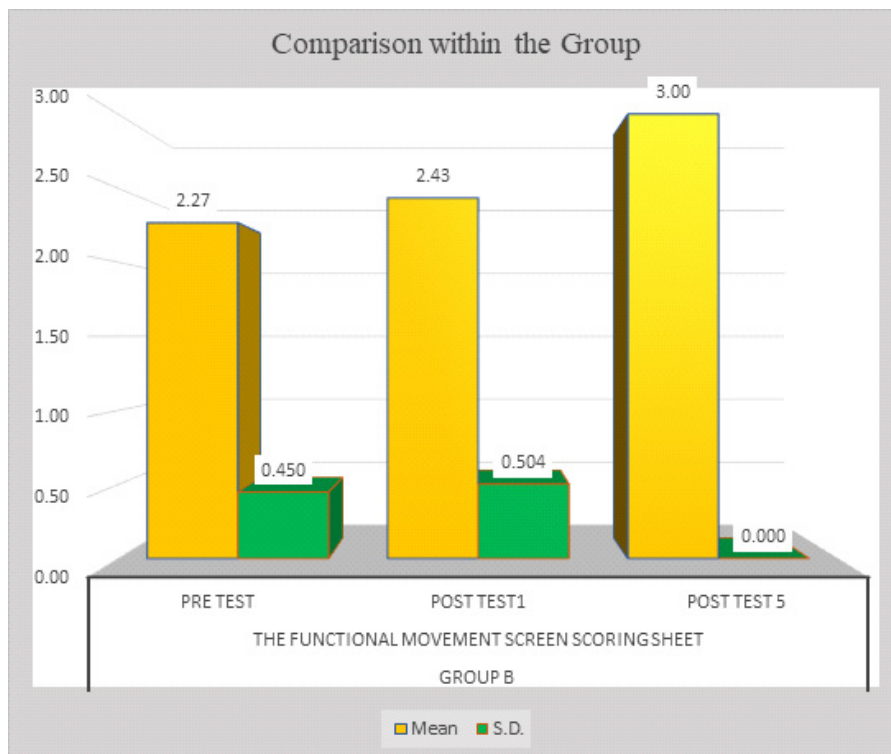


Graphs (2.1 & 2.2) shows that individuals in the IASTM group exhibited a significant improvement in the performance of the overhead deep squat when compared to those in the

THERAGUN group at immediate post testing ( $p = 0.0027$ ) and testing on the 5<sup>th</sup> test day later ( $p = 0.0016$ ).



(Graph 2.1)



(Graph 2.2)

## Discussion

Formally manipulation has been used as a genre of myofascial release to help to decrease fastening of the fibres and enhances the performance in sports.

There was an improvement in strength by 2 folds post treatment of Handheld percussive massage therapy was discussed by Lee et al in 2018, he also hints at the use of Handheld percussive massage therapy might help in remobilizing the fascia back to its normal aligned state, which can bring about the enhancement of soft tissue compliance by enabling the muscle to lengthen and thus increase the AROM and functional movement.

Schleip R. in 2003 described the adaptation of flexibility on an application of IASTM by an improvement in the fascial sliding, a decrease in collagen resistance and increase in local temperature. IASTM showed improvement in AROM and functional movement for chronic ankle pain by Sandrey in 2012 as a result of giving recoverable microtrauma to the muscle which enhances the formation of fibroblast cells and collagen remodelling.

## Conclusion

The study examined the effect of IASTM and THERAGUN which shows significant changes in the Active Range of Motion & functional movement were present. According to few studies which shows that IASTM shows better results as it penetrates deeper in the muscle group providing better fibroblast and fibroblast cell formation and remodeling of the collagen fibers. So, this study concluded that IASTM shows finer result in comparison of Theragun on functional movement, active range of motion.

## Limitations

1. All the sprinters were going through their normal training routine throughout the time period of data collection.
2. Influence of Covid-19 (2019-2021) pandemic on training.
3. Sprinter's diet was not taken into consideration during the research time span.

## Delimitations

1. The study will be delimited to 60 sprinters only.
2. The study will be demarcated to only few selected variables Active Range of Motion and Functional Movements of triceps surae muscles.
3. The study will be demarcated to only male sprinters aged between 18-25 years.

**Ethical Clearance:** prior to the study conducted on the subjects, procedure and guidelines were orally presented and in written form. Subjects agreeing to participate signed a consent form.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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## To Determine the Effectiveness of Tibialis Posterior Strengthening along with Conventional Therapy on Ankle Dorsiflexion Range of Motion, Functional Status and Navicular Position in Patients with Plantar Fasciitis

Divya Chouhan<sup>1</sup>, Sneha Joshi<sup>2</sup>, Vijay Kaushik<sup>3</sup>, Ramhari Meena<sup>4</sup>

<sup>1</sup>Student, <sup>2,3</sup>Associate Professor, <sup>4</sup>Principal, The Mahatma Gandhi Memorial Medical Allied Health Sciences Institute (MAHSI) Indore, Madhya Pradesh, India.

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### Abstract

**Background:** Plantar fasciitis is most common cause of heel pain. Plantar fasciitis is common inflammatory condition of the plantar fascia and surrounding perifascial structure. Strengthening of tibialis posterior along with conventional therapy helps to improve functional status, ankle dorsiflexion range of motion and navicular position.

**Method:** 40 subjects with plantar fasciitis participated in the experiment study underwent treatment duration for four weeks after giving their informed consent. They were evaluated and randomize into experimental group receiving tibialis posterior strengthening along with conventional therapy and control group receiving only conventional therapy. The pre and post values of ankle dorsiflexion range of motion, Navicular drop and Foot Function were recorded at start of the treatment and consequently after the end of treatment.

**Conclusion:** Tibialis posterior strengthening along with conventional therapy were found to be more effective in improving functional disability, ankle dorsiflexion ROM and Navicular drop values. Tibialis posterior strengthening shows better result in improving over pronation of foot, hence decreasing risk of plantar fasciitis.

**Keywords:** Plantar Fasciitis (PF), Tibialis Posterior Strengthening, Conventional therapy, Navicular drop test (NDT), Foot Function Index (FFI), Iontophoresis, Windlass Mechanism.

### Introduction

The plantar fasciitis also known as Heel pain, Plantar fasciopathy, Jogger's heel, Painful heel syndrome, Heel spur syndrome, Runner's heel, Sub calcaneal pain, Calcaneodynia and Calcaneal periositis.<sup>1,2,3</sup> The word "fasciitis" assumes inflammation is an inherent component

of this condition.<sup>4</sup> Plantar fasciitis is defined as an inflammation of the origin of the plantar fascia and surrounding perifascial structure.<sup>5</sup> In general population 40 - 60 years of age group is in higher risk of plantar fasciitis. Women are more prone than men and have reported higher incidence of persisting symptoms.<sup>6,7</sup>

**Corresponding Author:** Divya Chouhan, Student, The Mahatma Gandhi Memorial medical allied health sciences institute (MAHSI) Indore, Madhya Pradesh, India.

The etiology of PF is various faulty biomechanics such as pes planus (excessive pronation), claw toes, pes cavus (high arch) and prominent metatarsal heads.<sup>3</sup> Overpronation contributes excessive foot mobility, which can increase the 2 level of stress applied to the musculofascial and soft tissue structures through plantar fascial elongation and increase tissue stress. reduction in the strength of hip abductors and lateral rotators can lead to adduction and medial rotation of the hip and dynamic knee valgus, which is related to pronation of the foot.<sup>8</sup>

Predisposing factors of plantar fasciitis are obesity (common in middle aged female) or sudden weight gain/High body mass index >30kg/m<sup>2</sup>, degenerative changes with increased age, functional alteration in gait cycle, abnormal foot biomechanics, anatomy of foot deformity such as pes planus and pes cavus, standing on hard surface, leg length discrepancy, traumas, decrease ankle dorsiflexion range of motion, tightness in calf and hamstring muscle.<sup>1,3,6,7,8,9,10,11,12,13,14</sup>

Some risk factors are occupational activity require prolong standing and walking involving teachers, construction workers, cooks, nurses, military personnel, athletes, dancers.<sup>14</sup>

The plantar fascia originates from the medial calcaneal tuberosity, dividing into 3 bands, medial, central, and lateral band that connect to the superior surface of the abductor hallucis, flexor digitorum brevis, and abductor digiti minimi musculature, respectively.<sup>13,14</sup> The central portion is thick, with thinner medial and lateral bands that help maintain the longitudinal arch. It is triangular and divided into five bands at the mid metatarsal level which is further subdivided into a deep tract and a superficial tract.<sup>16</sup> The foot has a visible medial longitudinal arch (MLA), resembles rods. These rods are connected at their base by the plantar fascia. When force is applied to the apex of the MLA, the arch depresses, the two rods separate, and tension is distributed throughout the plantar fascia. The main ligaments are the long and short plantar ligaments and calcaneonavicular ligament (spring ligament) which support MLA.<sup>14</sup> Tibialis posterior is deeply situated in the posterior compartment of the lower leg, between the flexor digitorum longus

and flexor hallucis longus. It is a main muscle to supporting the medial arch of the foot. Tibialis posterior dysfunction can lead to flat feet and weak arch control in adult. Abductor hallucis, flexor digitorum brevis, flexor hallucis longus also help to stabilize and re supinate the foot.<sup>14</sup>

The windlass mechanism expresses the manner by which the plantar fascia supports the foot during weightbearing activities and provides information regarding the biomechanical stresses placed on the plantar fascia. Truss arch formed by the calcaneus, midtarsal joint, and metatarsals (the medial longitudinal arch) and tie rod which is run from the calcaneus to the phalanges is formed by the plantar fascia. Ground reaction forces travel upward through calcaneus and the 6 metatarsal heads, which can further attenuate the flattening effect because these forces fall both posterior and anterior to the tibia. The heel-cord tightness is seen in patients with plantar fasciitis and it restricts dorsiflexion range during gait. A person with a flexible foot type can compensate for this limit of ankle dorsiflexion by unlocking the midtarsal joint because dorsiflexion and abduction are movements permit at the midtarsal joint's oblique axis and this increased motion results in excessive pronation that can stress the plantar fascia. Increased internal rotation of lower leg, which accompanies over pronation of the subtalar joint. More transverse rotation must be absorbed in the knee joint with subsequent disturbance of the normal tibio-femoral rotation relational relationship and disturb in normal patellofemoral mechanics. A now-rigid first ray promotes further locking of the tarsus by tightening the plantar fascia.<sup>8</sup>

Symptoms related with plantar fasciitis is pain with first few steps in the morning and discomfort in the inferior heel region, which is provoke on weight bearing after a period of non-weight bearing. Symptoms settle, only after period of rest and/or later in the day.<sup>9,17</sup>

The diagnosis of plantar fasciitis is usually based on clinical features, specifically pain localized on medial tubercle of calcaneus. A positive windlass test, navicular drop test and assessment of ankle range of motion are useful.<sup>15,18,19</sup>

A wide variety of management strategies have been developed to treat plantar fasciitis. Medical treatment involves non-steroidal anti-inflammatory drugs (NSAIDs), oral steroids, local corticosteroid injections, platelet rich plasma therapy, prolotherapy. Surgical management involves either open or endoscopic partial plantar fasciotomy.<sup>20,21,22,23,24</sup>

Physiotherapy application includes rest, activity modifications, shoe modifications, ice, contrast bath, stretching of calf and plantar fascia, strengthening exercises for intrinsic foot muscles, ultrasound, phonophoresis, iontophoresis, extra corporeal shock wave therapy, manual treatment include joint mobilization, taping, night splints, walking casts, arch support and orthotics.<sup>3,5,25,26,27,28</sup>

## Material and Method

Subjects were recruited from MYH department of physiotherapy after obtaining informed consent and patient general examination. A total of 47 patients are selected in this study by means of convenience sampling technique at sampling stage one. All the subjects both male and female were included and also included 25 - 60 years of age with Pain in first few steps in the morning, NPRS - 5 to 10, Plantar heel pain for more than 3 months, Pain on palpation along the proximal plantar fascia, Positive Windlass test, Reduced dorsiflexion of ankle joint, Navicular drop > 1 cm. Age group > 60 & < 25years, Undergoes prior physiotherapy treatment, High BMI, Pregnant ladies, Peripheral vascular diseases, Neurological conditions, Calcaneal stress fractures, Any foot or heel surgeries are excluded from this study.

All the subjects both male and female were included according to the set inclusion criteria, afterwards 7 were excluded, as they were not interested and having bilateral heel pain. At sampling stage two, random allocation of 20 subjects each to group A and B, i.e., Control group and experimental group were done respectively and specific physiotherapy protocol were given to the subjects. Assessment values of ankle dorsiflexion range, foot function status, navicular position was taken before the intervention and then the group A, (Control group) receives the conventional therapy

while the group B, (experimental group) receives the Tibialis posterior strengthening along with conventional therapy protocol. Ethical Clearance was the study was obtained from the ethical committee of the Mahatma Gandhi Memorial Allied health science institute Indore.

**Procedure:** All subjects had undergone two measurements, one on entry to the study (pre-test) and one after the 4 weeks of intervention period (post-test).

**Group A - Control group** (Receiving conventional therapy)

Iontophoresis with 0.4% Dexamethasone drug for 10 mins, 3 sessions per week for four weeks. 2. Stretching of calf and plantar 3. Self-release of plantar fascia with tennis Ball 4. Intrinsic foot muscle strengthening Exercises - Short foot exercises - Heel raise - Toe curls (no hold, repeat 10 times, 2 sets). FITT - 10 Repetitions / 10 secs hold/ 2 sets/ twice a day for 4 weeks.

**Group B - Experimental group** (Tibialis posterior strengthening along with conventional therapy)

1. Ankle inversion using elastic band emphasizing eccentric control
2. Side lying ankle inversion using ankle weight, emphasizing eccentric phase control
3. Single leg stance balance Activities with neutral foot positions. FITT - 15 Repetitions / 10 secs hold/ 2 sets/ twice a day for 4 weeks.

## Statistical Analysis

Descriptive and inferential statistics were implemented as statistical tools to analyse the gathered data statistically. Baseline demographic and clinical characteristics was analysed using Mean  $\pm$  Standard Deviation (Min-Max). The study differences between pre and post test score of NDT, FFI and ankle dorsiflexion ROM were analysed using parametric test and paired parametric test. Independent sample t-test was used to observe the significance of mean difference of score of NDT, FFI and ankle dorsiflexion ROM of Plantar fasciitis patients of group A and group B.

## Results

**Table 1: Demographic data (Gender) of the subjects with plantar fasciitis**

Sex	Experimental Group	Control Group	Total
Female	17	15	32
Male	3	5	8
total	20	20	40

**Table 2: Mean and standard deviation of demographic data (age) of the subjects with plantar fasciitis**

Group	N	Mean age	S.D	p- value
Experimental	20	43.5000	11.17563	0.14 (non-significant)
Control	20	39.2500	9.25587	

**Table 3: Effect of conventional therapy on Foot Function Index (FFI) of control group having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
FFI	Pre	20	55.65	9.96	12.45	<0.05
	Post	20	18.30	8.98		

**Table 4: Effect of Tibialis posterior strengthening along with conventional exercises on Foot Function Index (FFI) of experimental group having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
FFI	Pre	20	52.00	17.11	9.09	<0.05
	Post	20	10.75	10.91		

**Table 5: Effect of conventional therapy on Ankle dorsiflexion ROM of control group having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
Ankle Dorsiflexion ROM	Pre	20	10	3.97	3.56	<0.05
	Post	20	14	3.08		

**Table 6: Effect of Tibialis posterior strengthening along with conventional therapy on Ankle dorsiflexion ROM of experimental group having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
Ankle Dorsiflexion ROM	Pre	20	9.50	4.89	5.81	<0.05
	Post	20	17.50	4.44		

**Table 7: Effect of conventional exercises on Navicular drop test (NDT) of control group having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
Navicular drop test	Pre	20	1.93	0.42	1.60	>0.05
	Post	20	1.73	0.39		

**Table 8: Effect of Tibialis posterior strengthening along with conventional exercises on Navicular drop test (NDT) of experimental group having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
Navicular drop test	Pre	20	1.85	0.41	3.82	<0.05
	Post	20	1.38	0.38		

**Table 9: Comparison between effect of conventional therapy and Tibialis posterior strengthening along with conventional therapy on Foot Function Index (FFI) of patient having plantar fasciitis**

Variable	Condition	N	Mean	S.D	t-value	p-value
FFI	Control (Pre)	20	18.30	8.98	2.39	<0.05
	Experimental (Post)	20	10.75	10.91		

**Table 10: Comparison between effect of conventional exercises and Tibialis posterior strengthening along with conventional exercises on Ankle dorsiflexion ROM of patient having plantar fasciitis.**

Variable	Condition	N	Mean	S.D	t-value	p-value
Ankle dorsiflexion ROM	Control (Pre)	20	14	3.08	2.90	<0.05
	Experimental (Post)	20	17.5	4.44		

**Table 11: Comparison between effect of conventional exercises and Tibialis posterior strengthening along with conventional exercises on Navicular drop of patient having plantar fasciitis.**

Variable	Condition	N	Mean	S.D	t-value	p-value
Navicular drop	Control (Pre)	20	1.73	0.39	2.88	<0.05
	Experimental (Post)	20	1.38	0.38		

## Discussion

The purpose of the present study was to find out the effectiveness of tibialis posterior strengthening along with conventional therapy on ankle ROM, functional status and navicular position in patients having plantar fasciitis.

Total 40 patients between age group 25-60 years have fulfilled the inclusion and exclusion criteria. Patients were randomly divided into two groups in which 20 patients in each group.

Group A (20) control group, received conventional therapy and group B (20), received tibialis posterior strengthening along with conventional therapy. The patients were treated for 5 sessions per week for four weeks and changes in ankle ROM, functional status and navicular position were recorded before and after the interventions. The demographic data of our study shows the more prevalence in female subject in plantar fasciitis because of the various factors like different footwear use, pain severity, health status, physical activity schedule or social characteristics between both sexes.

In this study, the Tibialis posterior strengthening along with the conventional therapy were proved to be statistically significant effect in pain and functional status of foot, Ankle Dorsiflexion ROM and Navicular drop values in the management of

Plantar fasciitis. Tibialis posterior strengthening helps to reduce overpronation of the foot and navicular pronation, ultimately improving biomechanics of foot. It has a significant effect on decreasing the stress over the plantar fascia, which ultimately leads to normal alignment of navicular bone and appropriate biomechanics of foot.

Todd J. May et al state that between 81% - 86% of individual with Plantar fasciitis having Excessive foot pronation can lead to tibialis posterior in a lengthen positioned and are easily fatigued in an attempt to control excess motion. This causes plantar fascia and tibialis posterior become weak to restore the MLA and re-supinate the STJ before toe-off.

Hence, there will be significant effect of conventional therapy on FFI and ankle dorsiflexion ROM but the results show more significant effect of tibialis posterior strengthening along with the conventional therapy on FFI, ankle dorsiflexion ROM as well as Navicular drop position in experimental group.

## Conclusion

This study concluded that there was significant effect of tibialis posterior strengthening along with conventional therapy on foot functional status, ankle dorsiflexion ROM and navicular position in



patient with plantar fasciitis. The statistical analysis suggested that the measurement values of foot function index, ankle dorsiflexion range of motion and navicular drop value were significantly improved when the tibialis posterior strengthening along with conventional therapy were given to patients with plantar fasciitis.

**Conflict of interest:** Nil

**Source of Funding:** None

**Ethical Clearance:** Ethical committee of The Mahatma Gandhi Memorial medical allied health sciences institute (MAHSI) Indore, Madhya Pradesh, India.

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## To Assess Anxiety and Phobia in Female College Going Students for Resuming College after Covid-19 Confinement: A Pilot Study

Firdous Mohammad Ikram<sup>1</sup>, Shubha Arora<sup>2</sup>

<sup>1</sup>Pursuing MOT Paediatrics, Department of Occupational Therapy, Jamia Hamdard, New Delhi,

<sup>2</sup>Assistant Professor, Department of Occupational Therapy, Jamia Hamdard, New Delhi. Formerly: Head of Department of Occupational Therapy; DIRD, GGSIP University, Delhi.

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### Abstract

The pandemic is causing people to feel anxious, distressed, or worried due to fear of contracting the virus, isolation and quarantine measures, and fear of a long-term impact of the global disruption.

**Aim/Objective:** The aim of this study is assess fear/anxiety and avoidance in female hostel students for resuming college after COVID-19 confinement.

**Methods:** The study included 30 college going female hostel students between ages 20-25 years. Participants was assessed for level of anxiety and phobia on 24 items Liebowitz Social Anxiety Scale. Analysis of data was done using independent sample test.

**Results:** Mean and standard deviation for fear/anxiety, avoidance and total scores were (31.9 ± 6.38), (32.3 ± 7.86) and (64.2 ± 10.35) respectively. Fear/Anxiety and Total Scores reflects *P Value* ≤ 0.05 which is highly significant.

**Conclusions:** It was found Total of 30 subjects were taken out of which 70% were moderate, 13% were marked and 17% were severe anxiety/phobia. After 2.5 years of confinement, data revealed that maximum level were falling in moderate social anxiety followed by marked, whereas severe social anxiety were the least scorers. So it is aforesaid that above levels are falling in clinically significant ranges. Being Occupational Therapist, they all require treatment approach in form of counselling, creating and joining the group dynamics physically. Relaxation technology, deep breathing exercise, visual imagery can be helpful in the above.

**Keywords:** Liebowitz Social Anxiety Scale, fear/avoidance, anxiety/phobia, confinement

### Introduction

Situations commonly feared by children and adolescents include interactions with peers,

answering questions in class, public speaking, initiating conversations, attending parties or school, speaking to authority figures, and performing in front of others.<sup>1</sup> Fear of social or performance situations in

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**Corresponding Author:** Firdous Mohammad Ikram, Pursuing MOT – Paediatrics, Department of Occupational Therapy, Jamia Hamdard, New Delhi.

**Email id:** [firdousmikram@gmail.com](mailto:firdousmikram@gmail.com)

**Contact No.:** 9910898450

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which the person is exposed to unfamiliar people or to possible scrutiny is the hallmark of social phobia.<sup>2</sup> Frequent hygiene and preventive practices (such as, wearing mask, sanitizing hands, maintaining social distance, etc) are new challenges for students for resuming their activities in educational and social context that may lead to anxiety. The pandemic is causing people to feel anxious, distressed, or worried due to fear of contracting the virus, isolation and quarantine measures, and fear of a long-term impact of the global disruption.<sup>3</sup> Besides it has a burden due to deviation to offline schooling modes through online platforms like Whatsapp, Google meet or zoom web applications with minimized internet facility in remote areas, failure to manage or assist the children education from home, diminished health status of the family members with sudden pandemic attacks, and house arrest due to complete or partial lockdowns.<sup>4</sup> While anxiety is a physiological behavioural response induced by a threat to wellbeing. It is often associated with functional impairment in social and occupational domains and in daily activities.<sup>5</sup> These changes and new measures of COVID-19 concern access to almost all activities of daily living, accessing resources, mobility, communication, social isolation, displacement, work, education with consequences on and changes in the way they use and access occupations.<sup>6</sup> Liebowitz social anxiety scale is a comprehensive scale that measures both fear and avoidance of the types of situations which students may commonly experience.<sup>7</sup> Henwood A9 did a study and found that Reduced-overall-interaction (digital and in person) was found to predict faster avoidance relative to approach of sad faces. The results suggest that automatic approach-avoidance tendencies may function to counterbalance the negative impacts of reduced social interaction, with important implications for understanding public resilience during time of crisis, and beyond. This thought process encouraged us to do the study on "To assess anxiety and phobia in female college going students for resuming college after COVID-19 confinement". Occupational therapy scope of practice for addressing depressive and anxiety symptoms in the physical disability in In Patient Rehabilitation setting primarily includes cognitive and behavioural strategies.<sup>8</sup> Occupational therapists are experts in ADLs and IADLs task analysis and they use

modifications, adjustments and special approaches and techniques.<sup>6</sup> The objective of the study is "To assess anxiety and phobia in female hostel students for resuming college after COVID-19 confinement". When the subjects were exposed to their friends' circle after 2.5 years of COVID-19 confinement at home that leads to variation in group dynamics (such as social interaction, gestural communication, expressive language) that will affect daily living activities (such as eating in public). The symptoms related to anxiety can be emotional (irritability, nervousness, restlessness), cognitive or behavioural (trouble in making decision and memory problems) and physical problems (shortness of breath, fatigue, sleeplessness and high blood pressure). These affects psychic of the subjects and leads to fear/anxiety and avoidance when subjects will be in real life situation, that felt in need to do the study.

## Methods

The pilot study included 30 college going female hostel students between ages 20-25 years, after the confinement of 2.5 years post covid. The sample was selected conveniently, and the research design was observational study. The study was explained to the participants and consent forms were taken from each participant who were interested in the study. Subjects addressed their level of fear/anxiety and avoidance on 24 items self-report "Liebowitz Social Anxiety Scale" which evaluated symptoms experienced in past week while resuming college after COVID- confinement. The data was prepared on excel sheet and was analysed using SPSS software. "Independent sample test" was used for evaluating the significant levels.

## Results

### 1. Basic Characteristics:

30 female hostel Students participated in the study. Liebowitz Social Anxiety Scale was given to each participant for the assessment.

### 2. To assess anxiety and phobia in female hostel students for resuming college after COVID-19 confinement:

The study was focused on mainly two variables (1) Fear/Anxiety and (2) Avoidance

on different parameters. The mean and standard deviation were analysed for both the variables as reflected in Table 1.

**Table 1: Mean and the standard deviation of fear/ anxiety, avoidance and total scores of Liebowitz Social Anxiety Scale.**

	Mean	Standard Deviation
Fear/Anxiety	31.9	±6.38
Avoidance	32.3	±7.86
Total	64.2	±10.35

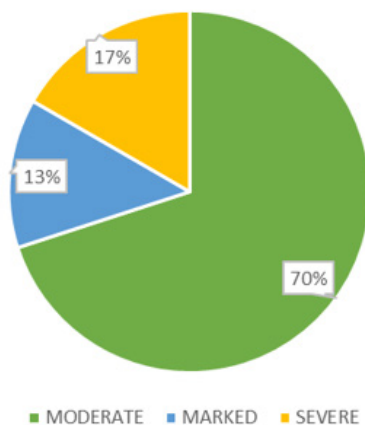
3. Data collected was analysed is represented in Table 2.

**Table 2: Participants’ range of total scores of Liebowitz Social Anxiety Scale.**

Range	Participants
Moderate	21
Marked	4
Severe	5
Total	30

4. Percentage of values as per data analysed according to Liebowitz Social Anxiety Scale is depicted in Graph 1.

Percentage for Total Scores of Liebowitz Social Anxiety Scale



**Graph 1: Participants’ percentage for total scores of Liebowitz Social Anxiety Scale.**

5. **Significance Value:**

“Independent Sample Test” was applied to

both Variables (fear/anxiety and avoidance), *F and P value* was calculated as Illustrated in Table 3.

**Table 3: Results from “Independent Sample Test”.**

	F Value	Significance
Anxiety	9.1	.005*
Avoidance	1.7	.193
Total	23.5	.000*

Fear/ Anxiety and Total Scores reflects *P Value* ≤ 0.05\* which is highly significant\*, whereas Avoidance *P Value* was. 193 which was greater than 0.05.

### Discussion

30 subjects were taken as per inclusion criteria. The self-report Liebowitz Social Anxiety Scale was given to each participant for evaluating the fear/ anxiety and avoidance levels which revealed out of 30 participants, 21 were moderate, 4 were marked, whereas 5 participants were having severe social anxiety having *p value* for total score 0.00 which is highly significant.

Henwood A<sup>9</sup> did a study and found that Reduced-overall-interaction (digital and in person) was found to predict faster avoidance relative to approach of sad faces. The results suggest that automatic approach-avoidance tendencies may function to counterbalance the negative impacts of reduced social interaction, with important implications for understanding public resilience during time of crisis, and beyond.

Mohamad H. Itani<sup>5</sup>, did a study on “Severe Social Anxiety Among Adolescents During COVID-19 Lockdown”. A total of 178 adolescents attending the private clinics of the authors were screened online for the presence of SSA, by using the self-reporting format of the Liebowitz Social Anxiety Scale for children and adolescents (LSASCA). The 18% of participants had SSA, no correlation was found between having SSA and acknowledging or fearing the COVID-19 morbidity. Factors associated with SSA included texting, using social media, and playing video games during the lockdown. Mitigating factors include high family socioeconomic status, history of socialization with friends, and the use of WhatsApp as a source of information about COVID-19 infection.

Klaudia Paula Czorniej<sup>11</sup>, studied on "Assessment of Anxiety disorders in students starting work with coronavirus patients during a pandemic in Podlaskie province, Poland". Their study involved 255 students from Poland starting work with coronavirus patients during the pandemic, using the Liebowitz Social Anxiety Scale (LSAS) and the State-Trait Anxiety Inventory (STAI). Results revealed that Fifty-one percent of subjects demonstrated symptoms of mild to severe social phobia. Level of trait anxiety among students correlated significantly with age and gender (females). The level of social anxiety in the evaluated students was significantly correlated with marital status, the self-assessment of the experienced fear, self-perceived health status, having had a coronavirus infection, fear of deterioration of one's health after starting work with coronavirus patients, and fear of contracting the disease while working with coronavirus patients, and using tranquilizers. Level of state anxiety significantly correlated with state anxiety, the self-assessment of professional preparedness for work with coronavirus patients, self-perceived health status, vaccination against coronavirus, and the assistance of a psychiatrist in the past.

Cao W<sup>10</sup>, studied "The psychological impact of the COVID-19 epidemic on college students in China" and received 7,143 responses. Results indicated that 0.9% of the respondents were experiencing severe anxiety, 2.7% moderate anxiety, and 21.3% mild anxiety. Moreover, having relatives or acquaintances infected with COVID-19 was a risk factor for increasing the anxiety of college students (OR = 3.007, 95% CI = 2.377 - 3.804). Results of correlation analysis indicated that economic effects, and effects on daily life, as well as delays in academic activities, were positively associated with anxiety symptoms ( $P < .001$ ). hence, their study suggested that the mental health of college students should be monitored during epidemics.

### Conclusion

Total of 30 subjects were taken out of which 70% were moderate, 13% were marked and 17% were severe anxiety/phobia. After 2.5 years of

confinement, data revealed that maximum level were falling in moderate social anxiety followed by marked, whereas severe social anxiety were the least scorers. So it is aforesaid that above levels are falling in clinically significant ranges. Being Occupational Therapist, they all require treatment approaches in form of counselling, creating and joining the group dynamics physically. Relaxation techniques, deep breathing exercises, and visual imagery can be helpful in the above.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** It was observational study, in community.

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## Correlation Between Body Mass Index and Cardiorespiratory Fitness in Young Healthy Males

G. Jency Thangasheela<sup>1</sup>, V. Karthik<sup>2</sup>, A.Sathishkumar<sup>3</sup>

<sup>1</sup>Professor, Cherraans College of Physiotherapy, Department of Orthopaedics, <sup>2</sup>Professor, Cherraans College of Physiotherapy, Department of Cardio-Respiratory, <sup>3</sup>MPT Final year, Cherraans College of Physiotherapy.

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### Abstract

**Background:** Increased body fatness as predicted by body mass index is an additional factor for developing cardiovascular diseases.

**Objective:** The objective of this study was to determine the cardiorespiratory fitness in terms of VO<sub>2</sub> max in young healthy males and to study the relation between body mass index and cardiorespiratory fitness.

**Methodology:** 50 young healthy male subjects in the age group of 18 to 22 years were included in this study group. Body mass index was measured as weight (in kilograms) divided by height (in meters) squared. Cardio respiratory fitness in terms of VO<sub>2</sub> max was assessed by following the protocol of Queen's College Step Test (QCT).

**Results:** There was a significant negative correlation between body mass index (BMI) and VO<sub>2</sub>max (ml/kg/min) ( $r = -0.890$ ).

**Key words:** Body mass index, cardio respiratory fitness, vo<sub>2</sub> max.

### Introduction

Physical fitness is measure of proper functioning of cardiovascular, respiratory, neuro endocrine, muscular and haemato circulatory system. Physical fitness, daily routine physical activity and task oriented physical exercises are outcome of integrated functioning of all bodily system. Hence, when physical fitness is checked, the functional status of all system is actually being assessed. Due to this reason

physical fitness is considered as very useful health markers.<sup>5</sup>

Cardio respiratory fitness is a powerful predictor of cardiovascular and all-cause mortality. Low aerobic fitness is one of the modifiable cardiovascular risk factor. Effect of body fatness and leanness with aerobic fitness has remained unexplored. Body composition parameters affect cardiovascular fitness.<sup>12</sup>

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**Corresponding Author:** G. Jency Thangasheela, Professor, Cherraans College of Physiotherapy, Department of Orthopaedics.

**Email id:** [macklinjency@gmail.com](mailto:macklinjency@gmail.com)

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Cardiovascular fitness is different in individual with different body mass. Lean individual with high body fat is very common trend in India. In lean individual, high mortality is seen in association with smoking and other diseases. Cardio respiratory fitness should be assessed to check association between body composition and mortality. Overweight and obesity have increased very fast in India in last few decades.<sup>11</sup>

Cardiovascular mortality is very common in overweight and obese. Unwanted premature cardiovascular deaths are also common in lean individual. Body mass index is commonly used tool to check all cause morbidity and mortality<sup>2,3,4</sup>. In obese individuals, more body weight is seen for particular height but fat mass and fat free mass are ignored. Increased body mass index reflects high body fat and fat free mass and they have different association with cardiovascular fitness.<sup>15</sup>

Cardio respiratory fitness can be measured in terms of VO<sub>2</sub> max (ml/kg/min). It measures the capacity of the body to utilize oxygen. Assessing VO<sub>2</sub> max in children and adolescents is very important to determine the cardiovascular, metabolic and musculoskeletal risk factors in adult life. Clinical trials have shown that atherosclerosis which is a major cardiovascular complication begins in childhood and leads to adulthood mortality. High VO<sub>2</sub> max shows that the child is free of cardio metabolic complications in later life and a low VO<sub>2</sub>max in childhood suggests that the child is prone for high cardiovascular risk profile.<sup>16</sup>

There is evidence that cardio respiratory fitness and physical activity significantly reduce cardiovascular risks in adults. A better understanding of the association between cardio respiratory fitness, physical activity, and childhood obesity is vital in assessing. The benefits of interventions to prevent obesity.<sup>9</sup>

The body composition was done with light weight of clothing. The body weight was recorded in kilograms on an empty bladder on a standard weighing machine. The body weight was recorded bare footed to the nearest 0.1 kg. The height was measured using meter scale without footwear to the nearest 0.1 cm. BMI was calculated as the weight (kg)

divided by the square of height (m<sup>2</sup>). Total body fat percentage (TBF %) and visceral fat were assessed by bioelectrical impedance technique using Omron HBF-302, a body fat monitor. Fat mass was calculated on the basis of total body fat percentage into body weight. Fat free mass was calculated by subtracting fat mass from total body weight. FMI was calculated as the FM (kg) divided by the square of height (m<sup>2</sup>). FFM was calculated by deducting FM from the body weight, and FFMI was calculated as the FFM (kg) divided by the square of height (m<sup>2</sup>).

The body mass index corresponding to weight in kg, height in m<sup>2</sup> and is a good marker of malnutrition present in the majority of existing nutritional screen for calculating the BMI one not only have to measure the height and weight of individuals but also have to do mathematical calculation.

Measure in the height and weight in the field visits in rural areas cumbersome job. BMI measurement require a trained work staff carrying instruments such as weighting scale and stadiometer in the field survey are also not smooth in terms of logistics.

The relationship between body mass index, cardio respiratory and musculoskeletal fitness has not been well explored, particularly in males.

### **Aim of the Study**

The aim is to find out the correlation relation between body mass index and cardiorespiratory fitness in young healthy males.

### **Need for Study**

Low cardio respiratory fitness in young adults has emerged as an important factor for developing cardiovascular co morbidities later in middle age, so we are in the need to do further research in this study.

### **Objectives of the Study**

To find the relation between the body mass index and cardiorespiratory fitness in young healthy males.

### **Materials and Methodology**

**Study Design:** Correlation Study

**Study Setting:** Cherraan's college of physiotherapy

**Study Samples:** 50 subjects including male college students

### Materials and Tools

- Body mass index
- Cardio-respiratory fitness

### Materials

- Pen / pencil, to note down the measurement
- Paper with measurement table
- Inch tape
- Stadiometer
- Class 3 electronic weight measuring machine
- Calculator
- Finger type pulse-oximeter

### Criteria for Selection of Subjects

The study group comprised of 100 young healthy males in the age group of 18 to 22 yrs.

### Inclusion Criteria:

- Males
- Age between 18-22 yrs.
- Otherwise healthy

### Exclusion Criteria:

- Male subjects below 18 and above 22 yrs
- History of cardiac disease
- History of lung disease
- Smoking
- Not on regular medications affecting cardiovascular and respiratory system
- Not undergoing any physical conditioning programmes

### Procedure

50 subjects were selected from the young healthy males between the age group of 18-22. After explaining the procedure, consent was obtained. Before, to start the procedure, heart rate was measured by using queen's college step test, after that procedure, again heart rate was measured. Pre and post heart rate were compared. Statistical analysis were done by using correlation method.

### Data Presentation and Analysis

Statistical analysis were done by using correlation method

**Table 1:**

S No	Parameter	Means
1	Body mass index	23.0168
2	Cardio respiratory fitness	72.84

Correlation between body masss index and cardiorespiratory fitness in young healthy males. (Age group 18-22)

**Table 2:**

S.No	BMI (X)	Heart rate (Y)
1	22.24	83
2	26.2	70
3	17.3	70
4	20.3	71
5	18.6	70
6	26.3	70
7	18.9	70
8	24.9	71
9	22.7	73
10	23.2	78
11	22.1	70
12	21.9	70
13	28.8	70
14	21.9	70
15	24.4	70
16	21.6	70
17	24.3	70
18	23.9	70
19	28	70
20	21	70
21	24.2	78
22	23.6	70
23	21.7	70
24	24.4	70

S.No	BMI (X)	Heart rate (Y)
25	19.5	70
26	20.8	73
27	33.2	72
28	24.9	71
29	23.2	72
30	21.1	73
31	18.8	73
32	24.4	70
33	21.2	71
34	25.5	71
35	23	73
36	21.1	70
37	18.2	71
38	18.9	73
39	24.6	70
40	23.2	73
41	22.1	71
42	21.9	70
43	28.8	70
44	21.4	72
45	23.6	70
46	24.4	73
47	21	73
48	24.4	70
49	25.5	73
50	23.5	70
Total	1150.84	3642

Correlation between Body mass index and cardio respiratory fitness in healthy males CORELLATION COEFICIENT = - 0.890

This implies that there is a NEGATIVE CORRELATION between body mass index and cardio respiratory fitness. Null hypothesis is accepted.

### Result

There was significant negative correlation between body mass index and vo2 max-  $r = -0.890$

### Discussion

**LAKMI CC, UDAYAIB, VINUTHA SHANKAR S** In this study there was a significant One hundred young healthy male subjects in the age group of 18 to 22 years were included in this study group. Body mass index was measured as weight (in kilograms) divided by height (in meters) squared. Cardio respiratory fitness in terms of VO<sub>2</sub> max was assessed by following the protocol of Queen's College Step Test (QCT). There was a significant negative correlation between body mass index (BMI) and VO<sub>2</sub>max (ml/kg/min) ( $r = -0.48, p < 0.01$ ). The results suggest the striking effect of body fat on cardiorespiratory functions. Excessive amount of body fat exerts an unfavourable burden on cardiac function and oxygen uptake by working muscles. Low cardio respiratory fitness in young adults with increased body fat could be a factor for developing cardiovascular co morbidities later in middle age

**SANTU DHARA AND KALLOL CHATTERJEE** Within the limitation of the present study the following Conclusions were drawn on the basis of obtaining results. In this study there were very low positive co-relation was exist on VO<sub>2</sub> max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students, but the value was not so correlated that a significance difference can be possess. The scholar is greatly satisfied to mention that the findings have accomplished the purpose for which the study was initially conceptualized. The study done by 'Sports Medicine Program Faculty of Medicine Universities Indonesia', In the year of 2012 it was held in Gelora Bung Karno (GBK) Jakarta, Fitness Challenge is a serial fitness tests held annually including BMI and cardio respiratory endurance examination mass index (BMI) and VO<sub>2</sub> max (ml/kg/min) ( $r = -0.48, p$  In this study there was a significant Negative correlation between body mass index and vo2max( ml/kg/min) ( $r = -0.48, p < 0.01$ )

**APARNA KONDAPALLI ,DR GANPAT DEVPURA, DR MANOHAR ,SARAVANTH PERAKAM** In this study : This is a cross sectional study involving 60 girls with an age group of 14 -16 years and were categorized into 3 groups (n=20) based on their BMI and WHR. All three groups

were assessed for Cardio respiratory fitness using 20m shuttle run test. Results: The data was analyzed using ANOVA and ( $P < 0.05$ ) in all the 3 groups. This suggests the significant difference of VO<sub>2</sub>max in all the 3 groups. There is negative correlation between body mass index and vo<sub>2</sub> max

In this study there was a significant negative correlation between body mass index and vo<sub>2</sub> max CORELLATION COEFICIENT = (- 0.890). This implies that there is a NEGATIVE CORRELATION between body mass index and cardio respiratory fitness. Null hypothesis is accepted.

### Conclusion

From the data presentation and analysis it is evident that the body mass index and cardio respiratory fitness is negatively correlated.

**Ethical clearance**> Taken from... CHERAN COLLEGE OF PHYSIOTHERAPY ETHICAL... committee

**Source of funding:** Self.

**Conflict of Interest:** NIL.

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# A Comparative Study on Effect of Non-Ballistic Active Knee Extension in Neural Slump Position Versus Post Isometric Relaxation Techniques on Hamstring Flexibility in Sedentary Workers

Gautami Bhutada<sup>1</sup>, Sucheta Golhar<sup>2</sup>, Anant A. Takalkar<sup>3</sup>

<sup>1</sup>Postgraduate Student, Musculoskeletal Physiotherapy, <sup>2</sup>Principal and Professor, PES Moderna College of Physiotherapy, Pune, Maharashtra, <sup>3</sup>Professor Community Medicine department, MIMSR Medical College, Latur, Maharashtra.

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## Abstract

**Introduction:** Flexibility is the ability to move single joint or series of joints smoothly and easily through an unrestricted, pain free ROM. Adequate flexibility is an important characteristic of physical and health related fitness.

**Objective:** To find out the effect of Non-Ballistic Active Knee Extension in Neural Slump Position versus Post Isometric Relaxation techniques on hamstring flexibility in sedentary workers assessed using Active Knee Extension (AKE) test and Sit and Reach Flexibility test at the end of 3 weeks of intervention.

**Methodology:** The present experimental study was carried out in sedentary workers having hamstring tightness (age group of 30 to 50) at musculoskeletal physiotherapy department at PES Moderna College of Physiotherapy, Pune.

**Results:** Majority of the patients in group A were from 36-40 years age group i.e. 14(31.1%). Majority of the patients in group B were from 30-35 years age group i.e. 18(40%). Hamstring flexibility of right leg and left leg are comparable at the end of 3 weeks. Post intervention hamstring flexibility using Sit and Reach in both legs are comparable at the end of 3 weeks.

**Conclusion:** Both non-ballistic active knee extension in neural slump position versus post isometric relaxation technique's along with conventional treatment are equally effective in improving hamstring flexibility in sedentary workers.

**Keywords:** Non-Ballistic active knee extension, post isometric relaxation techniques, hamstring flexibility, sedentary workers.

## Introduction

Flexibility is the ability to move single joint

or series of joints smoothly and easily through an unrestricted, pain free ROM. Muscle length in

**Corresponding Author:** Anant A. Takalkar, Professor Community Medicine department, MIMSR Medical College, Latur, Maharashtra.

**Email id:** [ananttakalkarpsm@gmail.com](mailto:ananttakalkarpsm@gmail.com)

conjunction with joint integrity and extensibility of periarticular soft tissues determine flexibility. <sup>(1)</sup> For normal biomechanical functioning, flexibility is considered as the most essential element. <sup>(2)</sup> Muscle flexibility will allow muscle tissue to accommodate to imposed stress easily and allow efficient and effective movement. <sup>(3)</sup>

In normal healthy individuals, muscular tightness is the most common disorder because of postural malalignment, muscle imbalances, impaired muscle performance and sedentary lifestyle. <sup>(4)</sup> Hamstrings are long and powerful group of muscles that span the back of the thigh. Most people have short hamstrings as a result of spending a long time seated every day. <sup>(5)</sup> Adequate flexibility is an important characteristic of physical and health related fitness. Lack of flexibility is associated with problems in executing and sustaining various activities in daily life. <sup>(5)</sup> Importance of flexibility as a component of health-related fitness is related to prevention of orthopaedic impairments later in life, especially lower back pain. Flexible muscles permit proper pelvic rotation, decrease disc compression, and avoid excessive stretch of musculatures. <sup>(5)</sup>

The sedentary work nature has been the root cause for a variety of musculoskeletal disorders and discomforts which are broadly classified under the umbrella of Work-Related Musculoskeletal disorders (WRMSD). WRMSDs are disorders of the muscles, skeleton and related tissues which have been caused by a work place activity (particularly a repetitive activity). The common musculoskeletal symptoms reported are pain (55%) stiffness (14.8%) and the common sites affected are neck (44%), low back (30.5%), wrist/hand (19%) and shoulder (12.5%). <sup>(5)</sup>

Pradip B et al stated that 96.7% of people having tight hamstring in prolonged desk job doing IT professionals at South Bangalore. As desk job workers develop tightness of hamstring which make them prone to low back pain or other symptoms associated with back or hip, prolonged hours of sitting, work without breaks. <sup>(6)</sup>

By increasing the length of the hamstring muscles, the aim is to minimize further load/stress on the lumbar spine and increase the contribution of the hip to lumbo-pelvic motion. <sup>(7)</sup> Conventionally, stretching

exercises targeting the hamstring muscle extensibility are employed to treat hamstring tightness 9/6 mainly the static stretch. <sup>(8)</sup>

Slump stretch is neurodynamic test which is used to evaluate the dynamics of the neural structures of the central and peripheral nervous system from head, along the spinal cord, and sciatic nerve tract and its extension in the foot. <sup>(9)</sup>

So, the present study was carried out to find out effect of Non-Ballistic Active Knee Extension in Neural Slump Position versus Post Isometric Relaxation techniques on hamstring flexibility in sedentary workers assessed using Active Knee Extension (AKE) test and Sit and Reach Flexibility test.

## Objective

To find out the effect of Non-Ballistic Active Knee Extension in Neural Slump Position versus Post Isometric Relaxation techniques on hamstring flexibility in sedentary workers assessed using Active Knee Extension (AKE) test and Sit and Reach Flexibility test at the end of 3 weeks of intervention.

## Materials and Methods

**Sample Population:** Sedentary workers having hamstring tightness (age group of 30 to 50) were included.

**Study setting:** PES Moderna College of Physiotherapy, Pune

**Sample size:** Total 90 cases. 45 patients in each group. Group A (Conventional + Non ballistic active knee extension in neural slump position) and Group B (Conventional + Post isometric relaxation technique in neural slump position)

**Sampling Technique:** Simple Random Sampling method

### Inclusion criteria

- Both Males and Females
- Healthy individuals in the age group of 30- 50 years with bilateral hamstring tightness
- Individuals having hamstring tightness i.e., knee flexion angle >15°
- Working with a desk job for a minimum of 5-8 hours. <sup>(6)</sup>

- Worked in a sitting job for at least 7 consecutive years.<sup>(6)</sup>

#### Exclusion criteria

- History of any recent musculoskeletal injuries like fractures, dislocation, or any soft tissue injuries in past 6 months.<sup>(6)</sup>
- Presence of tumour that can restrict ROM at hip and knee joint.<sup>(2)</sup>
- Any congenital deformity of lower limb.<sup>(6)</sup>
- History of trauma (acute or chronic) of lumbar spine, pelvis, hip and knee.<sup>(2)</sup>

#### Method of data collection

The ethical clearance was obtained from the Institutional Ethical committee. The participants who satisfy the study criteria were enrolled and briefed about the study. An informed consent was taken from each participant in the study in the language best understood to them. The participants were divided using odds and evens method into two groups i.e. Group A and Group B where Group A received Non-Ballistic Active knee extension in neural slump position along with Conventional treatment while Group B were treated with Post isometric relaxation technique along with Conventional treatment. Pre-intervention scores for hamstring tightness were measured in the first session. Active Knee Extension (AKE) Test, Sit and Reach Flexibility Test were taken. Both the groups were assessed and treated thrice a week for 3 weeks. Post intervention scores for Active Knee Extension (AKE) Test, Sit and Reach Flexibility test were measured at the end of 3 weeks.

Group A- non-ballistic active knee extension in neural slump position

Participants were in sitting position on the table at a height which didn't allow the foot contact with the floor with thighs supported, leg flexed and popliteal fossa touching the table edge, maintaining the cervical and thoracolumbar flexion by interlocking both hands behind the neck. Participants were then be instructed to perform 30 repetitions maintaining the full dorsiflexion, up to the point where resistance or stretch felt and will held this position for the self-count of one, two, three, four by the patient. This

technique was done thrice weekly for a period of 3 weeks.

Group B: post isometric relaxation technique.

Participants were in supine lying with contralateral hip and knee in semi flexed position. The leg to be treated were fully flexed at hip and knee, and then extended until the restriction barrier were identified. The calf of the treated leg were placed on the shoulder of the therapist for e.g. right leg on right shoulder. The participant were then be instructed to gently bend the knee against the resistance (here the counterforce were given by the therapist's shoulder) starting slowly and using only sub maximal strength. Inhale, and slowly built up an isometric contraction; hold the breath during the 7-10 sec of contraction. Release the breath as slowly cease the contraction. This position was held for 10-15 sec. During the second exhalation legs were straightened at the knee towards its new barrier. Procedure was repeated two more times and thrice weekly for a period of 3 weeks.

Conventional protocol:

Conventional treatment was given to both the groups. Participants perform static stretch in modified Hurdler's position by flexing forward from the hips and maintaining the spine in the neutral position. Stretch was maintained for 30 seconds until the stretch sensation was felt in the posterior thigh, knee or calf. Three repetitions of static stretch were given with the interval of 5 second in between each stretching session.

#### Statistical analysis plan:

Data were collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 22.0 IBM USA. Qualitative data were expressed in terms of proportions. Quantitative data were expressed in terms of Mean and Standard deviation. Descriptive statistics of each variable were presented in terms of Mean, standard deviation, standard error of mean. Comparison of mean and SD between two groups were assessed by using paired t test. A p value of <0.05 were considered as statistically significant whereas a p value <0.001 were considered as highly significant.

**Results**

**Table 1: Distribution according to age group**

		Group A		Group B	
		Frequency	Percent	Frequency	Percent
Age group	30-35	13	28.9	18	40
	36-40	14	31.1	8	17.8
	41-45	8	17.8	8	17.8
	46-50	10	22.2	11	24.4
	Total	45	100	45	100

We included total 45 patients in each group. Majority of the patients in group A were from 36-40 years age group i.e. 14(31.1%) followed by 13 (28.9%) from 30-35 years, 10(22.2%) from 46-50 years and 8(17.8%) were from 41-45 years age

group. Majority of the patients in group B were from 30-35 years age group i.e. 18(40%) followed by 11(24.4%) from 46-50 years age group and 8 each i.e. 17.8% were from 36-40 years and 41-50 years age group respectively.

**Table 2: Comparison of mean age between Group A and Group B**

Group		N	Mean	Std. Deviation	t	p	Inference
Age	Group A	45	39.49	6.31	0.049	0.961	Not significant
	Group B	45	39.42	6.57		(>0.05)	

Mean age of the patients in Group A was 39.49±6.31 years and in Group B was 39.42±6.57 years. When we compared the mean age between two

groups, the difference was not significant. It means both the groups were comparable with respect to age group.

**Table 3: Comparison of mean hamstring flexibility of right leg using AKE test between Group A and Group B**

Group		N	Mean	Std. Deviation	t	p	Inference
Hamstring flexibility Right Leg post intervention	Group A	45	18.80	3.83	-0.043	0.933	Not significant
	Group B	45	18.84	5.72		(>0.05)	

We assessed the hamstring flexibility of right leg. Mean hamstring flexibility in Group A was 18.80±3.83 and in Group B was 18.84±5.72. When we compared the mean difference in the hamstring flexibility

between two groups, the difference was found to be statistically not significant. It means both the groups are comparable at the end of 3 weeks.

**Table 4: Comparison of mean hamstring flexibility of left leg using AKE test between Group A and Group B**

Group		N	Mean	Std. Deviation	t	p	Inference
Hamstring flexibility Left Leg post intervention	Group A	45	20.22	5.07	-0.097	0.92	Not significant
	Group B	45	20.33	5.73		(>0.05)	

We assessed the hamstring flexibility of left leg. Mean hamstring flexibility in Group A was 20.22±5.07

and in Group B was 20.33±5.73. When we compared the mean difference in the hamstring flexibility



between two groups, the difference was found to be statistically not significant. It means both the groups are comparable at the end of 3 weeks.

**Table 5: Comparison of post intervention HAMSTRING FLEXIBILITY (Sit and Reach Test) in Group A and Group B**

Group	N	Mean	Std. Deviation	t	p	Inference
Hamstring flexibility post intervention	Group A	45	30.91	-3.679	0.06	Not significant
	Group B	45	34.53		1.20	

Mean post intervention hamstring flexibility using Sit and Reach in Group A was 30.91±1.31 and in Group B was 34.53±1.20. When we compared the mean difference in the hamstring flexibility

between two groups, the difference was found to be statistically not significant. It means both the groups are comparable at the end of 3 weeks.

**Table 6: Comparison of difference of HAMSTRING FLEXIBILITY (Sit and Reach Test) in Group A and Group B**

Group	N	Mean	Std. Deviation	t	p	Inference
Hamstring flexibility pre and post difference	Group A	45	6.04	-5.487	0.098	Not significant
	Group B	45	7.27		1.91	

MeanSit and Reach (pre and post difference) in Group A was 6.04±1.93 and in Group B was 8.27±1.91. When we compared the mean difference between two groups, the difference was found to be statistically significant. It means Sit and Reach (pre and post difference) was more in Group B as compared to Group A in our study. There was significant difference with p value 0.001 when compared non-ballistic active knee extension test and post-isometric relaxation technique for Left Leg hamstring flexibility in sedentary workers (age 30 to 50 years) at the end of 3 weeks.

received Post-Isometric Relaxation technique with Conventional treatment for 3 weeks.

### Discussion

The present study was undertaken with the intention to see the effect of Non-Ballistic Active Knee Extension in Neural Slump Position as compared to Post Isometric Relaxation Technique on Hamstring Flexibility by measuring popliteal angle taken by using AKE test and Sit and Reach test in Sedentary Workers in the age group between 30 to 50 years.

The probable reason of reduced knee flexion angle post neural stretch can be attributed to the improved physiological functions of nervous system, including improved axoplasmic flow and vascular perfusion and reduced neuromeningeal mechano-sensitivity. According to Shaclok, Damaged or inflamed nerves leads to increase in mechano-sensitivity which is a direct response to mechanical loading of the neural structures.<sup>(10)</sup>

My study is supported by Roberto Mendez-Sanchez et. al. in 2010 in which they have attributed improved lower quadrant mobility post neurodynamic intervention to the decrease in neural mechano-sensitivity, and states that the subgroup of patients with hamstring strain that have neural tissue involvement, benefit from adding neural mobilization techniques to the rehabilitation program.<sup>(11)</sup>

In this study total of 90 sedentary workers were included with 45 in each group. Group A received Non-Ballistic Active Knee Extension in Neural Slump Position with Conventional treatment while Group B

Study done by Cornelius, W.L Rauschuber, M.R found that an isometric contraction greater than 6 seconds up to 10 seconds was sufficient to produce desired outcome. This is followed by the 2 nd phase, where the muscle was held in relaxed position for

7 to 10 seconds and then knee was passively stretched to new barrier and held for 30 seconds. After a phase of isometric contraction, the muscle would show an increased flexibility due to decreased resting tension which was due to the post contraction inhibition of alpha motor neuron and/or by reduced motor neuron excitability. In Post-isometric relaxation technique, a strong muscle contraction against equal counterforce triggers the Golgi tendon organ. The afferent nerve impulse from the GTO enters the dorsal root of spinal cord and meets with an inhibitory motor neuron and therefore prevents further contraction, the muscle tone decreases which in turn results in agonist relaxing and lengthening.<sup>(12)</sup>

### Conclusion

The present study concluded that both non-ballistic active knee extension in neural slump position versus post isometric relaxation technique's along with conventional treatment are equally effective in improving hamstring flexibility in sedentary workers.

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**Conflict of Interest:** Nil

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## Comparison of Integrated Neuromuscular Inhibition Technique versus Myofascial Release of Upper Trapezius on Neck Range of Motion and Dysfunction in Individuals with Nonspecific Neck Pain

Heena Dhama<sup>1</sup>, Jaspreet Kaur<sup>2</sup>, Manharleen Kaur<sup>3</sup>

<sup>1</sup>MPT Orthopedics Student, ASIMSR, Ludhiana, Baba Farid University of Health Sciences, Faridkot, Punjab, <sup>2</sup>Associate Professor, Department of Orthopedics, ASIMSR, Ludhiana, Baba Farid University of Health Sciences, Faridkot, Punjab, <sup>3</sup>Associate Professor, Department of Sports, ASIMSR, Ludhiana, Baba Farid University of Health Sciences, Faridkot, Punjab.

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### Abstract

**Background:** Nonspecific Neck Pain is caused by assumption of faulty neck posture for prolonged period of time, resulting in overuse of Upper Trapezius and development of Trigger Points in the muscle. This study evaluated the effect of Integrated Neuromuscular Inhibition Technique and Myofascial Release of Upper Trapezius on Neck Range of Motion and Dysfunction in individuals with Nonspecific Neck Pain.

**Materials and Method:** Based on Inclusion and Exclusion criteria 60 individuals with nonspecific neck pain of age group 25-40 years were assessed & selected by purposive sampling and informed consent were taken. The subjects were divided into three groups of 20 each. Group A (Control Group) was given Conventional treatment as Hot Pack over the Upper Trapezius muscle and Neck mobility exercises. Thereafter Group B (Experimental Group 1) received Integrated Neuromuscular Inhibition Technique & Conventional treatment and Group C (Experimental Group 2) subjects were given Myofascial Release & Conventional treatment on Upper Trapezius muscle for total 6 sessions as 3 sessions a week for 2 weeks respectively. Pretest and Post test data for the 3 groups were evaluated for Neck Range of Motion by using Universal Goniometer and Neck Dysfunction by using Neck Disability Index respectively. The data was collected, compiled and analyzed.

**Results:** There were significant differences in pre and post scores of Group B (INIT) and Group C (MFR) when paired t-test was applied. However, Group A (control group) didn't show any improvement significantly. When these groups are compared using unpaired t-test, all showed significant differences. Group B demonstrated more improvement than Group C and Group A. Whereas, when Group C and Group A were compared, Group C showed significant improvement than Group A.

**Conclusion:** The study concluded that Integrated Neuromuscular Inhibition Technique is better than Myofascial Release on Upper Trapezius muscle in improving Neck Range of Motion and Dysfunction in Individuals with Nonspecific Neck Pain.

**Keywords:** Nonspecific neck pain; upper trapezius; neck dysfunction

**Corresponding Author:** Heena Dhama, MPT Orthopedics Student, ASIMSR, Ludhiana, Baba Farid University of Health Sciences, Faridkot, Punjab.

**Email id:** [heena.dhama01@gmail.com](mailto:heena.dhama01@gmail.com)

## Introduction

Neck pain is one of the most common musculoskeletal disorders in the general population as mentioned by Fejeret al<sup>1</sup>. Roughly two thirds of the general population have neck pain at some time in their lives and the prevalence is highest in middle age as mentioned by Jyotsna et al<sup>2</sup>. "Nonspecific Neck Pain" is defined as simple neck pain without a specific underlying disease causing the pain, which results from postural and mechanical causes. The non-specific neck pain commonly seen in people involved in occupation like computer processing, students, sedentary life style etc. as mentioned by Alberto De Vitta et al.<sup>3</sup>. Aetiological factors are poorly understood and are usually multifactorial, including poor posture, anxiety, depression, neck strain, and sporting or occupational activities as mentioned by Binder.<sup>4</sup>

The upper trapezius muscle, which spans the neck and shoulder, contributes to normal cervical vertebra and scapula motion as mentioned by Johnson et. al.<sup>5</sup>.

The upper trapezius being a postural muscle is highly susceptible to overuse. Interruptions of low frequency in the muscle activity during repetitive tasks are associated with future development of neck pain. Muscle spasm keeps the muscle continuously in contraction and this overload creates knot in the muscle. These are known as trigger points leading to pain as mentioned by Hermanset al.<sup>6</sup>. Myofascial trigger point is most commonly found in the midpoint of upper border of trapezius as mentioned by Chaudhary et al.<sup>7</sup>. Pain, stiffness and tenderness are felt on palpation in the belly and at paraspinal region as mentioned by Carneroet al.<sup>8</sup>. Tightness in muscle reduces the range of neck movements as well as the mobility of the cervical joints. Neck pain and restricted movements give a subjective feeling of stiffness which further aggravate pain and ultimately leads to muscle spasm, increase in soft tissue tightness, with an ensuring pain-spasm cycle which can be difficult to break as mentioned by Helen et al.<sup>9</sup>

Myofascial trigger point can be defined as a hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band. The etiology of TrP development is currently unknown, recent studies have hypothesized that the

pathogenesis results from the overloading and injury of muscle tissue, leading to involuntary shortening of localized fibers as mentioned by Simons et al.<sup>10</sup>

The combination of Muscle Energy Technique, Ischemic compression and Strain Counter strain produces the most effective, targeted approach to Trigger point release. This method is termed the Integrated Neuromuscular Inhibition Technique (INIT). He has suggested that the benefit of the technique lies in its multifaceted approach. The INIT approach allows for delivery of the techniques in a single coordinated manner as mentioned by Albert et al.<sup>11</sup> Effectiveness of Integrated Neuromuscular Inhibition Technique has been reported in two case series, which showed rapid results with decreased pain and stiffness. The individual components (Trigger Point Release, Positional Release Technique and Muscle Energy Technique) of INIT has also been proved effective for treating myofascial pain syndrome as discussed by Singh et al.<sup>12</sup>

Myofascial release (MFR) is a progressive pressure release technique which is used to decrease muscle tension by elongation of the muscle fiber thereby increasing gradual pressure on the motor trigger point. Study has proved successful to decrease pressure pain sensitivity as mentioned by Ellythy.<sup>13</sup>

## Materials and Methods

**Study Design:** This study is an Experimental study which is comparative in nature.

**Sampling Technique:** The subjects selected by Purposive Sampling.

**Source of Data:** Subjects will be taken from All Saints Institute of Medical Sciences and Research Out Patient Department and Physiotherapy clinics in and around Ludhiana.

### Eligibility

### Inclusion Criteria

- Both male and female subjects between age group of 25-40 years.
- Subjects with history of neck pain without any specific etiology like trauma from past 6 months.

- Subjects who are not involved in any routine sports training and conditioning programme.

**Exclusion Criteria**

- Subjects with history of recent trauma of Cervical spine.
- Subjects with history of Sprain and Strain of Cervical region.
- Subjects with history of Cervical Radiculopathy.
- Subjects with inflammatory disorders of Cervical spine.
- Non Cooperative subjects.

**Procedure**

Based on Inclusion and Exclusion criteria, 60 Individuals between age group 25-40 years were selected by purposive sampling and informed consent was taken. Subjects were divided into 3 Groups of 20 each as Group A,B, C.

Pretest data was obtained for Neck Range of Motion using Universal Goniometer and Neck Dysfunction was evaluated using a Neck Disability Index respectively.

**Group A** including 20 subjects were given Conventional treatment as Hot Pack over Upper Trapezius for 10 min and Neck Mobility exercises for 10 repetitions respectively.The protocol was 3 sessions per week for 2 weeks.

**Group B** including 20 subjects was given

Conventional treatment as Hot Pack over Upper Trapezius for 10 min and Neck Mobility exercises for 10 repetitions respectively.

Thereafter, the subjects received INIT protocol consisting of three techniques that performed in co-ordinated manner. i.e. Ischemic Compression, Strain-Counterstrain and Muscle Energy Technique for Upper Trapezius muscle.The protocol was 3 sessions per week for 2 weeks.

**Group C** including 20 subjects were given Conventional treatment as Hot Pack over Upper Trapezius for 10 min and Neck Mobility exercises for 10 repetitions respectively.Thereafter, the subjects were given MFR over Upper Trapezius muscle.

The Protocol included 10 repetitions in set, thrice a week for two weeks.Post test for Pretest data obtained for Neck Range of Motion using Universal Goniometer and Neck Dysfunction will be evaluated using a Neck Disability Index respectively.

The data was collected, compiled and analyzed.

**Statistical Analysis**

Data was meaningfully assorted through calculations of Mean and SD. Later on paired ‘t’ test was applied for comparison within the Group A, B and C for NDI Scale and ROM. Thereafter, Unpaired ‘t’ test was applied for comparison between the Group A, B and C for NDI Scale and ROM respectively. The level of significance was fixed at  $p < 0.05$ .

**Results**

**Table 1: Comparison of INIT and MFR (NDI Scale) between Group B and C**

Unpaired T Test	INIT vs MFR			
	NDI SCALE			
	Pre-test		Post-test	
	Group B	Group C	Group B	Group C
Mean	18.80	18.75	17.05	10.05
S.D.	2.913	2.593	2.781	2.544
‘t’ value	0.057		8.306	
Result	NS		S	

The Unpaired ‘t’ test gave ‘t’ value 8.306 which was statistically Significant for NDI Scale at  $p > 0.05$ .

**Table 2: Comparison of INIT and MFR (Left Neck Lateral Flexion ROM) between Group B and C**

Unpaired T Test	INIT vs MFR			
	NECK LATERAL FLEXION ROM (LEFT)			
	Pre-test		Post-test	
	Group B	Group C	Group B	Group C
Mean	30.50	31.25	37.80	36.65
S.D.	1.539	2.268	1.281	1.981
't' value	1.224		2.180	
Result	NS		S	

The Unpaired 't' test gave 't' value 2.180 which was statistically significant for Neck Lateral Flexion ROM (Left) at  $p > 0.05$ .

**Table 3: Comparison of INIT and MFR (Right Neck Rotation ROM) between Group B and C**

Unpaired T Test	INIT vs MFR			
	NECK ROTATION (RIGHT)			
	Pre-test		Post-test	
	Group B	Group C	Group B	Group C
Mean	56.20	56.20	63.50	61.25
S.D.	1.196	1.196	1.638	1.209
't' value	0.000		4.943	
Result	NS		S	

The Unpaired 't' test gave 't' value 4.943 which was statistically significant for Neck Rotation ROM (right) at  $p > 0.05$ .

### Discussion

The data was analyzed through paired 't' test for comparison within Groups which gave 't' value for NDI Scale for Group A 1.675, for B 20.424, for C 20.879. Paired 't' values for Neck Lateral flexion (left and right) within Group A were 1.789 and 1.453 which was statistically non-significant, whereas within Group B paired values were 40.742 and 17.411, whereas within Group C paired values were 25.683 and 33.645 and for Neck Rotation (left and right) within Group A were 1.832 and 1.453 which was statistically non-significant, within Group B was 24.330 and 16.302, within Group C were 32.776 and 15.022 which was statistically significant.

Thereafter, Unpaired 't' test for applied for NDI Scale for comparison between Group A and B which gave 't' value as 8.306, Group A and C 5.908, Group B and C 2.565, which was statistically significant with  $p < 0.05$ . Thereafter, Unpaired 't' test was applied for Neck Lateral Flexion (left and right)

for comparison between Group A and B which gave 't' value as 15.595 and 9.349, Group A and C 9.878 and 8.076, Group B and C 2.180 and 2.131, which was statistically significant. Similarly, the Neck Rotation (left and right) for comparison between Group A and B gave 't' value as 16.834 and 13.942, Group A and C 12.145 and 10.931, Group B and C 6.114 and 4.943, which was statistically significant.

The result of Group B which received INIT came out to be significant in correlation to study which compared the effect of INIT versus TENS with passive stretching in patients with Upper Trapezius in NSNP and the result concluded that the effect of INIT is more effective than TENS with passive stretching on upper trapezius trigger points in reducing pain and improvement of function in patients with NSNP as mentioned by Aartee.<sup>18</sup>

The result of the Group C which received MFR came out to be significant in correlation to the study which compared the effects of Myofascial Release

Technique and cold pack in Upper Trapezius spasm. There was significant difference in post treatment comparison between MFR and Cold pack group. The MFR group showed more significant improvement than cold pack in VAS, PPT and ROM score. When Myofascial Release is used on the TrPs, local chemistry changes due to blanching of the nodules followed by hyperaemia. This flushes out the muscle inflammatory exudates and pain metabolites, breaks down the scar tissue, desensitizes the nerve endings and reduces muscle tone as mentioned by Irnich D et al.<sup>20</sup>

Another study which aimed to investigate the efficacy of MFR plus therapeutic exercise for management of NSNP concluded that MFR improves pain and movement in patients with neck pain. Fascia restriction of the neck area may result in excessive tension in other parts of the body because the fascia is continuous. Application of MFR in the neck area can reduce this excessive tension and improve cervical movement and impaired sliding fascial mobility in people with non specific neck pain as mentioned by Ajimsha et al.<sup>21</sup>

The comparison between Group A, B, C showed significant improvement in Neck ROM and Dysfunction in individuals with NSNP of Group B and C while Group A did not show any improvement. The improvement was more in Group B who received INIT for Upper Trapezius than Group C which received MFR. On the basis of the results, it can be concluded that the present study provided evidence to state that INIT showed more efficacy in treating ROM and Dysfunction in individuals with NSNP than the Control Group.

### Conclusion

The study concluded that there was a significant variation of values between the effect of Integrated Neuromuscular Inhibition Technique versus Myofascial Release on Upper Trapezius muscle on Neck Range of Motion and Dysfunction in individuals with Nonspecific Neck Pain. Therefore Alternate Hypothesis was accepted and Null Hypothesis was rejected. Comparison of Post-test mean values revealed that Integrated Neuromuscular Inhibition Technique was better than Myofascial Release on

Upper Trapezius muscle on Neck Range of Motion and Dysfunction in individuals with Nonspecific Neck Pain.

### Limitations

- Study had a small sample size.
- Type of Nonspecific Neck Pain was not taken into consideration.
- Study focused only on upper trapezius, other muscles were not considered.
- Daily routine activities were not taken into consideration.

**Source of funding:** No funding was obtained for the study.

**Conflict of Interest:** No conflicts of interest are present.

**Ethical clearance:** The research was conducted in accordance to the ethical standards of Baba Farid University of Health Sciences along with the following reference number ASP-MPO-2020/02. Written informed consent were provided by all participants prior to participation.

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## Observing the Clinical use of Ultrasound Imaging by Physiotherapists in Saudi Arabia

Jaffar S. Abdrabarasol<sup>1</sup>, Amin A. Algafly<sup>2</sup>,  
Ahmed A. Almusabbeh<sup>3</sup>, Wafa H. Almaghaslah<sup>4</sup>

<sup>1</sup>MSc. Physical Therapist, Sport Medicine Rehabilitation, <sup>2</sup>MSc. Physical Therapist, Sport Medicine Rehabilitation, <sup>3</sup>MSc. Physical Therapist, <sup>4</sup>BSc. Physical Therapy, MSc. Public health, Field Epidemiology, Ministry Of Health, Qatif Central Hospital, Eastern region, KSA.

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### Abstract

**Objective:** This study aimed to design a questionnaire to survey physiotherapists' use of ultrasound imaging (USI), identify barriers to use, and determine what training physiotherapists require.

**Background:** USI is becoming increasingly common in physiotherapy practice, but it is highly operator-dependent, and there are safety and professional issues regarding its use. Physiotherapists using USI currently lack specific training guidelines. As a result, it is necessary to not only evaluate the context of its clinical use but also to identify the barriers preventing its uptake. However, few regulatory bodies guide the use of USI in physical therapy. The scope of practice for physical therapists in using USI is limited, as well as the opportunities for continuing education.

**Methods:** A questionnaire was developed based on research literature and guidelines.

**Design:** Cross-sectional observational design utilizing an Internet-based electronic survey.

**Results:** The majority of respondents were male (N= 111, 73.50%), and the rest were female (N= 40, 26.50%). Most of the respondents said they don't perform USI in clinical practice (N= 99, 65.10%), and they stated that lack of training and lack of ultrasound machines are the main barriers that limit them from using USI (N= 59, 60.80%) and (N= 54, 55.70%).

**Conclusions:** The participants reported a variety of clinical uses for USI and levels of training. Training and uptake of USI would both be enhanced by more knowledge of its clinical uses and benefits. Barriers preventing physiotherapists from using USI in Saudi Arabia and ways to overcome them are discussed.

**Keywords:** Ultrasound imaging, Survey, Physiotherapist, Biofeedback, Ultrasound training

**Corresponding Author:** Jaffar S. Abdrabarasol, MSc. Physical Therapist, Sport Medicine Rehabilitation, Ministry Of Health, Qatif Central Hospital, Eastern region, KSA.

**Email id:** jaffarzm@yahoo.com

## Introduction

Physical therapists apply ultrasound imaging (USI) as a precise and as assistant to physical examination in order to clarify uncertain findings or provide image guidance that improves the success and safety of procedures besides saving time. USI has become more viable as a tool for physiotherapists to augment their practices due to increased research, growth of USI training opportunities, and the development of ultrasound technologies. Only a limited amount of research has formally documented the use of USI by physiotherapists (1-3).

Nowadays, USI is considered a tool for assessing muscle function in physiotherapy research (4-6), and has been used in clinical physiotherapy practice (7, 8). Thus, it has been suggested that USI is used to visualize the deep muscles of the trunk, spine, neck, and pelvic floor (8). In these muscles, USI is being used as a form of assessment and visual biofeedback during re-education of dysfunction (8, 9).

Physiotherapy applications of USI include rehabilitative USI (e.g. assessment of soft tissue morphology and function, biofeedback, etc.) (7, 10, 11); diagnostic USI (e.g. assessment of injury, disease, etc.) (10, 12); interventional USI (e.g. guidance of needles, apart from the well-established use of USI in musculoskeletal and sports physiotherapy (13, 14). Other uses are emerging in areas such as women's (15) and men's (16) pelvic floor health, and cardiorespiratory (17).

Although these studies showed interesting conclusions related to the uses of USI, they did not show any of the barriers preventing physiotherapists from using USI or the fields of practice for physiotherapists to use USI. It is highly required to understand the obstacles preventing physiotherapists from using USI, as this knowledge would provide means to overcome them. These barriers include the lack of ultrasound equipment and training (18).

In addition to a lack of regulatory oversight, surveys conducted in the UK (2), Australia (1) and New Zealand (3) revealed that there is no internationally accepted program for physical therapists training in USI. However, clear and consistent guidance from regulatory and professional associations could assist in reducing these gaps

In KSA, the number of physical therapists using USI is unclear. There is a need for training courses for physiotherapists to use USI since how it is being used is what should be investigated.

## Objectives

The purpose of this study is to evaluate the use of USI by physiotherapists, identify barriers to use, and determine what training physiotherapists need.

## Materials and Methods

This study is a cross-sectional observational design using an internet-based survey for Saudi Arabian registered physiotherapists. As reported in previous surveys (1, 2), a group of experts in the field of USI was gathered to provide feedback and guidance for the current survey.

### Data Collection:

The final survey was hosted on the Internet-based survey site, Survey-Monkey, which enabled secure and anonymous survey participation (including consent to participate) and anonymous data collection.

### Data Analysis:

Data was exported from Survey-Monkey and analyzed using the Statistical Package for the Social Sciences software (SPSS)(19). Depending on the number of valid responses per item, closed and multiple-choice questions were presented as frequencies and percentages. The frequencies and percentages of valid responses were calculated for each category of open-ended questions based on responses that were similar.

## Results:

### Analysis Interpretation

#### 1. Demographical

Among the respondents, 111 (63.5%) are males and 40 (26.5%) are females. Approximately 75.20 percent of respondents (N= 112, 75.20%) are studying for a bachelor's degree, according to the descriptive statistics. In contrast, 17.40% of students are pursuing master's degrees, 4.70% diplomas, and 2.70% Ph.D. programs. In the survey, musculoskeletal and sports

physiotherapy was reported by 81% of respondents (N= 111). Among the other respondents are 5.10 % from the neurological physiotherapy profession, 3.60 % from the pediatric physiotherapy profession, and 2.20 % from the cardiopulmonary physiotherapy profession. Based on descriptive statistics, 38.00% of respondents have experience of 1 to 5 years. Likewise, 26.00% of respondents have 11 to 20 years of experience, 24.70% have 16 to 10 years of experience, and 11.30% have more than 20 years of experience as shown in table below:

Gender	Frequency	Percentage
Male	111	73.50%
Female	40	26.50%
<b>Degree</b>		
Bachelor	112	75.20%
Master	26	17.40%
Diploma	7	4.70%
PhD	4	2.70%
Other	0	0.00%
<b>Profession</b>		
Musculoskeletal and Sports Physiotherapy	111	81.00%
Neurological Physiotherapy	7	5.10%
Pediatric Physiotherapy	5	3.60%
Cardiopulmonary Physiotherapy	3	2.20%
Other	11	8.00%
<b>Years of Experience</b>		
1 to 5 years	57	38.00%
11 to 20 years	39	26.00%
6 to 10 years	37	24.70%
More than 20 Years	17	11.30%

## 2. Uses of Ultrasound

There were 99 respondents who claimed not to use USI in their clinical practices (65.10%), and 53 others who recognized it was used (34.90%). About 86.90% of respondents said they were interested in using USI, while 13.10% said they weren't As shown in the table below.

Do you use musculoskeletal ultrasound imaging in clinical practice?	Frequency	Percentage
No	99	65.10%
Yes	53	34.90%
<b>Do you have an interest in using musculoskeletal ultrasound imaging?</b>		
Yes	86	86.90%
No	13	13.10%

## 3. Barriers

The following table shows the results that most of the respondents said that lack of training and lack of ultrasound machines are the main barriers that limit the therapist from using USI (N= 59, 60.80%) and (N= 54, 55.70%). On the other hand, fewer respondents complained that their organization's policy doesn't permit them to use it (N= 17, 17.50%).

What are the barriers that limit you from using musculoskeletal Ultrasound imaging?	Frequency	Percentage
Lack of training	59	60.80%
Lack of Ultrasound Machine	54	55.70%
My organization's Policy doesn't permit its use	17	17.50%
No time to practice	11	11.30%
I have no interest	8	8.20%
Other	2	2.10%

## 4. Training

The majority of respondents denied that they had trained to use USI (N=96, 63.60%) and the rest of the respondents agreed that they had trained to use it (N=55, 36.40%). The majority of the respondents said that lack of professional training is the main reason why they didn't get the training (N= 116, 79.50%), and 30.10% of respondents said that the high cost of the training programs is another reason (N= 44, 30.10%) as shown in table below:

Have you trained to use musculoskeletal ultrasound imaging?	Frequency	Percentage
No	96	63.60%
Yes	55	36.40%
Why did not you get the training?		
Lack of the professional training	116	79.50%
High cost of the training programs	44	30.10%
Other	10	6.80%

### 5. Awareness

Help in diagnosis is the most common application of USI in physiotherapy clinics (N= 125, 85.60%). Additionally, to assess progress and evaluate soft tissue injuries, nearly an equal number of physiotherapy clinics use USI (N= 94, 64.40%) and (N= 91, 62.30%). According to respondents, biofeedback and measurement tools in research account for nearly equal proportions of USI use in physiotherapy clinics (N= 58, 39.70%) and (N= 49, 33.60%) as shown in table below:

What are the uses of musculoskeletal ultrasound imaging in physiotherapy clinics?	Frequency	Percentage
Help in diagnosis	125	85.60%
To evaluate the progress	94	64.40%
Evaluate soft tissue injuries	91	62.30%
Biofeedback	58	39.70%
Measurement tools in research	49	33.60%
Other	4	2.70%

### Discussion

This study represents the use of diagnostic ultrasound by physiotherapists in Saudi Arabia. There were 151 respondents, and 111 of them were male (73.5%) and 40 were female (26.5%). It could be argued that the availability and use of physiotherapy

equipment indicate their popularity in clinical practice.

Most of the respondents said they don't use USI in clinical practice (N= 99, 65.10%) and the rest all agreed that they use USI in clinical practice (N= 53, 34.90%). This proportion of users is substantially higher than an Australian study by (1), which reported 12% of their 664 respondents as users of USI. In this study, (1) used USI over a period of time that represents an increase in physiotherapists' use of the procedure over the course of 14 years. Physiotherapy's General Scope of Practice is designed to be broad and does not include (or exclude) specific therapies, techniques, or assessment tools (3).

It is the responsibility of the physiotherapist to demonstrate competence in this field of practice through "relevant and appropriate education and training specifically relating to that field", as stated in the PBNZ's position statement 'Practicing in a Defined Field' (3). This uncertainty is likely to persist because USI is an emerging tool for physiotherapists and its application to physiotherapy is still evolving.

Most respondents stated that lack of training and lack of ultrasound machines are the main barriers that limit them from using USI (N= 59, 60.80%) and (N=54, 55.70%). In addition, a small part stated that the organization's policy does not permit its use (N= 17, 17.50%). The lack of USI training was a significant barrier, as there are limited USI training opportunities in Saudi Arabia. The generalist courses aimed at training sonographers are not targeted at physiotherapists (3).

In addition to a lack of ultrasound equipment, another major barrier was believed to be the high cost of ultrasound equipment. USI may also be a barrier because some participants are not aware of its clinical benefits and uses, as evidenced by some participants' confusion regarding its scope of practice (3). One study suggested that this barrier could be overcome through the provision of guidelines for clinical use and benefit, information about the clinical benefits of USI and how these can add clinical value, and improved research evidence to support the use of USI. The responsibility, therefore, falls upon researchers and clinicians using USI to ensure that the benefit of USI for physiotherapists, along with an accurate

representation of scopes of practice, are disseminated appropriately (3). In light of this, it is essential to remove barriers to facilitate the development of USI in the profession of physiotherapy.

Most of the respondents denied that they had been trained to use USI (N=96, 63.60%) and the rest agreed that they had been trained to use USI (N=55, 36.40%). In order to limit the possibility of diagnostic or therapeutic errors, physiotherapists using USI should be well-trained (both in terms of operation and interpretation) (1, 10, 11, 18).

In terms of USI training for physiotherapists, it needs to be led by experts in the field and designed specifically for the needs of physiotherapists. Even though it is agreed that guidelines should be implemented to direct training and competence (10-12, 20), USI can be used by physiotherapists if they meet certain thresholds and receive adequate training. This issue has not been resolved to date and provides active debate within the physiotherapy USI community (3).

Biofeedback and measurement tool in research has almost equal part of the uses of USI in physiotherapy clinics (N=58, 39.70%) and (N=49, 33.60%) as answered by the respondents. The majority of respondents used USI for biofeedback, yet it is not known if ultrasound biofeedback influences treatment outcomes (7, 14). However, as other forms of biofeedback have been shown to improve outcomes (21), this may be a useful area for future research on ultrasound imaging (10, 22).

A common theme that emerged from the open questions was that USI is very operator-dependent (10, 23-25) and this was perceived as a 'pitfall' and may support the need for structured and on-going training.

#### **Limitation:**

Certain limitations of this study need to be acknowledged. As our sample study covered only the government physical therapy section, it might not be generalized to the other sectors in the Kingdom. Because of the nature of this study, we used a convenient sample instead of a random sample.

#### **Recommendation:**

Future efforts should focus on developing international standards for self-governance of USI use by physical therapists and ensuring that training and practice standards are identified, reached, and maintained. Physical therapists, among other professionals, need to be exposed to the use of USI in order to avoid inaccurate assumptions about the professional violation and to foster an understanding of the unique applications of USI to physical therapy practice. Last but not least, physical therapists must continue to demonstrate that USI enhances the quality, cost-effectiveness, and efficacy of physical therapy management.

#### **Conclusion**

A structured framework to train physiotherapists in USI that is similar to those for other professions is needed since there are relatively few formal training courses specifically designed for physiotherapists.

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## Effect of Constrained Induced Movement Therapy on Functional Arm Reach Distance on Adult Hemiplegic Patients: A Pilot Study

R. Shyam Sundar<sup>1</sup>, M. Prem Kumar<sup>2</sup>, K. Kartheeswari<sup>3</sup>, Mohammed Ameer Hussain<sup>4</sup>

<sup>1</sup>PhD Research Scholar, <sup>2</sup>Professor Cum PhD, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001, <sup>3</sup>Final Year Student, Santosh College of Physiotherapy, Affiliated to The Tamilnadu Dr. MGR Medical University, Madurai, <sup>4</sup>PhD Research Scholar, Institute of Physiotherapy, Srinivas University, Mangaluru, India.

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### Abstract

**Background:** Stroke is an acute onset of neurological dysfunction due to an abnormal cerebral vascular circulation with resulting signs and symptoms that corresponds to focal area of brain. The most common characteristics of MCA stroke are contra lateral spastic hemiparesis, motor and sensory disturbance of face, motor weakness of upper extremity and lower extremity with upper limb more affected than lower limb. Constraint induced movement therapy (CIMT) involves ipsilesional limb restraint with training of paretic arm to overcome this learned disability by restraining the unaffected extremity and training the affected extremity.

**Aims and objectives of the study:** To observe and analysis the effect of Constrained Induced Movement Therapy on hand function of chronic stroke patients.

**Data Analysis & Results:** Shows that the pre and post intervention values of variable functional arm reach in chronic stroke patients of this study. In that mean values of pre and post intervention of functional arm reach were 19.0 cm and 23.0 cm respectively. Results of significance p value were  $p \leq 0.05$  explained that after constrained induced movement therapy intervention to the subjects the functional arm reach was improved statistically.

**Conclusion:** This study concluded that Constraint Induced Movement Therapy (CIMT) shall have statistically significant improvement on hand function of functional arm reach distance in adult hemiplegic patients.

**Keywords:** Functional Arm Reach, Chronic Stroke, Spasticity, Constraint Induced Movement Therapy.

### Introduction

Stroke is an acute onset of neurological dysfunction due to an abnormal cerebral vascular

circulation with resulting signs and symptoms that corresponds to focal area of brain. The most common characteristics of MCA stroke are contra lateral spastic hemiparesis, motor and sensory disturbance

**Corresponding Author:** M. Prem Kumar, Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001.

**Email id:** 80pk2009@gmail.com

**ORCID ID:** 0000-0003-0958-6143

of face, motor weakness of upper extremity and lower extremity with upper limb more affected than lower limb.<sup>1</sup> Stroke is second most frequent cause of death after coronary artery disease. In India, stroke is an important cause of premature death and disability.<sup>2</sup>

Spasticity usually develops slowly with antigravity muscles of the upper extremity and usually affects the depressors of the shoulder girdle and arm; the fixators and retractors of the scapula, the side flexors of the trunk, the adductors and internal rotators of the arm, the flexors pronators of the elbow and wrist, the flexors and adductors of the fingers.<sup>3</sup> Stroke is a leading cause of long-term disability in Western countries<sup>4</sup>. Constraint-induced movement therapy (CIMT) is a relatively recent approach developed to promote paretic upper-limb function following sub acute and chronic stroke.<sup>5</sup> There is evidence in the literature that stroke patients with chronic, mild to moderately severe arm motor impairment who are given CIMT show improvement in motor ability and a marked increase in the amount of use of the more affected upper extremity.<sup>6</sup>

Alberts et. al. hypothesized that this lack of understanding may be partly attributable to the methods used in assessing upper-extremity functions.<sup>7</sup> Most studies rely on clinical tests but more objective outcome measures are necessary to understand the mechanisms underlying stroke motor deficits and CIMT - hence the need for a new evaluation method that provides a more accurate analysis of the results. In the field of gait analysis, much progress has been made with the introduction of instrumental kinematic evaluation. The validity of this method in the study of the lower limb is well known and its use is consolidated.<sup>8</sup> Although the study of movements of the upper limb is more complex than the study of gait, and the application of kinematic analysis is still in its early stages,<sup>9</sup> studies based on this approach are increasingly frequent. Kinematic instrumental analysis is, in fact, proving to be an excellent tool for quantifying the functionality of the upper limb and thereby monitoring the effects of treatments on motor performance over time.<sup>10</sup>

Although traditional method for rehabilitation among patients with limited upper extremity function after stroke, such as neurodevelopmental

techniques, have not been shown to be efficacious in controlled studies, more recent approaches that involve repetitive training of the paretic upper extremity on task-oriented activities give evidence of efficacy among stroke survivors who retain some ability to actively extend the fingers and wrist of their paretic upper extremity.<sup>11</sup> One approach, which has substantial evidence of efficacy for individuals with long-term stroke disabilities (1 year after event), involves intense functionally oriented task practice of the paretic upper extremity along with restraint of the less-impaired upper extremity for most waking hours. This approach encourages use of the paretic upper extremity in daily life<sup>12</sup> and is thought to help overcome what Taub<sup>13</sup> first described in a deafferented monkey model as "learned non use" of the paretic upper extremity. Treatment by restraining only the less-impaired upper extremity, which is typically accomplished by placing the entire arm in a sling or placing the hand in a mitt for most waking hours for 2 weeks, without supervised task practice, is referred to as "forced use" and has been applied to long-term and sub acute stroke patients. Constraint induced movement therapy (CIMT) involves ipsilesional limb restraint with training of paretic arm use conducted by a clinician following shaping and repetitive task practice principles over the same time course or less intensely over several weeks.<sup>14</sup> The Extremity Constraint Induced Therapy Evaluation (EXCITE) Trial represents the first national, randomized, single-blind study to systematically test a neuro rehabilitation therapy among patients with the ability to initiate extension movements at the wrist and fingers and who had experienced a first stroke within 3 to 9 months prior to enrollment.<sup>15</sup>

Stroke patients who initially attempt to use the affected extremity find themselves unable to do so because the process of spontaneous recovery of function has not yet proceeded sufficiently far. These results in the experience of failure or punishment for attempts to move the extremity and in positive reinforcement for compensatory movements by the unaffected extremity-a learning process that might be supported by the teaching of compensatory activity during rehabilitation.<sup>16</sup> This learned non use impedes attempts to further rehabilitate the affected extremity. Based on this theoretical account, constraint-induced



(CI) movement therapy was developed. It is designed to overcome this learned disability by restraining the unaffected extremity and training the affected extremity there by leading to massed practice in the use of affected extremity for period of 2 weeks.<sup>17</sup>

The main aim of this study was to observe and analysis the effect of Constrained Induced Movement Therapy (CIMT) on hand function of chronic stroke patients. With this study results for chronic stroke patients, the physiotherapy treatment may include Constrained Induced Movement Therapy on hand function to treat effectively Chronic Stroke patients. By doing this study significance using CIMT to assess Functional arm reach on chronic stroke patient will be strengthened and ascertained.

### Materials and Methods

**Study Design:** Pilot study.

**Study Setting:** Abhinav Physiotherapy Center, P&T Nagar, Madurai.

**Study Duration:** 12 months.

**Study Sampling:** Convenient Sampling.

**Study Population:** In Around Madurai District.

**Study Sample:** 3 to 4 subjects.

#### Criteria of Selection:

##### Inclusion Criteria:

Age- 50-75

Sex - Both Sex

Both side affected hemiplegic patients

Hemiplegic for the past 6 months

Hemiplegic can walk with or without assistance

Hemiplegic functionally limited hand functions

##### Exclusion Criteria:

Psychological disorder.

Severe musculoskeletal disorder.

Serious neurological and cardiorespiratory disorders

Systemic disorders

Disoriented and non cooperative patients.

#### Variable:

Functional Arm Reach Distance.

#### Intervention:

Constraint Induced Movement Therapy (CIMT) for hand.

#### Procedure:

13 subjects full fill the criteria of selection were selected and recruited for this study convenient sampling method. Their demographic data including vitals were collected and documented. Pre intervention functional arm reach measurements were measure and selected. By convenient sampling method patients were selected and Constrained Induced Movement Therapy (CIMT) was given on hand function, 30 minutes a session, 5 sessions a week for 12 weeks were given. Post intervention functional arm reach measurements were measured and documented. Suitable statistical methods in the form of paired student t test with descriptive analysis was done with the assistance of spss 16.0 software version for windows.

#### Data Analysis and Results

This study results were showing that the pre and post intervention values of variable functional arm reach distance in adult hemiplegic patients of this study. In that mean values of pre and post intervention of functional arm reach were 19.0 cm and 23.0 cm respectively. Results of significance p value were  $p \leq 0.05$  explained that after constrained induced movement therapy intervention to the subjects the functional arm reach was improved statistically by using student t test.

**Table 1: Comparison of Pre & Post Values of Functional Arm Reach Distance in cm.**

Group	No of subjects	Mean	Standard Deviation	T Value	P Value
Pre	13	19	1	4.89898	0.004025
Post	13	23	1		

p<0.05

**Picture 1: Patient Performing Constrained Induced Movement Therapy (CIMT) for hand**

### Discussion

Improvement in functional arm reach of the subjects involved in this study after the intervention of constrained induced movement therapy (CIMT) was happened might be due to the physiological response and changes in the neurons of central nervous system in response to functional exercises to the affected musculature and development of new neuron and its connections and neural plasticity as a whole.

This study results strengthened the concept of A.Siebers 2010 stated that Our study suggests that modified CIMT in an outpatients clinic may reduce spasticity and increase functional use of the affected arm in spastic chronic hemiplegia ,with improvement persisting six months.<sup>18</sup>

And also the study results of Annett Kunkel 1999 stated that Based on the large effects produced by CI therapy in chronic stroke patients, there is a need for

application of CI therapy with acute and sub acute stroke patients where it might be possible to avoid completely the development of a portion of the chronic motor deficit that would otherwise develop<sup>19</sup> was also ascertained.

On the basis of this study results it can be referred that Constrained Induced Movement Therapy (CIMT) to the chronic stroke patient to improve their functional arm reach. As a whole CIMT was improving functional activities of chronic stroke patients in their various day to day activities has been proved by this study results.

### Conclusion

This study concluded that Constraint Induced Movement Therapy (CIMT) shall have statistically significant improvement on hand function of functional arm reach distance in adult hemiplegic patients.

**Ethical Clearance:** Taken from Institutional Ethical Review Board, Santosh College of Physiotherapy, Madurai.

**Conflict of Interest:** Nil

**Source of Funding:** Self

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## Effect of IFT with Anterior Glide versus Posterior Glide Joint Mobilisation Technique on Shoulder External Rotation Rom in Patients with Adhesive Capsulitis: Comparative Study

Madhuripu<sup>1</sup>, M. Prem Kumar<sup>2</sup>, Radhika Gopal.S<sup>3</sup>, S. Kavitha<sup>4</sup>

<sup>1</sup>Associate Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, Mangaluru, India, <sup>2</sup>Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar Campus, Mangaluru, Karnataka - 575001, <sup>3</sup>Assistant Professor, Institute of Physiotherapy, Srinivas University, Mangaluru, India, <sup>4</sup>Assistant Professor, Santosh College of Physiotherapy (Affiliated to the Tamilnadu Dr. MGR Medical University), 15B, GST Main Road, Tirunagar, Madurai, Tamilnadu - 625006.

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### Abstract

**Background:** Adhesive capsulitis is a clinical diagnosis made from a history of the gradual onset of severe shoulder pain with the progressive limitation of active and passive glenohumeral movements. The most significant loss of movement is in the external rotation of the joint. Traditionally physical therapists have used an anterior glide of the humeral head on the glenoid technique to improve external rotation range of motion a choice based on 'convex on concave' concept of joint surface motion.

**Aim & objective of the study:** To compare the effect of IFT with anterior glide versus posterior glide joint mobilization technique on shoulder external rotation ROM in patients with adhesive capsulitis.

**Data Analysis and Results:** This study results shows that there is statistically significant improvement in the variables of shoulder pain and disability index (SPADI) and Shoulder External Rotation ROM between pre and post mean values in both control and experimental group with  $p < 0.05$ . The Post mean values of SPADI and Shoulder External Rotation ROM in degrees with  $p$  values  $p < 0.05$  in Control group when compared to Experimental Group.

**Conclusion:** This study concluded that both anterior glide and posterior glide with Interferential therapy reduce the pain and improve the external rotation range of motion in adhesive capsulitis. Meanwhile, interferential therapy with anterior glide is more effective than the interferential therapy with posterior glide in reducing the pain and improving the external rotation range of motion in adhesive capsulitis.

**Key Words:** Adhesive Capsulitis, Shoulder Joint, Shoulder Joint Mobilization, Anterior Glide, Posterior Glide, SPADI, Shoulder External Rotation ROM.

**Corresponding Author:** Madhuripu, Associate Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, Mangaluru, India.

**Email id:** madhuripu@gmail.com

**ORCID ID:** 0000-0002-7639-4679.

## Introduction

Total functionality of the upper limb is closely tied to the shoulder complex's architecture. The limb's joint mechanics enable the positioning, use, and hand control immediately anterior to the body, where the actions can be observed easily<sup>1</sup>. Four joints that make up the shoulder complex move precisely, in unison, and simultaneously. The clavicle, scapula, and humerus all move as the position of the arm is altered. The Sternoclavicular, Acromioclavicular, Glenohumeral, and Scapulothoracic Gliding Mechanisms work together to produce these motions.<sup>2,3,4</sup>

Adhesive capsulitis of the shoulder is a frequent condition that affects 2 to 5 percent of adults overall and up to 20 percent of those with diabetes.<sup>5</sup> In England<sup>6</sup>, a general practise list of 6250 people on average would see 15 to 16 new cases annually.<sup>7</sup> Neviasser invented the term "adhesive capsulitis" in 1945 to designate a pain and stiffness in shoulder.<sup>8</sup> When describing a painful shoulder disease that develops slowly and causes stiffness and difficulties sleeping on the afflicted side, Codman<sup>9</sup> coined the phrase "frozen shoulder." However, it was Duplay who first defined the illness as 'periarthrits scapulohumerale' in 1872.<sup>10</sup> These phrases are now used interchangeably.<sup>11,12,13</sup>

The clinical identification of adhesive capsulitis is grounded on a history of progressively limiting passive and active glenohumeral motions together with the gradual development of significant shoulder discomfort.<sup>12,13</sup> External rotation of the joint has the most loss of motion.<sup>9,12</sup>

A number of accounts state that the sickness has three phases and affects children between the ages of 11 and 13. The "adhesive phase," which is a time of increasing stiffness, is usually followed by a painful phase that lasts three to eight months.<sup>12,13</sup> The resolving phase of an ongoing recovery of mobility generally persists between 5 and 24 months.<sup>5,12,14</sup>

Conditions that are linked to or result from a recognised predisposing factor should be treated with adhesive capsulitis, whereas the first idiopathic condition is known as adhesive capsulitis, and the following condition is known as. For example, a

broken humerus, a dislocated shoulder, an avascular necrosis of the humerus, or a stroke. The majority of sources confirms that adhesive capsulitis is the product of inflammation of the synovium and capsules in the joint, which results in the formation of capsular contractures<sup>15</sup>. Clinically speaking, the glenohumeral joint has a general reduction of passive and active range of motion, in which external rotation is the movement that is more physiologically limited and results in functional limitation.<sup>15</sup>

Transcutaneous electrical stimulation is a common treatment method used by therapists. They can choose between continuous or as a series of pulses direct current administered, or alternating current at various rates. With regard to therapeutic application, each type of current has both benefits and drawbacks.

In terms of low-frequency alternating currents and direct current, the outer layers of skin have a high electrical impedance (>1 kHz). Deep tissues are painful to treat because a large transcutaneous current flow is necessary for enough current to go deeply. Even though they usually oscillate too fast to directly trigger the tissues, alternating currents of medium (>1kHz to 10kHz) meet less resistance and easily penetrate the tissues (attributable to a marked decline with how skin capacitance affects current flow).<sup>16-18</sup>

Interferential current therapy, which was developed in the early 1950s, assisted in overcoming these difficulties. The device produces two slightly distinct medium-frequency alternating currents, which are commonly used to induce analgesia, provoke muscle contraction, modify the activity of the autonomic system, enhance healing, and reduce oedema.<sup>18-20</sup>

According to the "convex on concave" theory of joint surface motion<sup>21</sup>, physical therapists have long used the anterior glide of the humeral head on the glenoid technique to extend the range of motion for external rotation. Roubal et al., on the other hand, used a posteriorly directed glide correction based on the "capsular constraint mechanism" to restore both the exterior and interior rotation range of motion.

In order to increase shoulder external rotation range of motion and functional activity in persons

with primary adherence, this study intended to determine the direction of force application (anterior vs. posterior) for glenohumeral joint mobilisation.<sup>21</sup>

The main aim and objectives of the study to compare the effect of IFT with anterior glide versus posterior glide joint mobilization technique on shoulder external rotation ROM in patients with adhesive capsulitis.

The results of the study if it explains Interferential Therapy with anterior joint mobilization or posterior joint mobilization for adhesive capsulitis which is better, it will provide greater importance and significance in the selection of treatment approaches for adhesive capsulitis.

## Materials and Methodology

### Study Design:

Comparative study

### Study Setting:

Joy physiotherapy Clinic OP department, Madurai.

### Study Duration:

2 months

### Study Sample:

Simple random sampling

### Study Population:

In and around Madurai district

### Study Sample

A total number of 20 patients who were diagnosed as adhesive capsulitis by clinical Orthopaedician were selected by random sampling method and divided into 2 groups after due consideration to the inclusion and exclusion criteria.

### Criteria of Selection:

#### Inclusion Criteria

- Patients with 4-5 months duration of adhesive capsulitis.
- Idiopathic adhesive capsulitis (insidious onset).

- Sex-both sexes.
- Age group-30 to 50 years.
- Pain with restricted range of motion not more than 50%.
- Unilateral condition.
- Restricted range of motion due to capsular lesion.

#### Exclusion Criteria

- Polyarthritis.
- Hemiplegic shoulder.
- Cardiovascular disease.
- Osteoporosis.
- Cervical spondylosis.
- Hypertension.
- Brachial neuralgia.
- Neurological disorder (like Stroke, Parkinsonism).
- Subscapularis flexibility deficits.
- Fractured/ Dislocated shoulder.
- Severe shoulder deformity.

#### Variables:

- Shoulder Pain and Disability Index (SPDAI).
- Shoulder External Rotation ROM.

#### Materials and Tools:

- Goniometer.
- Shoulder pain and disability index chart.
- Couch
- Pillows
- Inch tape

#### Interventions:

- Mobilisation technique
- IFT

#### Procedure:

A total number of 20 subjects who met the inclusion criteria were recruited by simple random sampling method by obtaining consent form from the participants. After the informed consent obtained they were divided into 2 groups - group A and group B with 10 subjects in each group.

After a brief demonstration about the procedures, Group A subjects were subjected to IFT with Anterior Glide for a period of 4 weeks. After a brief demonstration about the procedures, Group B subjects were subjected to IFT with Posterior Glide of 5 sessions for a period of 4 weeks.

Pre test and Post test results were recorded and computed for suitable statistical analysis with spss 16 software version of windows.

**Treatment Interventions:**

**IFT** - Interferential Therapy for both groups A and B

4000 Hz to 4500 Hz - Medium Frequency Current

Beat frequency - 50 Hz used

Intensity - Comfortable Limit

Duration - 15 Minutes

Sessions - 20 sessions in the span of 4 weeks

**Anterior Glide of Gleno Humeral (GH) Joint:**

Purpose: to increase shoulder external rotation and extension Position: patient is prone with shoulder at edge of table and abducted to 90 degrees, elbow flexed to 90 degrees; mobilizing hand on posterior humeral head while stabilizing hand holds mid-humerus Mobilization: anterior force applied by

mobilizing hand to humeral head while stabilizing hand applies gentle traction.

**Posterior Glide of Gleno Humeral (GH) Joint:**

Purpose: to increase shoulder flexion and internal rotation Position: patient is supine with the shoulder at the edge of the table, scapula stabilized by the table or towel roll; abducted to 45 degrees and elbow slightly flexed; mobilizing hand on anterior humeral head and stabilizing hand supporting elbow Mobilization: posterior force applied by mobilizing hand to humeral head while stabilizing hand applies gentle traction.

**Data Analysis and Results**

This study results shows that there is statistically significant improvement in the variables of SPADI and Shoulder External Rotation ROM between pre and post mean values in both control and experimental group with  $p < 0.05$ . There is homogenous of variables in pre values of variables of SPADI and Shoulder External Rotation ROM in degrees between control and experimental groups. The Post mean values of SPADI and Shoulder External Rotation ROM in degrees with  $p$  values  $p < 0.05$  in Control group when compared to Experimental Group.

Students t test was used for statistical analysis.

**Table 1: Comparison of Pre and Post Mean, Standard Deviation, 't' Value and 'p' value of SPADI and Shoulder External Rotation Range of Motion in Control Group.**

No of Subjects	Variables	Mean Value		SD		T Value	P Value
		Pre	Post	Pre	Post		
10	SPADI	65.5	53.8	36.28	34.18	4.40787	0.00017
	Shoulder External Rotation ROM	28.0	60.1	10.89	68.1	-11.42447	0.00001

$p < 0.05$

**Table 2: Comparison of Pre and Post Mean, Standard Deviation, 't' Value and 'p' value of SPADI and Shoulder External Rotation Range of Motion in Experimental Group.**

No of Subjects	Variables	Mean Value		SD		T Value	P Value
		Pre	Post	Pre	Post		
10	SPADI	64.8	50.7	36.18	43.34	5.00006	0.000046
	Shoulder External Rotation ROM	28.5	43.7	16.94	31.79	-6.88542	0.00001

$p < 0.05$

**Table 3: Comparison of Pre Mean, Standard Deviation, 't' Value and 'p' value of SPADI and Shoulder External Rotation Range of Motion between Control and Experimental Group to check homogeneity.**

No of Subjects	Variables	Pre Mean Value		SD		T Value	P Value
		Control	Experimental	Control	Experimental		
10	SPADI	65.5	64.8	36.28	36.18	0.26005	0.39887
	Shoulder External Rotation ROM	28.0	28.5	10.89	16.94	-0.2997	0.383919

$p < 0.05^{NS}$

**Table 4: Comparison of Post Mean, Standard Deviation, 't' Value and 'p' value of SPADI and Shoulder External Rotation Range of Motion between Control and Experimental Group to check significance.**

No of Subjects	Variables	Pre Mean Value		SD		T Value	P Value
		Control	Experimental	Control	Experimental		
10	SPADI	53.8	50.7	34.18	43.34	1.11339	0.140094
	Shoulder External Rotation ROM	60.1	43.7	68.1	31.79	5.18902	0.000031

$p < 0.05$

### Discussion

Due to shoulder joint mobilizations both anterior and posterior glides with interferential therapy, which occur as a result of the breakdown of adhesions of joint space, flexibility of ligaments, and other joint structures, there is statistically significant improvement in the variable of SPADI and Shoulder External Rotation ROM in degrees in both groups. This physiological adjustment contributes to an increase in the shoulder joint's range of motion (ROM), notably the degree of shoulder external rotation. Interferential Therapy Application has a therapeutic impact that is demonstrated in this study as a reduction in pain using the Shoulder Pain and Disability Index as a gauge.

IFT's potential to reduce pain is consistent with study by G.C. Goats et. al. (1990) that interferential treatment may efficiently activate voluntary muscle, improve peripheral blood flow, and expedite bone mending. The use of this strategy to reduce pain is supported by empirical research<sup>22</sup>, and according to ZAMBITO ET AL (2006), this randomised double-blinded controlled study offered the first proof that IFT is considerably beneficial in reducing pain. At the beginning of the treatment, the placebo effect is impressive, but it usually wears off after a few weeks.<sup>23</sup>

The results of the study done on were supported by the significant increase in Shoulder External Rotation Range of Motion (ROM) brought on by Anterior and Posterior glides conducted a research with 49 individuals who had adhesive capsulitis. For around 4 to 8 weeks, each patient received treatment. By combining vigorous physical therapy with intra-articular infusion and light manipulation, the research aimed to change the course of the disease and shorten the length of time needed for recovery. The findings of this study show that following the initial physiotherapy treatment, almost 90% of patients saw a significant improvement.<sup>24</sup>

### Conclusion

According to the study's findings, both groups SPADI and shoulder external rotation range of motion significantly improved between pre and post measurements. Based on the findings, this study came to the conclusion that anterior glide and posterior glide with interferential treatment both lessen discomfort and increases the range of motion for external rotation in adhesive capsulitis. While analysing the data (table 3,4) we can conclude that, interferential therapy with anterior glide is superior to interferential therapy with posterior glide for relieving pain and increasing external rotation range of motion in adhesive capsulitis.



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**Conflict of Interest:** Nil

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## Effectiveness of Sleeper and Cross Body Stretches and Muscle Energy Techniques for Periarthritis Shoulder: Comparative Study

Mohammed Ameer Hussain<sup>1</sup>, M.Premkumar<sup>2</sup>,  
R. Muthupandi Kumar<sup>3</sup>, R.Shyam Sundar<sup>4</sup>

<sup>1</sup>PhD Research Scholar, Institute of Physiotherapy, Srinivas University, Mangaluru, India, <sup>2</sup>Professor cum PhD Research Scholar (Corresponding Author), Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001, <sup>3</sup>PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001, <sup>4</sup>PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001.

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### Abstract

**Background:** Periarthritis of shoulder typically is referred to as the spontaneous onset of gradually progressive shoulder pain and severe limitation of movement. Recently Sleeper stretch and Cross body stretch are used to stretch the posterior shoulder tightness to improve internal rotation range of motion and they prove effective in improving internal rotation range of motion of shoulder joint in posterior capsular tightness.

**Aim & objectives of the study:** To compare the effect of sleeper and cross body stretch versus muscle energy techniques in subjects with Periarthritis of shoulder.

**Data analysis and results:** Data analysis and result of this study shows that there was statistically significant improvement in the variable of pain in VAS and Shoulder Abduction ROM in pre post analysis of data after the intervention of Sleeper, cross body stretches in control group and Muscle Energy Techniques (MET) after intervention in both groups. After intervention of treatment, the experimental group is showing statistically better improvement in reduction of Pain in VAS but not Shoulder Abduction ROM when compared to control group.

**Conclusion:** It was concluded that both sleeper, cross body stretches of shoulder and Muscle Energy Techniques for Shoulder have statistically significant better reduction in Pain in VAS and Shoulder Abduction ROM in the treatment of Periarthritis, whereas Muscle Energy Techniques have statistically slightly better results of pain reduction and range increase in Periarthritis shoulder ROM when compared to sleeper and cross body stretches of shoulder.

**Key words:** Periarthritis of Shoulder, Sleeper Stretch, Cross Body Stretch, Muscle Energy Techniques.

**Corresponding Author:** M. Prem Kumar, Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001.

**Email id:** 80pk2009@gmail.com

**ORCID ID:** 0000-0003-0958-6143.

## Introduction

Shoulder joint is one of the most rewarding and functional joints involved in daily routines including performances, occupational and recreational activities.<sup>1</sup> Operation of this joint facilitates stability and mobility which often mutually co-exist between the upper and lower limb movements during skilled and powerful activities of the hands. The joints in human body get affected by different disabilities, of which arthritis represents a major one. Arthritis of the shoulder joint is reported since 1872<sup>2</sup>, described as 'Humero Scapular Periarthritis'. The ailment was renamed as 'Frozen Shoulder' in 1934 by Codman<sup>3</sup> and later described as 'Adhesive Capsulitis', by Neviarer<sup>4</sup> in 1945, who reported the occurrence of this ailment amongst 7%-21% of the population. The condition is characterized by painful stiff shoulder.

Periarthritis of shoulder typically is referred to as the spontaneous onset of gradually progressive shoulder pain and severe limitation of movement.<sup>5</sup> The incidence of Periarthritis of shoulder in general population is 2% and 10-20% Diabetes patients. It affects females slightly more than the males and is usually seen in ages 40-70 and about 12% of individuals affected develop the condition bilaterally, recurrence is rare in the same shoulder.<sup>6,7</sup> As the condition progresses, during frozen stage pain during rest subsides, and discomfort occurs only during movement. Eventually, the pain decreases spontaneously, but motion restriction persists and stiffness. During thawing stage resolution of pain and gradual recovery of joint movements.<sup>7</sup>

Management option for this Periarthritis of shoulder is pharmacological, non pharmacological and surgical interventions and Physiotherapy. Exercise therapy includes Shoulder Mobilization Exercises, Pulley Exercises, Back Climbing Exercises, Wall Climbing Exercises, Circumduction Exercises, and Pendulum Exercises. Recently Sleeper stretch and Cross body stretch are used to stretch the posterior shoulder tightness to improve internal rotation range of motion and they shows effective in improving internal rotation range of motion of shoulder joint in posterior capsular tightness.<sup>7-9</sup>

The correlation between the tightness in a joint capsule and pattern of motion restriction in a joint was

revealed by Hannafin et. al.<sup>9</sup>. Agonizing shoulder, freezing stage with chronic pain, frozen stage with significant limitation of ROM and thawing phase with progressive improvement in ROM have been identified as the major phases of frozen shoulder<sup>10</sup>. End range mobilization of the shoulder joint and intensive mobilization techniques [MT] have been identified as useful approaches for reducing the risk of stiffness or joint contracture progression in patient with adhesive Capsulitis.

MET is a unique technique in which the patient provides the corrective force rather than the care provider. MET is defined as the procedure that provides voluntary contraction of the muscle at varying levels of intensity, in a very controlled direction, against a force applied by the care provider. The potential applications of MET includes lengthening and strengthening of muscles, increasing fluid flow and decreasing local edema.<sup>10-12,14</sup>

To compare the effect of and sleeper and cross body stretch versus muscle energy techniques in subjects with Periarthritis of shoulder and to know whether sleeper and cross body stretch is more effective than the muscle energy techniques in subjects of Periarthritis of shoulder. By doing this study, the effectiveness of new type of stretches along with muscle energy techniques could be understood and can be implemented in future treatment for Periarthritis.

## Materials and Methods

### Study Design:

Comparative study.

### Study Setting:

Abhinav Physiotherapy and Fitness Centre, Madurai.

### Study Duration:

12 months

### Study Sampling:

Convenient sampling.

### Study Population:

Periarthritis Shoulder Patients in and around Madurai.

**Study Sample:**

30 subjects for each control and experimental group

**Criteria of Selection:****Inclusion Criteria:**

Diagnosed by a clinician as Periarthritis of shoulder.

Age between 30 – 60 years.

Both male and female.

Individuals with Periarthritis of shoulder and shoulder flexed to 90 degrees.

Subjects who are willing to participate in the study with symptoms of periarthritis of shoulder.

**Exclusion Criteria:**

Skin lesions at the site of applications.

Intra articular injections to the shoulder joint within 6 months prior to the study.

Traumatic injury to the shoulder joint within 6 months of study

Existence of CNS/PNS Disorder.

Mental disorders.

Tumors / Malignancies.

**Variables:**

Pain in VAS – Visual Analog Scale

Shoulder Abduction Range of Motion (ROM)

**Interventions:**

Sleeper Stretch, Cross Body Stretch and Muscle Energy Techniques (MET).

**Procedure:**

60 subjects with pain in the shoulder joint, restriction of shoulder internal rotation and clinically diagnosed of having periarthritis of shoulder were screened and after finding their suitability as per the inclusion and exclusion criteria patients are requested to participate in the study. They are divided into two groups of 30 each by convenient sampling

into control and experimental group. The subjects willing to participate in the study were briefed about the nature of the study and the intervention. After briefing them about the study, their informed written consent was taken.

The demographic data like age, sex, height, weight, occupation, and address was collected. Joint involved and duration of the symptoms was noted. Initial evaluation for their pain profile using visual analogue scale (VAS) and Shoulder Abduction was taken. Control Group was given sleeper stretch and cross body stretch for shoulder joint was given whereas experimental group got Muscle Energy Techniques for affected Shoulder Joint. 45 minutes a session, 4 sessions a week for 6 weeks intervention were given to both control and experimental groups. After the interventions, subjects were evaluated for their pain profile using pain in VAS, Goniometer for measuring shoulder joint abduction Range of Motion, all measurements were taken again by the same tester and range of motion noted after therapeutic intervention.

**Data Analysis and Results**

Data was analyzed with suitable statistical method with spss 16.0 version for online windows.

Shapiro Wilk test was used for checking normality distribution of data and independent student t test was used for analysis between variables in between groups.

Data analysis and result of this study shows that there is statistically significant improvement in the variable of pain in VAS and Shoulder Abduction ROM in pre post analysis of data after the intervention of Sleeper, cross body stretches in control group and Muscle Energy Techniques (MET) in Experimental Group with conservative Physiotherapy treatment for Periarthritis Shoulder. Homogeneity of variable pain VAS and Shoulder Abduction ROM is maintained in pre mean values between groups before intervention. After intervention of treatment, the experimental group is showing statistically better improvement in reduction of Pain in VAS but not Shoulder Abduction ROM when compared to control group.

**Table 1: Comparison of pre intervention values of mean, SD and p value between control and experimental group with student t test (Source: Author)**

No of Subjects	Variables	Control Group(Sleeper and Cross Body Stretches) Mean ± SD	Experimental Group (Muscle Energy Techniques) Mean ± SD	P value
60	Pain in VAS	8.86 ± 3.91	8.75 ± 4.22	0.543
	Shoulder Abduction ROM	59.5 ± 422.5	62.5 ± 412.5	0.168

**Table 2: Comparison of post intervention values of mean, SD and p value between control and experimental group with student t test (Source: Author)**

No of Subjects	Variables	Control Group (Sleeper and Cross Body Stretches) Mean ± SD	Experimental Group (Muscle Energy Techniques) Mean ± SD	P value
60	Pain in VAS	3.2 ± 3.6	2.2 ± 7.6	0.005
	Shoulder Abduction ROM	122.0 ± 1910.0	138.5 ± 902.5	0.005



**Figure 1: Sleeper and Cross Body Stretches for Shoulder Joint (Source: Author)**



**Figure 2: Muscle energy techniques for shoulder joint (Source: Author)**

### Discussion

This study results notified the important of different stretches like sleeper stretch and cross body stretch as well as the need of Muscle Energy Techniques in the treatment of Periarthritis shoulder. Sleeper stretch and cross body stretch as well as the need of Muscle Energy Techniques are producing various physiological effects like involvement of recruitment of motor units, firing of muscle fibers, pain gate mechanism to reduce pain and increase Shoulder Abduction ROM.

This study was getting strength by reflecting the results of Shaik Raheem Sahebetal 2015 in their study concluded that both sleeper and cross body stretching techniques were found improvement in Range of motion and reduction of pain in VAS and Cross-body Stretch showed more Significant improvement than the sleeper Stretch after 6 weeks treatment<sup>13</sup>andHui-Ting LinAretal 2008 concluded in their study that end range mobilization of the shoulder joint and intensive mobilization techniques [MT] have been identified as useful approaches for reducing the risk of stiffness or joint contracture progression in patient with adhesive capsulitis. However, MET has been reported to be facilitating release of muscles and promoting body healing mechanisms and improving shoulder ROM.<sup>15</sup>

### Conclusion

It was concluded that both sleeper, cross body stretches of shoulder and Muscle Energy Techniques for Shoulder have statistically significant better reduction in Pain in VAS and Shoulder Abduction ROM in the treatment of Periarthritis, whereas Muscle Energy Techniques have statistically slightly better results of pain reduction and range increase in Periarthritis shoulder ROM when compared to sleeper and cross body stretches of shoulder.

**Ethical Clearance:** Taken from Institutional Ethical Review Board, Santosh College of Physiotherapy, Madurai.

**Conflict of Interest:** Nil

**Source of Funding:** Self

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## Effects of Occupational Therapy Intervention on Motor Cognitive Behavioural Development of Infant Born Pre-term: A Systematic Review

Sadia<sup>1</sup>, Rashida Begum<sup>2</sup>

<sup>1</sup>Mot, Paediatrics, Jamia Hamdard, <sup>2</sup>Associate professor Jamia Hamdard Dept of Occupational Therapy, Jamia Hamdard, New Delhi.

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### Abstract

**Aim:** To synthesize the existing literature and determine the efficacy of occupational therapy intervention, starting in the neonatal intensive care unit (NICU), on the motor, cognitive, and behavioural outcomes of Indian infants born pre-term.

**Method:** Databases were searched for randomized controlled trials, quasi-randomized controlled trials, pre and post studies etc of occupational therapy early intervention for infants with a gestational age of less than 37 weeks, initiated in the NICU and delivered by a therapist or parent with therapist support. Quality was evaluated using the Cochrane standardized risk of bias assessment tool. Recommendations were made using the Grading of Recommendations, Assessment, Development and Evaluations approach.

**Results:** Ten studies met the inclusion criteria. Studies were categorized into four intervention categories: (1) nesting, positioning and diaper sizing; (2) multi-sensory stimulation; (3) KMC (skin to skin care) (4) oral-motor intervention. Risk of bias varied from low to high or was unclear.

**Interpretation:** Preliminary support indicates that occupational therapy improves motor and cognitive outcomes in the short-term and possibly long-term. Occupational therapy intervention programmes for pre-term infants have a positive influence on cognitive and motor outcomes during infancy. A great deal of heterogeneity between studies was due to the variety of early developmental intervention programmes tested and to gestational ages of included pre-term infants; thus, comparisons of intervention programmes were limited. Further research is needed to determine which early developmental interventions are most effective in improving cognitive and motor outcomes, and to discern the longer-term effects of these programmes.

**Key words:** occupational therapy, pre-term infant, NICU, multi-sensory stimulation, KMC, neonatal positioning, exclusive breast feeding, spoon feeding, paladai feeding, PIOMI)

### Introduction

India has largest birth ratio (about 26 million per year) and experiencing dramatic improvement

in infant and child survival, although neonatal and infant mortality rate is still high 30 to 41 per 1000 births<sup>1</sup>.

**Corresponding Author:** Rashida Begum, Associate professor Jamia Hamdard Dept of occupational therapy, Jamia Hamdard, New Delhi.

**Email id:** [sadiatajuddin@gmail.com](mailto:sadiatajuddin@gmail.com)

Every year around 21 million low birth weight babies are born. They represent 16 percent of all new born, but large regional variations exist, where as in India constitute about 60%-70% of intra-uterine growth retardation and remaining 30%-40% pre-term infants born before 37 weeks of gestation<sup>1</sup>.

Pre-term birth is a major public health challenge worldwide, contributing about 10% of all births<sup>3</sup>. Pre-term babies, those born before 37 weeks of pregnancy, have a higher risk of motor, cognitive, and behavioural impairments than those born full-term<sup>2-5</sup>.

Occupational Therapists (OTs) in the NICU are responsible for recognising the interaction between the physical and social environments, educating caregivers on the NICU process, developing individualised intervention plans, and remaining competent, according to the American Occupational Therapy Association (AOTA, 2006b)<sup>6</sup>.

Infants born preterm are also at risk of having developmental coordination disorder, language impairments, problems with social/emotional development, impaired executive functions, and a limited attention span<sup>7</sup>. The risk of developmental impairment in children born pre-term increases with decreasing gestational age<sup>3</sup>.

The rationale for providing Occupational therapy to neonates is supported by three ideas:

1. Protection of the neonatal brain;
2. Optimization of the environment and intervention to promote better developmental outcomes;
3. Support for parents to cope with the challenges of preterm birth and prepare to support infants at risk for developmental delays.

Infants born pre-term are also at risk of having developmental co-ordination disorder, language impairments, problems with social/emotional development, impaired executive functions, and a limited attention span. The risk of developmental impairment in children born pre-term increases with decreasing gestational age.

There is much variability in occupational therapy, with models of intervention having a different focus,

such as prevention, remediation, or treatment of a specific disability. Heterogeneity also exists in the dose and timing of intervention in addition to heterogeneity, a lack of clarity in neonatal therapy research makes synthesizing the findings difficult.

Thus, the purpose of this review was to identify and evaluate studies where occupational therapy in neonates was initiated in the NICU, as provided or designed by an occupational therapist, and report the effect of the intervention on the motor, cognitive and behavioural outcomes.

## Methodology

- The protocol for this systematic review was developed according to the Preferred Reporting Items of Systematic Reviews and Meta-Analysis for Protocols (PRISMA-2020).

## Study design

- Experimental studies such as randomized controlled/clinical trials (RCTs) and cluster RCTs and various study designs (randomized controlled trials, quasi-experimental, cross-over or single-group repeated measure studies, PDSA). All literature published in English language in last 10 year (2012-2022). Studies that report outcomes of behaviour, motor development, and/or cognitive development, physiological parameters using standardized assessments, on Indian participants and fitted the inclusion criteria based on population, type of intervention, and reported outcomes.

## Inclusion criteria

### Population

Very pre-term infants (born > 32 weeks gestation) with very low birth weight(1-1.5kg) and low birth weight (1.5-2.5 kg) Who were hospitalized in the NICU and had occupational therapy intervention

### Interventions

Intervention was either delivered directly by an occupational therapist, or designed by a therapist and delivered by the parent under the supervision of a therapist in the NICU or initiated just before discharge and continued at home.



**Comparator**

All types of comparator groups, such as non-exposed control group or a group exposed to different intervention

**Outcome**

Studies reporting pre-term infants ‘outcomes of behaviour, motor development, and/or cognitive development using standardized assessments.

**Exclusion criteria**

Populations with mean or median gestational age greater than 35 weeks, with a purposeful sample of healthy infants (defined as 3 or more of the following factors: never on oxygen, never on medications, no intraventricular haemorrhage or other perinatal brain injury, or if Apgar scores were >7 at 1 or 5 min)

**Search strategy**

A systematic search for studies published from year 2012 to 2022, on electronic databases was searched with MeSH/

Thesaurus terms to screen for relevant studies for this systematic review: CINAHL, MEDLINE, PubMed, EMBASE (OVID), Cochrane Database of Systematic Reviews, Cochrane (CENTRAL), Web of Science, The Scopus database, Google scholar, etc

**Study quality**

Assessment of study quality was independently performed by two reviewers, and disagreements regarding study quality were resolved by discussion among the two reviewers until consensus was achieved.

The Cochrane’s risks of bias assessment tool were used by two reviewers independently to screen the studies risk of bias which was classified as low, high, or unclear risk of bias. The tool screens for sequence generation, allocation concealment, blinding, incomplete outcome data, and selective outcome reporting.

We used the GRADE Guideline Development Tool to create a ‘Summary of findings’ table to report the quality of the evidence.

	Random sequence generation (Selection bias)	Allocation concealment (Selection bias)	Blinding of participants and personnel (performance bias) All outcomes	Incomplete outcome data (Attrition bias) All outcomes	Blinding of outcome assessment (Detection bias)	All outcomes Selective reporting (reporting bias)	Other bias
Alice <b>Jeba J</b> et al 2019	+	+	-	-	+	+	?
Upadhyay, Et Al 2021	-	-	-	-	+	+	?
Shukla 2020	+	-	-	+	+	+	?
<b>Bala</b> et al 2016	+	-	?	-	+	+	?
Arora, et al.2018	+	-	-	-	-	-	?
<b>Bhal R</b> et al. 2021	+	+	+	-	+	+	?
<b>P. S. Kavagasabai</b>	+	-	-	-	+	+	?
Modi K et al. 2018	+	-	-	-	+	+	?
Sathish Y et al 2017	+	+	+	-	+	+	?
<b>Bera,</b> et al. 2014	-	-	+	-	+	+	?

**Fig. 1: Risk of bias summary: review authors’ judgements about each risk of bias item for each included study**

Inference -Green, moderate-to-large effect in a low/unclear risk of bias study; yellow, small effect and low risk of bias or moderate/large effect with high risk of bias; red, no effect.

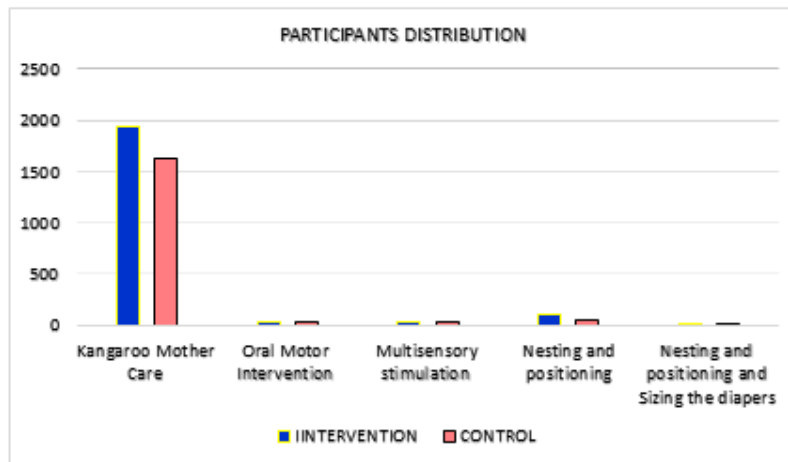
**Results**

**Description of studies**

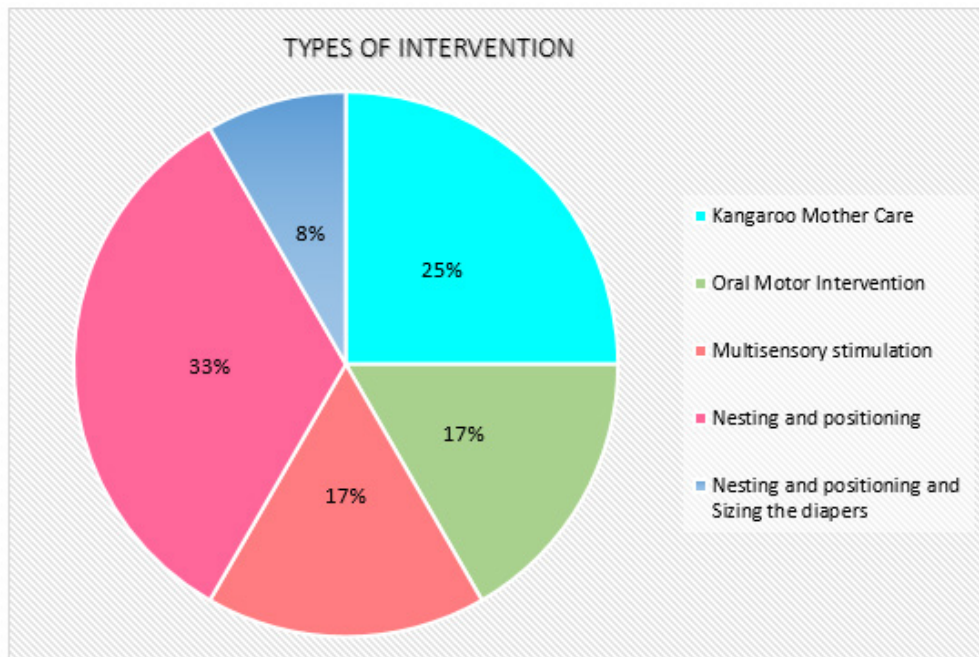
The search yielded 1005 studies after duplicates were excluded. Screening of titles resulted in 57 trials for further scrutiny. Review authors determined that 13 studies were potentially eligible for inclusion in

the review. On further inspection at data extraction, we had to exclude the stage 3 study, as data could not be extracted in relation to infants under 37 weeks' PMA. Therefore, a total of 10 studies were eligible for full data extraction.

The included studies enrolled between 16 and 1600 participants, for a total of 3898 participants, which reported feeding intervention, multi-sensory stimulation, therapeutic positioning, skin to skin contact (kangaroo mother care) nesting protocols.



**Graph 1: Showing Distribution of No. of Participants (intervention and control group) and Intervention in Included Studies**



**Graph 2: Types of Intervention in Included Studies**

## Discussion

To our knowledge, this is the first systematic review to evaluate the efficacy of early interventions therapy implemented in Indian population. The findings of the systematic review suggest that occupational therapy may improve motor and cognitive outcomes in infants born pre-term. Therapist-delivered postural control intervention (TDPCI) was found to have a short-term effect on motor development. Developmental care and Oral-motor interventions also showed a positive effect on behavioural motor and cognitive development. The results of are discussed in detail in the following sections.

### *Summary of main results*

The investigators reported a range of interventions that appear beneficial for pre-term infants in terms of reduced length of hospital stay and earlier transition to oral feeding, with reduced length of time on parenteral nutrition neuro-muscular maturity, weight gain, pain reduction, improvement in vital signs.

### *Kangaroo Mother Care*

World Health Organization (WHO) guidelines currently recommend initiation of short in-termittent Kangaroo Mother Care sessions when the infant's condition begins to stabilize, and continuous Kangaroo Mother Care when fully stable. In this review out of 3898 participants 3575 participants received (intervention 1941 control-1634) skin to skin care (kangaroo mother care)<sup>14,19,21</sup> KMC showed modest but statistically significant improvement in vital physiological parameters<sup>18</sup> and improve survival rate of LBW neonates by 25%<sup>19</sup>.

### *Nesting And Positioning and Sizing the Diapers*

The use of positioning aids for pre-term infants is recommended to facilitate their growth and clinical outcome. A study conducted in New Delhi investigated the effect of nesting on posture discomfort and physiological parameters of low-birth-weight infants. There was a significant reduction in the discomfort in experimental group compared to the control group ( $t=10.65$ )<sup>21</sup>, one study was on positioning nesting and dipper sizing, introduction

of nesting rolls and appropriate size diapers had significantly improved mean IPAT score<sup>13</sup>.

### *Oral Motor Intervention*

Oral motor intervention trial<sup>15,16</sup> showed that pre-feeding intervention with PIOMI is effective in improving the oral-motor function of the pre-term infants Gaebler and Hanzlikhad<sup>10</sup> demonstrated that infants receiving a peri- and intra-oral stimulation just before oral feedings scored better on the NOMAS which was also consistent with results of these studies.

### *Multisensory intervention*

Multi-sensory stimulation appears to have a beneficial effect on the tonal maturation in pre-term infants, the response of the infants to stimulation was within the physiological limits, hence ATVV stimulations are safe to administer in stable pre-term infants<sup>19,18</sup>. The present observations are consistent with Nelson<sup>11</sup>, who also showed no clinically significant difference in the HR, RR and SpO<sub>2</sub> between the control group and the ATVV stimulated group in preterm infants of 33–35-week post conceptional age.

### *Variations in sample, inclusion, exclusion criteria and control conditions*

There is significantly variability among studies in terms of sample characteristics. Statistical significance; There is wide variation in gestational ages of pre-term babies on whom OT intervention was applied leading to limited generalizability of study findings. Most of the studies excluded the vulnerable pre-term as their condition might interfere with study. Inconsistencies are found across studies as in most of the studies the control group received developmentally supportive routine care. Some studies have used sham intervention<sup>9</sup>, swaddling<sup>3</sup>, wrapping in cloths<sup>3</sup> (to blind the unit staff and primary care providers) which includes standing by the bedside for the exact same duration and while putting a curtain.

### *Quality of the evidence*

Trends in the data appear to indicate that providing an occupational therapy intervention protocol reduces length of hospital stay, time taken to achieve oral feeding and time spent on parenteral

nutrition, cognitive and neuromuscular maturity but all of the analyses are based on studies of limited methodological quality. Results of the data analysis are encouraging but must be interpreted with caution, given the high risk of bias encountered across virtually all of the included studies. the quality of the evidence ranged from low (parenteral nutrition, breast feeding, sensory stimulation) to very low (vital signs, weight gain, cognitive development)

### Potential biases in the review process

We strove to decrease biases in the review process authors (MS, RB) individually examined studies using screening tool. Our deviations from the protocol consisted of re-definition of interventions, re-scoping of the review focus and application of the GRADE method in assessing the quality of evidence and were unlikely to introduce bias into the review process.

### Limitations of included studies

There is a possibility of publication bias, where only studies reporting positive outcomes were published and included in this review. In addition, most studies included multiple outcome measures, many of which did not reach statistical significance. Many outcomes that did have statistical significance were challenging to interpret and many may not have been clinically significant. We included multiple research designs in an effort to capture all appropriate literature related to OT in NICU, so lower quality non-randomized designs could have biased the review findings, the studies that were randomized, did not specify their methods clearly or report allocation concealment. Completeness of treatment and follow-up was also difficult to ascertain, as studies infrequently reported the number of infants by group with complete outcomes data and reasons for loss to follow-up. Most interventions were very short and were not conducted across the hospitalization period and did not give clear descriptions of inclusion criteria. Finally, generalizability of many of the studies is limited.

**Ethical Clearances:** Ethical clearance was taken from institutional ethical committee to conduct the study.

**Conflict of Interest:** Authors report no conflict of interest.

**Funding:** Self

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## Effect of Cardiac Rehabilitation in Percutaneous Transluminal Coronary Angioplasty (PTCA)

Namrata Parekh<sup>1</sup>, Charusmita Badgajar<sup>2</sup>, Swati Patel<sup>3</sup>

<sup>1</sup>M.P.T(Cardio) Clinical Physiotherapist, <sup>2</sup>M.P.T (Ortho) Clinical Physiotherapist, <sup>3</sup>M.P.T(Ortho) Clinical Physiotherapist, Fortis Hiranandani Hospital, Vashi, Navi Mumbai-400703.

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### Abstract

**Introduction:** Percutaneous transluminal coronary angioplasty (PTCA) also called percutaneous coronary intervention (PCI) is a minimally invasive procedure to open blocked or stenosed coronary arteries allowing unobstructed blood flow to the myocardium. Cardiac rehabilitation is important role for more successful PTCA. To increase cardiac efficiency, increase exercise tolerance or endurance and to get the effective and better results.

**Case presentation:** 45 years male admitted in emergency department with chest pain during gym workout. Blood reports, ECG, ECHO, and angiography done in investigation. In angiography RCA 99% stenosis and in D1 ostial 60% stenosis. PTCA procedure done with DES to RCA. Twelve days after surgery patient came for cardiac rehabilitation in physiotherapy department.

**Management and Outcome:** warm-up, aerobic period, and cool-down, abdominal exercise, strengthening exercise included in cardiac rehabilitation. Pulse rate, blood pressure, respiratory rate, SpO<sub>2</sub>, Rate of perceived exertion scale and 6-min walk test, distance, VO<sub>2</sub> max calculated as an outcome.

**Discussion:** Cardiac Rehabilitation is most important for faster recovery as well as better efficiency for cardiac endurance. Maximum oxygen uptake increased after cardiac rehabilitation protocol.

**Conclusion:** Cardiac Rehabilitation is helpful for more successful PTCA.

**Key words:** Cardiac Rehabilitation, PTCA, VO<sub>2</sub> max, Aerobic exercise.

### Introduction

Percutaneous transluminal coronary angioplasty (PTCA) also called percutaneous coronary intervention (PCI) is a minimally invasive procedure to open blocked or stenosed coronary arteries allowing unobstructed blood flow to the

myocardium<sup>1</sup>. Cardiac rehabilitation is important role for more successful PTCA. To increase cardiac efficiency, increase exercise tolerance or endurance and to get the effective and better results.

The blockages occur because of lipid-rich plaque within the arteries, diminishing blood flow to the

**Corresponding Author:** Namrata Parekh, M.P.T(Cardio) Clinical Physiotherapist, Fortis Hiranandani Hospital, Vashi, Navi Mumbai-400703.

**Email id:** [parekhnmr@gmail.com](mailto:parekhnmr@gmail.com)

myocardium. The accumulation of lipid-rich plaque in the arteries is known as atherosclerosis. When atherosclerosis affects the coronary arteries, the disorder is known as coronary artery disease.

Patient with CAD usually present with exertional chest pain, or with dyspnea with exertion. In acute myocardial infarction, there is plaque rupture with platelet aggregation, and acute thrombus formation, which results in a sudden occlusion of coronary artery. These patients present with acute chest heaviness, diaphoresis, and nausea. Urgent PTCA is often required to limit myocardial damage.<sup>2</sup>

Cardiac rehabilitation is a complex, interprofessional intervention customized to individual patients with various cardiovascular disease such as ischemic heart disease, heart failure, and myocardial infarctions, or patients who have undergone PTCA or CABG.<sup>3</sup>

Cardiac rehabilitation has three phase: Warm-up, Aerobic Exercise, and Cool-down. In three phase of cardiac rehabilitation build cardiac muscle endurance and strength. Cardiac Rehabilitation is must for better results of successful surgery. Cardiac Rehabilitation plan according to FITT Protocol.

### Case Presentation

45 years male admitted in emergency department with chest pain during gym workout. Weight is 76.8kg, Height is 170.5cm, BMI is 25kg/m<sup>2</sup>. Blood reports, ECG, ECHO, and angiography done in investigation. In ECG, inferior wall MI was primary diagnosed with ST segment elevated. ST segment elevation settled with Thrombolysis.

In ECHO, left ventricle mid and basal inferior septum, infero-lateral wall are hypokinetic. Mildly depressed left ventricle systolic function. LVEF-45-50%. In Angiography, LAD-D1 shows 60% ostial stenosis, RCA- dominant vessel shows proximal 30-40% stenosis and mid RCA 99% stenosis. Final Diagnosis was CAD, PTCA. Patient underwent PTCA to RCA through right radial artery.

Patient taken tab. brilinta, ecosprin, roseday, cytogard, restyl, pruease medicine after discharge. Twelve days after surgery patient went for cardiac rehabilitation in physiotherapy department. On

room air patient vitals was PR-63bpm, SPO<sub>2</sub>-98%, BP-120/82mmhg, RR-22bpm, RPE-0(MBS). Patient had complain of difficulty in continuous walking for 10 mins, stair climbing. No other symptoms like chest pain, breathlessness. No other history like smoking, tobacco chewing.

### Management and Outcome:

Primary outcome was six minute walk test, distance, VO<sub>2</sub>max on first, fifth, and tenth day. Pre and Post exercise vitals taken for basic assessment. vitals observed on Telemetry. In Cardiac rehabilitation, planned according to FITT protocol.

First day: outcome measurement:

Six minute walk test: 28 laps

Distance: 840m

VO<sub>2</sub> max: 44ml/kg/m<sup>2</sup>

Warm-up period:

All Upper limb and Lower limb big muscle flexibility ROM exercise, Segmental breathing exercise, Thoracic expansion exercise. Its taken 20 minutes.

### Exercise Program:

According to patient resting heart rate calculated was Target heart rate. intensity depend on target heart rate. For aerobic exercise used walking, Treadmill, cycle, arm-ergometry. Alternative days use different types of aerobic exercise. Its taken 35 minutes.

### Cool- down period:

All Upper limb and Lower limb big muscle stretching exercise, diaphragmatic breathing exercise, pursed-lip breathing exercise, relaxation exercise. Its taken 15 minutes.

On fifth day outcome measurement:

Six minute walk test: 32 laps

Distance: 960m

VO<sub>2</sub> max: 52 ml/kg/m<sup>2</sup>

After fifth day of exercise program start strengthening exercise in large muscle with 1.5 kg weight. Increased frequency and time of same type and intensity program.

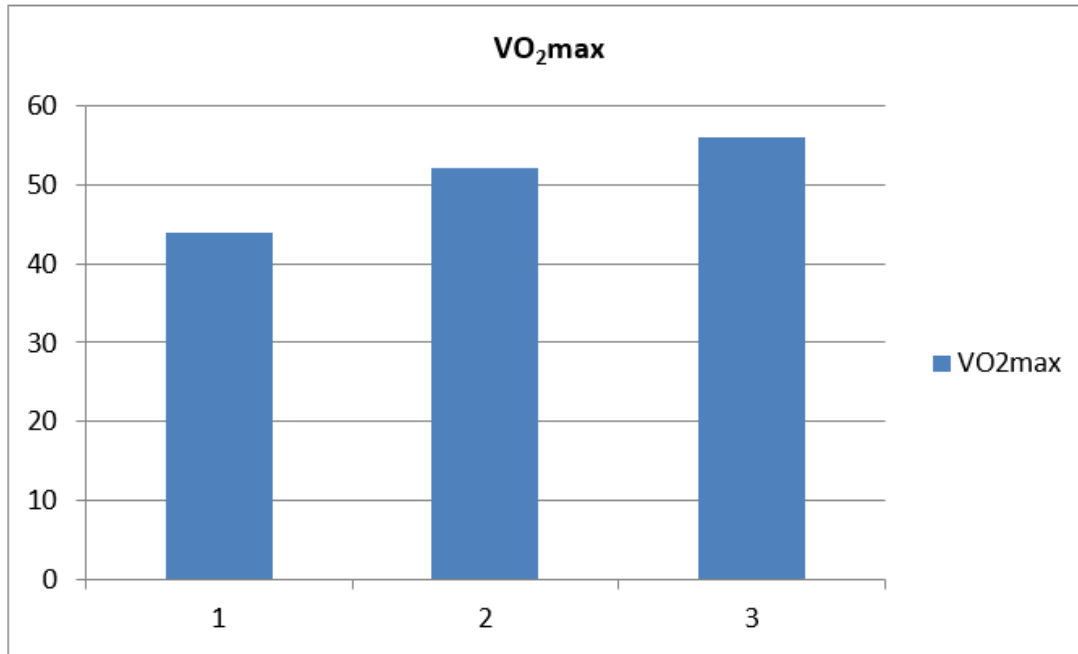
On Tenth day outcome measurement:

Six minute walk test: 52 laps

Distance: 1027m

VO<sub>2</sub> max: 56 ml/kg/m<sup>2</sup>

Mean of Pre and Post exercise period vitals was Pre pulse rate: 58b/min, blood pressure:130/86mmHg,Respiratory Rate:21b/min,SPO2:98%, RPE: 0.Post pulse rate:75b/min, blood pressure: 129/80mmHg,Respiratory Rate:20b/min, SPO2:98%,RPE:0.



**Graph 1: vo2 max on first, fifth, and tenth day.**

### Discussion

This study results suggested that cardiac rehabilitation was very helpful for successful PTCA. Maximal oxygen uptake of myocardium muscle was increased day by day because of cardiac rehabilitation. Muscle contraction ,relaxation, training, flexibility was part of cardiac rehabilitation.

In this study, calculated vo2 max use of six-minute walk test. Six -minute walk test is very accurate, cost- effective test to calculated maximum oxygen uptake.

Central and peripheral adaptations in oxygen transport and utilisation are training-modality dependant variables. Interval training has the potential to improve both central and peripheral components of VO<sub>2</sub> max whereas continuous training (endurance training at the same speed/ intensity) is mainly associated with greater oxygen extraction. The systemic and cardiac specific effect of exercise

(e.g. skeletal and cardiac muscle hypertrophy and hyperplasia, improved vascular flow, vasoreactivity, angiogenesis, insulin sensitivity, oxidative phosphorylation, stroke volume, cardiac output and cardiac protection by less ischaemic injury etc.). Exercise physiological knowledge can help patients to achieve higher VO<sub>2</sub> max, less hospital admissions and a lower morbidity and mortality.<sup>4</sup>

Increased cardiac output is the most important cardiovascular response to physical activity. This is caused by an increase in heart stroke volume and heart rate which can reach about 95% of its maximum level. Oxygen consumption in the body depends on how fast and slow the cardiovascular system in delivering oxygen to tissues is, it is closely related, therefore VO<sub>2</sub>Max values can be limited by the cardiovascular system. Maximum oxygen consumption (VO<sub>2</sub> Max) in several milliliters of oxygen per kg of a person's body weight according to their needs or body composition, therefore oxygen consumption in the



human body varies. For example, someone with a high body fat percentage requires a lower VO<sub>2</sub> Max consumption. Therefore, reducing fat in the body can be one solution to increase maximum oxygen consumption without additional exercise. A trained person will have a lower resting heart rate than an untrained person. People who are trained will have a lower resting heart rate, which can result in higher VO<sub>2</sub>max values.<sup>5</sup>

Squires et. al., demonstrated that exercise training results in an improvement in systemic oxygen transport, a reduction in myocardial oxygen requirement for a given amount of work and a decrease in the extent of ischemia during physical activity.<sup>6</sup>

During exercise, cardiovascular parameters change to supply oxygen to working muscles and to preserve perfusion of vital organs. The vascular resistance and heart rate are controlled differently during physical activity. At the onset of exercise heart rate (and cardiac output) elevation is mediated mostly by central command signals via vagal withdrawal. As work intensity increases and heart rate approaches 100 beats/ min, sympathetic activity begins to rise, further increasing heart rate and plasma norepinephrine concentric and eccentric vessels in visceral organs.<sup>3</sup>

### Conclusion

We concluded that cardiac rehabilitation is helpful for faster recovery after PTCA. Cardiac rehabilitation can change any cardiac surgery results. Its protocol based on patient's condition. Only cardiac rehabilitation can improve myocardium muscle strength. Proper protocol, frequency, training can improve patient's condition, willpower, decrease

patient's exertion level and muscle strength. Cardiac rehabilitation also improve patient's mental and psychological status.

### Limitation:

Use long term cardiac rehabilitation protocol.

Can use other test for vo<sub>2</sub> max calculation.

**Ethical clearance:** Approved by Fortis Hospital ethical committee

**Conflict of interest:** None

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## Physiological Cost Index among Individuals with Mild to Moderate Chronic Obstructive Pulmonary Disease and their Compliance with Pulmonary Rehabilitation

Namratha Shanbhag<sup>1</sup>, Sangeeta Appannavar<sup>2</sup>,  
Vijayalaxmi S Kathare<sup>3</sup>, Tulasi H Kulkarni<sup>4</sup>

<sup>1</sup>MPT in Cardiorespiratory Disorders, <sup>2</sup>Assistant Professor, <sup>3,4</sup>MPT in Cardiorespiratory Disorders, Shri Dharmasthala Manjunatheshwara College of Physiotherapy, Sattur, Dharwad, Karnataka, India.

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### Abstract

**Background:** Chronic obstructive pulmonary disease is currently one of the top three causes of mortality globally, with poor and middle income nations accounting for 90% of all deaths. The physiological cost index is a technique for calculating the energy cost using the measurement of heart rate.

**Aim:** To evaluate Physiological cost index among patients with chronic obstructive pulmonary disease and to check their compliance with pulmonary rehabilitation protocol and to rate their exertion using modified Borg scale.

**Methodology:** A total of 30 participants were included in this study. Subjects were asked to walk for 6 mins at comfortable walking speed and Physiological cost index was calculated by using the walking heart rate. The Physiological cost index were studied on two occasions, before and after performing the given exercises, included upper and lower mobility exercises along with breathing exercises.

**Results:** Data was analyzed using statistical software R software version 4.1.2. P-value less than equal to 0.05 was statistically significant.

**Conclusion:** This study found that the Physiological Cost Index of subjects with Chronic Obstructive Pulmonary Disease was seen to decrease after performing the prescribed exercises, suggesting a favorable reduction in energy consumption and improving their functional performance.

**Keywords:** Chronic Obstructive Pulmonary Disease (COPD), Forced Expiratory Volume in 1 second (FEV1), Global Initiative for Chronic Obstructive Lung Disease (GOLD), Modified Borg Scale (MBS), Physiological Cost Index (PCI), Pulmonary Rehabilitation (PR).

## Introduction

One of the main causes of death and morbidity worldwide is chronic respiratory illness. Among chronic respiratory diseases, asthma and Chronic Obstructive Pulmonary Disease (COPD) are the two most common.<sup>1</sup> A variety of diverse factors and mechanisms contribute to the pathophysiology and clinical manifestation of COPD, making it a complicated disorder.<sup>2</sup> Acute symptoms of COPD, a chronic condition marked clinically by increasing dyspnea, cough and sputum production, and increased sputum purulence, may periodically worsen.<sup>3</sup>

It is believed that the pathophysiology of COPD is based on lung inflammation brought on by exposure to inhaled particles and gases. Inflammatory cells are drawn to and activated in the lung as a result of exposure to these inhaled particles. The disease's major characteristics are mucus hypersecretion, small airway remodeling and constriction, and damage of the lung parenchyma, which cause coughing, air trapping, and increasing ventilation and perfusion mismatch.<sup>4,5</sup>

According to the degree of airflow limitation as indicated by Forced Expiratory Volume in 1 second (FEV<sub>1</sub>), the Global Initiative for Chronic Obstructive Lung Disease (GOLD) approach categorized COPD as follows:

Stage 1 (mild; FEV<sub>1</sub> ≥ 80% predicted)

Stage 2 (moderate; FEV<sub>1</sub> ≥ 50% and < 80% predicted)

Stage 3 (severe; FEV<sub>1</sub> ≥ 30% and < 50% predicted)

Stage 4 (very severe; FEV<sub>1</sub> < 30% or < 50% predicted with chronic respiratory failure).<sup>6</sup>

Patients with COPD engage in less exercise owing to skeletal muscle dysfunction, which is caused by deconditioning and affects skeletal muscle performance (strength and endurance) and structure (fibre size, fibre type distribution, capillary density, and metabolic capacity).<sup>7</sup>

The quantity of 'energy' or calories a person needs/burns to perform any physical or biological activity, such as breathing, flowing blood, digesting

food, or moving, is referred to as energy expenditure.<sup>11</sup> The efficacy of walking systems is commonly assessed by measuring the energy consumption of walking.<sup>8</sup> MacGregor founded Physiological Cost Index (PCI) after seeing the need for an easy to use, non-invasive way of calculating the physiological cost of walking that could be used in clinical settings.<sup>10</sup>

PCI is calculated by using the formula: PCI (beats/min) = (Walking heart rate - Resting heart rate) / Speed (m/min).<sup>11</sup>

By determining the energy cost of walking, over a 6-min walk test (6 MWT), PCI is a quick, safe, and inexpensive method which can be used for many different purposes such as evaluating orthoses, effects of anti-inflammatory drugs, and measuring the severity of diseases.<sup>11,9</sup>

Although there were a few studies that evaluated PCI in COPD individuals, most of them were centered on energy expenditure of walking i.e PCI after breathing exercises. Our literature search did not demonstrate any study which evaluated PCI among individuals with GOLD staging criteria, specifically stage 1 and stage 2, and their response to Pulmonary Rehabilitation (PR). PR has proven to be an integral part in the management of COPD to improve dyspnea and fatigue, exercise tolerance, health related quality of life and reduced hospital admissions. Hence the need of the study is to observe changes in the PCI, post PR among COPD patients and to observe changes their exertion using Modified Borg Scale (MBS).

A study with an objective to provide an update about COPD was conducted in the year 2016 by Sean O'Reilly. It was stated that COPD is a common, preventable, and treatable disease which is characterized by persistent airflow obstruction associated with enhanced inflammation in the airways and the lungs in response to noxious particles or gases. He also mentioned that clinical history and pulmonary function testing are necessary for accurate diagnosis. While exposure to tobacco smoke remains a common cause, other aetiologies and underlying genetic predisposition play significant roles. There are many different treatment choices, and each one should be customised based on the symptoms and frequency of exacerbations.<sup>4</sup>

A literature review was done in the year 2018 regarding exercise assessments and trainings of PR in COPD. In COPD patients, skeletal muscle weakness results in decreased activity. PR, a crucial component of managing COPD, lessens dyspnea and exhaustion, enhances exercise tolerance and health related quality of life, and lowers hospital admissions and death for COPD patients. The primary element of PR, which consists of exercise assessment and training therapy, is exercise. To evaluate PR's application in clinical practice, this article summarized the common methods of exercise measurement and exercise training for patients with COPD. Exercise evaluations should take into account a patient's symptoms, strength, endurance, and health related quality of life. Following calculations, comprehensive exercise programmes that may include endurance, strength, and respiratory training should be designed. More studies are warranted to support the evidence and examine the effects of long term benefits of exercise training for patients with COPD in each stage.<sup>7</sup>

A study was done to find out if PCI can be calculated using MacGregor's Equation in the year 2015. In this study a total of 50 young randomly selected healthy females performed 50m, 100m and 150m walking test at their self-selected preferred speed. A 100-meter walk at speeds slower and faster than the ideal speed yielded the PCI, too. Using MacGregor's equation, the PCI during exercise was computed by taking into account heart rate and walking pace over a range of distances. The PCI values increased significantly when subjects walked either slower or faster than their normal preferred speed. The results showed that the physiological cost index values were consistent over a range of walking distances. When respondents walked at their chosen speed, the PCI was the lowest, and it rose when they walked more slowly or more quickly. The first estimation was higher than subsequent estimations.<sup>9</sup>

### **Materials and Methods:**

This was a prospective cohort study aiming to find out PCI in COPD patients and their compliance with PR.

### **Inclusion Criteria:**

1. Patients diagnosed with COPD by a qualified medical practitioner.
2. Patients with mild to moderate COPD according to GOLD criteria.
3. Patients of age group 45 – 65 years of age.

### **Exclusion Criteria:**

1. Patients with acute exacerbation and GOLD staging of 3 and 4 COPD.
2. Patients who are suffering with any lung pathology secondary to post covid infection or secondary to any restrictive lung pathology/ any traumatic injury/ neurologic factor etc.
3. Patients with existing cardiovascular or neurological conditions.

The subjects were recruited using convenient sampling method. Patients visiting Medicine and Pulmonology OPD in SDM hospital, Dharwad (Dec 2021 - June 2022) who have been diagnosed with mild to moderate COPD were included as per the inclusion and exclusion criteria. Subjects were asked to complete the 6 minute walk test. MBS for rate of perceived exertion was recorded. PCI was obtained after the subject had completed 6 min walk test, after which subjects were made to perform a set of exercises which included 10 min warm up period, 25 min of aerobic activity and 10 min of cool down period. Aerobic activity included diagonal arm raises, arm abduction into elevation and reverse, and arm abduction, forward flexion, and reverse; step-ups with three step heights; and straight leg raises along with a walking program with nine levels, the maximum level being 10 min of rest and then 10 min of walking.<sup>12</sup>

In addition to this Diaphragmatic breathing and pursed lip breathing exercise were included.<sup>19</sup> The same set of exercises was given to the subject and was told to perform for 6 weeks. Dosage of exercise: Frequency of 3 – 5 times a week with a duration of 20 minutes performed twice a day. Patient was evaluated for their PCI after 6 weeks of follow up.

Data was analysed using statistical software R software version 4.1.2 and Microsoft Excel. Categorical variables are presented as a frequency table. Continuous variables are expressed as

Mean±SD/Median (minimum, maximum). For normally distributed variables paired t-test was used to compare the mean of variables between the time points. For non-normally distributed variables Wilcoxon Signed Rank test used to compare the distribution of variables between the time points. Shapiro-Wilk’s test used to check the normality of variables. P-value less than equal to 0.05 is statistically significant.

## Results and Discussion

The study had 30 participants. In the study, mean age observed was 57.07±6.42 years and 45 years and 65 years were the minimum, maximum years of age observed respectively. There were 19 males in the study. Out of 30, 21 (70%) had normal Body Mass Index (BMI) levels.

**Table 1: Comparison of variables over time.**

Variables	Time point		p-value
	Pre	Post	
RHR	89±4.19 89 (80, 99)	86.67±3.8 86 (78, 98)	<0.0001 <sup>WS</sup>
Distance (in meter)	278.67±33.96 277.5 (220, 350)	289.33±35.23 290 (225, 365)	<0.0001* <sup>pt</sup>
WHR	109.73±7.05 110 (96, 122)	105.83±6.68 106 (92, 118)	<0.0001* <sup>pt</sup>
Walking Speed	46.44±5.66 46.25 (36.67, 58.33)	48.22±5.87 48.33 (37.5, 60.83)	<0.0001* <sup>pt</sup>
SPO <sub>2</sub> (%)	96.87±0.9 97 (96, 99)	97.63±0.89 98 (96, 99)	<0.0001* <sup>WS</sup>
MBS	3.13±0.82 3 (2, 4)	2.25±0.77 2 (0.5, 3)	<0.0001* <sup>WS</sup>
PCI	0.46±0.13 0.45 (0.21, 0.76)	0.4±0.13 0.4 (0.18, 0.68)	<0.0001* <sup>pt</sup>

**Abbreviations: WS: Wilcoxon’s Signed rank test, pt: Paired t-test.**

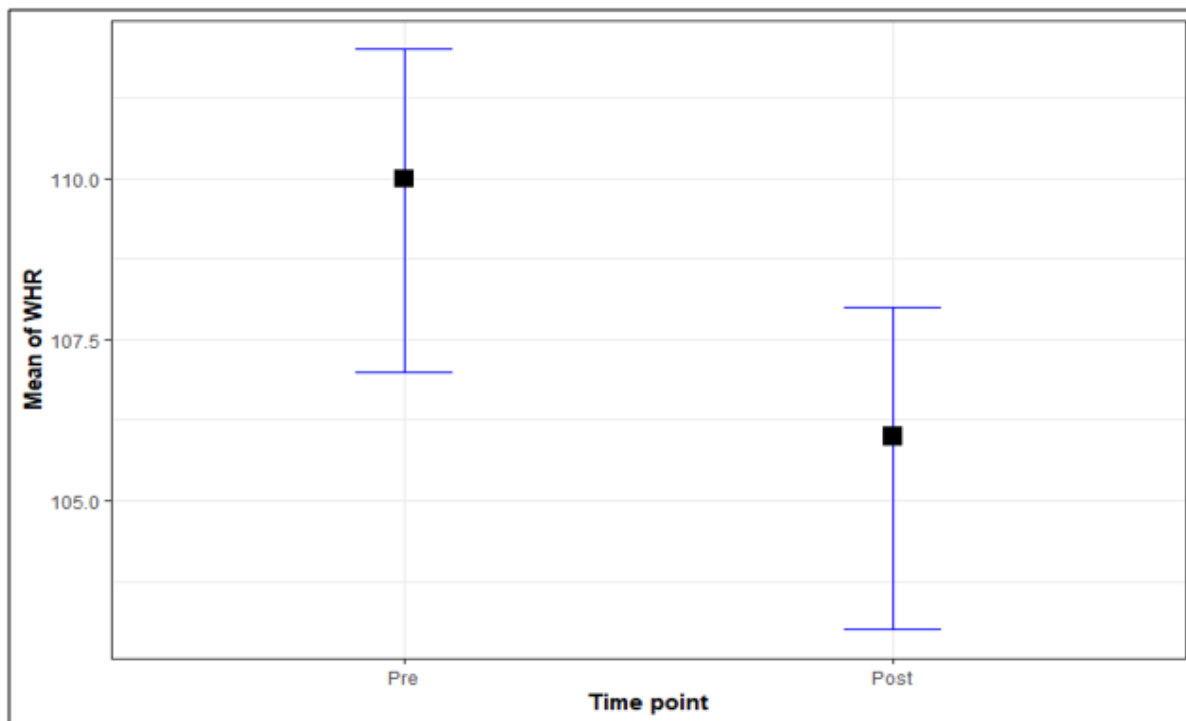


Figure 1: Mean of Walking Heart Rate (WHR) over time point.

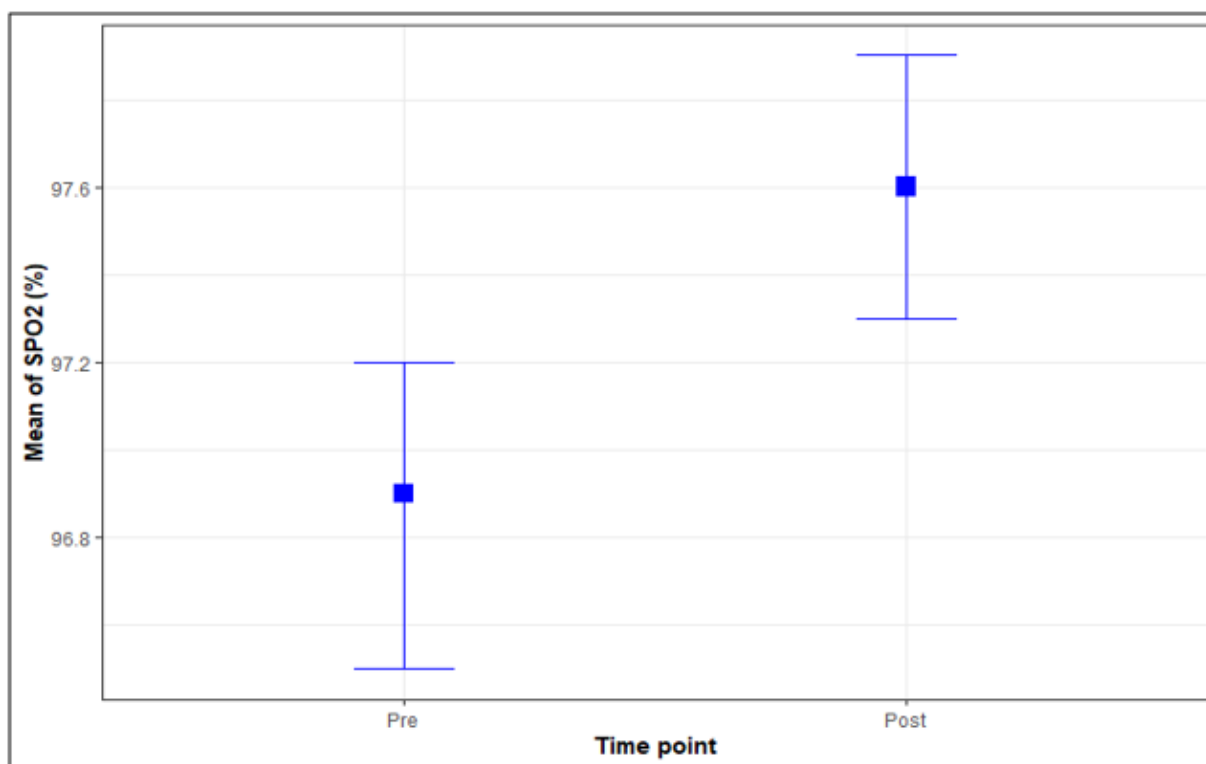


Figure 2: Mean of SPO2 (%) over time point.

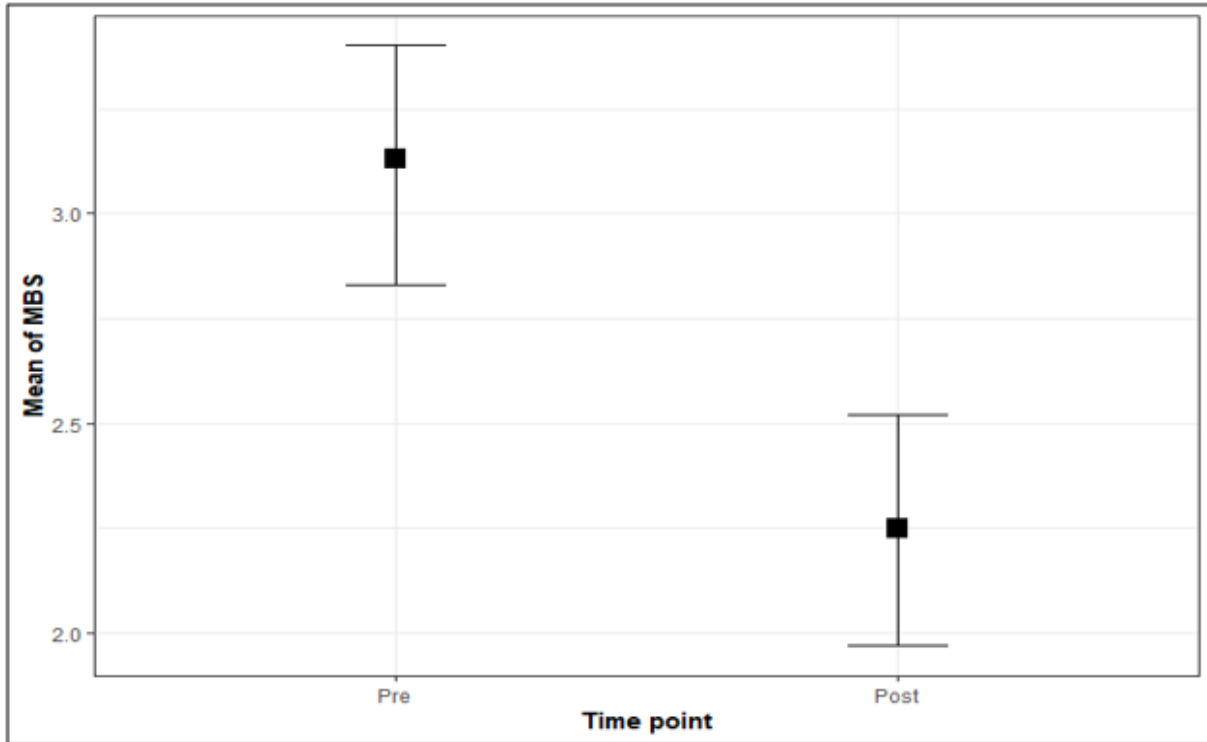


Figure 3: Mean of Modified Borg Scale (MBS) over time point.

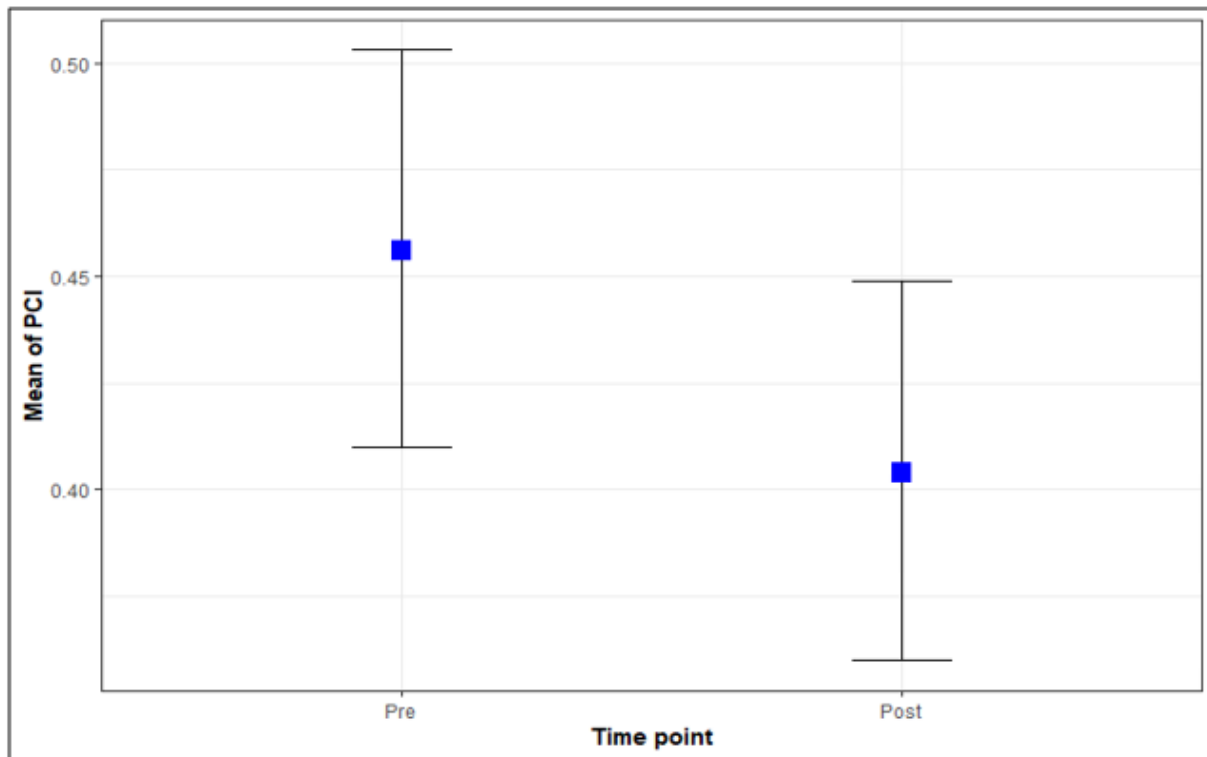


Figure 4: Mean of Physiological Cost Index (PCI) over time point.

The study was conducted with an objective to assess PCI in COPD individuals, after a period of 6 weeks and to check whether compliance of PR protocol influenced PCI. This study was carried out with a prospective cohort design. The demographic details of each subject were noted. A total of 30 subjects with mild to moderate COPD, according to GOLD staging criteria, were included in the study, of which 19 were male and 11 were female.

Patients with COPD experience an increase in heart rate during both rest and activity due to this increased effort of the heart. In our study, it was observed that all the patients had a considerable decrease in their resting heart rate after performing breathing exercises. This observation can be correlated with a study conducted by Gosselink which states that deep breathing exercises which included diaphragmatic breathing and pursed lip breathing resulted in decrease in heart rate, respiratory rate, anxiety and dyspnoea.<sup>13</sup>

After engaging in breathing exercises, the stress and mechanical effort of breathing will decrease. This lessened physiological effort required for breathing which could have resulted in a lower resting heart rate.

Our study included two types of breathing exercises, pursed lip breathing and diaphragmatic breathing. Diaphragmatic breathing technique has shown to improve ventilation and oxidative stress among COPD patients.<sup>14</sup>

An author, Gail, reviewed that pursed lip breathing slows the respiratory rate and that there is evidence to suggest that doing so may lessen the resistive pressure drop across the airways and, as a result, may lessen airway narrowing during expiration. The reduced dyspnea some people experience when adopting this technique may be caused by this decrease in airway constriction.<sup>18</sup>

All of these factors improved the oxygen flow to the working muscles, enabling the patients to walk more distance right away after engaging in breathing exercises. This can be correlated to increase in walking speed observed in these patients after a 6 week period. As discussed above, these changes may be contributing for the decreased PCI values post intervention.

In our study we included a set of exercises with 10 min warm up period, 25 min of aerobic activity and 10 min of cool down period. Aerobic activity included diagonal arm raises, arm abduction into elevation and reverse, and arm abduction, forward flexion, and reverse; step-ups with three step heights; and straight leg raises, as a part of PR. It was observed that this PR program helped in improving the exercise tolerance of these patients, which in turn helped in improving dyspnea and decreasing their overall work of breathing. This contributed significant changes in PCI. This observation is in concurrence with a study by James Patrick Finnerty, Iain Keeping, Irene Bullough, Julie Jones, who studied the effectiveness of outpatient PR in chronic lung disease.<sup>12</sup>

An uncontrolled study found that 5 hours per week of exercise training and knowledge intake over a period of six weeks was linked to a significant increase in shuttle walking distance that persisted for six months.<sup>12</sup> With an outpatient programme of as little as 1.5 hours per week of supervised teaching, breathing practice, and exercises, 44 individuals with COPD in another uncontrolled research demonstrated a significant improvement in dyspnea.<sup>12</sup> Considering these guidelines, we incorporated a PR program with a frequency of 3 – 5 times a week, for a duration of 20 minutes, performed twice a day, for our study.

Our study found that, at baseline, the average PCI increased as the age group increased. Post intervention, there was a significant decrease in the PCI suggestive of decreased oxygen uptake.

Individuals' walking speeds tend to slow down as they get older. As a result, PCI increased and an individual's distance travelled decreased, resulting in a higher energy cost. In patients with COPD who were doing a 6-minute treadmill walk, Belman et. al.<sup>15</sup> discovered that the MBS was a reliable technique for assessing dyspnea.<sup>16</sup>

Wilson and Jones evaluated the measurement of dyspnea in healthy young volunteers during exercise using a visual analogue scale and the MBS.<sup>17</sup> Similar findings were made by these researchers, who found a strong association between exercise-related employment and the degree of breathlessness as measured by the modified Borg scale.<sup>15</sup> Our study used modified Borg scale to understand rate



of perceived exertion before and after 6 weeks of exercise protocol. It was observed that there was a significant decrease in the rate of perceived exertion post PR.

### Conclusion

The Study concludes that PCI was seen to decrease in individuals suffering from COPD after a prescribed PR protocol. Also, there was significant improvement in their rate of perceived exertion using MBS.

### Limitations of the study:

1. This study could be conducted on a larger sample size which was a constraint we faced due to the on-going pandemic.
2. The study population were recruited from only one hospital.
3. This study lacked a control group which can be considered in future.

### Future scope of the study:

1. Further research can be done to identify the exercise that will be most helpful to patients undergoing PR by analysing the changes in energy expenditure following specific exercises.
2. Increasing public awareness of PR and involvement.
3. A multi-centered study can be carried out in order for the findings to be generalizable to a broader population.

**Ethical clearance:** Institutional Ethics Committee, SDM College of Dental Sciences and Hospital, Dharwad

**Source of funding:** Self

**Conflict of interest:** None

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## Effect of Modified Shoe with Motor Relearning Programme on Timed Up and Go Test Values and Gait Parameters in Chronic Stroke Patients: Comparative Study

R. Muthupandi kumar<sup>1</sup>, R. Shyam Sundar<sup>2</sup>,  
M. Premkumar<sup>3</sup>, Mohammed Ameer Hussain<sup>4</sup>

<sup>1,2</sup>PhD Research Scholar, <sup>3</sup>Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001, <sup>4</sup>PhD Research Scholar, Institute of Physiotherapy, Srinivas University, Mangaluru, India..

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### Abstract

**Background:** Hemiplegia secondary to stroke contributes to problems associated with standing and walking. Hemiplegic patients suffer from poor balance, slow walking, and weak muscles. Shoe modification and foot orthoses can play an important role in the nonsurgical management of foot and ankle pathology. Therapeutic footwear may be used to treat patients with diabetes, arthritis, neurologic conditions, traumatic injuries, congenital deformities, and sports-related injuries. These modalities may improve patient gait and increase the level of ambulation.

**Aims and objectives of the study:** To analyse the effect of modified shoe with motor relearning programme on Timed Up and Go test values and gait parameters of chronic stroke patients.

**Data Analysis and Results:** Pre intervention values of Timed Up and Go test (TUG) and gait parameters were homogenous between control and experimental groups with  $p \geq 0.05$  and post intervention values of TUG and gait parameters were statistically significant improvement in experimental group where shoe modification with motor relearning program with  $p \leq 0.05$

**Conclusion:** It was concluded that Modified Shoe with Motor Relearning Programme had statistically significant improvement in the Timed Up and Go test values and gait parameters of chronic stroke patients when compared to motor relearning program alone.

**Keywords:** Chronic Stroke, Motor Relearning Program, Timed Up and Go Test, Gait Parameters.

### Introduction

Stroke is the second most frequent cause of death after coronary artery disease. In India, stroke is an

important cause of premature death and disability.<sup>1,2</sup> Hemiplegia secondary to stroke contributes to problems associated with standing and walking. Hemiplegic patients suffer from poor balance, slow

**Corresponding Author:** M. Prem Kumar, Professor cum PhD Research Scholar (Corresponding Author), Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Mangaluru, Karnataka - 575001.

**ORCID ID:** 0000-0003-0958-6143

walking, and weak muscles.<sup>3,4</sup> Spasticity usually develops slowly with anti gravity muscles of the upper extremity and usually affects the depressors of the shoulder girdle and arm; the fixators and retractors of the scapula, the side flexors of the trunk, the adductors and internal rotators of the arm, the flexors and pronators of the elbow and wrist, the flexors and adductors of the fingers.<sup>5</sup>

Physiotherapy interventions for stroke subjects are represented by various approaches, for example proprioceptive neuromuscular facilitation, Brunnstrom, Bobath and motor relearning program. There is a general opinion that physiotherapy improves the function of the stroke subjects. But the benefit seems to be statistically small and limited. In few controlled studies on these subjects there was no proper documentation showing the effect of above mentioned physiotherapy approaches gives better result than the other approaches.<sup>6</sup>

Motor relearning program (MRP) was developed by Carr and Shepherd for stroke that incorporates many aspects of motor learning theory and provides practical guidelines for retraining functional skills.<sup>7</sup>

Ambulation is an important movement pattern by which one can move in community.<sup>8,9</sup> Walking is an essential movement which enables us to be active and productive. Normal walking speed for elderly people is 1.3 m/s and walking capacity measured by the distance covered in 6 minutes is 576 meters for men and 494 meters for women. After stroke, many patients have lingering walking disabilities.

Shoe modification and foot orthoses can play an important role in the nonsurgical management of foot and ankle pathology. Therapeutic footwear may be used to treat patients with diabetes, arthritis, neurologic conditions, traumatic injuries, congenital deformities, and sports-related injuries. These modalities may improve patient gait and increase the level of ambulation.<sup>10,11</sup>

Therapists use a wide-range of strategies and interventions to assist those with a neurological disorder to be able to complete everyday tasks and participate in activities. Therapists may use a remedial approach, such as repetitive task performance

or spaced retrieval, or a compensatory approach such as using cues, or modification of the task, or environment. Evidence suggests that repetitive task training is an effective approach for regaining motor function after stroke.<sup>12</sup>

Due to characteristic hemiplegic gait there is learned disuse of affected limb. In such population weight bearing asymmetry, equinovarus positioning of foot complex, reduced hip extension, hyperextension of knee and pelvic retraction are observed in affected lower extremity while walking. So they are not able to do the necessary hip-knee ankle flexion of the affected lower extremity during the swing phase of gait. As a consequence, the affected leg relatively lengthens causing the patient to walk with a hiking or a circumduction gait. Increasing the height of the unaffected side can help to relatively shorten the affected lower extremity, shifting weight on affected side in stance helping symmetrical weight bearing, foot clearance in swing and reduce the effort of walking. Few studies showed significant immediate improvement in weight bearing with temporary use of shoe lift on unaffected lower extremity in stroke patients.<sup>13-16</sup>

The main aim of this study was to compare the effect of Modified shoe with Motor Relearning Programme versus Motor Relearning Program alone on Gait of Chronic stroke patients. With this study results for Chronic Stroke patients, the physiotherapy treatment may include Modified Shoe with Motor Relearning Programme to treat effectively chronic stroke patients.

## Materials and Methods

**Study Design:** Comparative study.

**Study Setting:** Aayush Physiotherapy Clinic, By-Pass Road, Madurai.

**Study Duration:** 24 months.

**Study Sampling:** Convenient Sampling.

**Study Population:** In Around Madurai District.

**Study Sample:** 10 subjects in each group.

**Criteria of Selection:**

**Inclusion Criteria:**

- Age: 55 to 75 years
- Sex: Both Sex
- Both side affected hemiplegic patients
- Hemiplegic for the past 6 months
- Hemiplegic can walk with assistance

**Exclusion Criteria:**

- Severe musculoskeletal disorder.
- Serious neurological and cardiorespiratory disorders
- Disoriented and non cooperative patients.
- Non cooperative patients

**Variables:**

- Time Up and Go Test values in seconds
- Step Length and Cadence

**Intervention:**

- Shoe Modification
- Motor Relearning Program

**Procedure:**

20 subjects full fill the criteria of selection were selected and recruited for this study through convenient sampling method. Their demographic data including vitals were collected and documented. Pre intervention Timed Up and Go test values in seconds were measured and recorded. Subjects were divided into control and experimental group of 10 each through lottery method. Motor relearning program was given to control group by adapting functional ambulatory patterns whereas experimental group were given motor relearning program with modified shoe in ambulation training. Interventions were given on functional ambulation, 45 minutes a session, 4 sessions a week for 20 weeks were given. Post intervention Timed Up and Go test values were taken and documented. Suitable statistical methods in the form of paired student t test with descriptive

analysis was done with the assistance of spss 16.0 software version for windows.

**Motor Relearning Programme:**

Motor Relearning Programme (MRP) studies show considerable improvement in functional recovery, walking, motor function, balance and quality of life in acute and sub-acute stroke patients, to improve ambulation of post-stroke patients. Active participation and self reliance would help in subjects to learn effectively motor learning of the pattern of movement, in a given context and task.

**Shoe Modification:**

The use of a 1 cm shoe rise on the unaffected side was used to effect the affected gait cycle of stroke patients. Hence, finding out the effect of shoe raise on the uninvolved leg along with motor relearning program on spatio-temporal parameters and gait deviations of the affected gait cycle, is of absolute importance.

**Data Analysis and Results**

Shapiro Wilk test was used for checking normality distribution of data and independent student t test was used for analysis between variables in between groups.

This study results were showing that the pre and post intervention values of variables of timed up and go test values and gait parameters of cadence and step length in chronic patients of both control and experimental group in this study. In that pre intervention mean values of TUG and gait parameters were statistically homogenous with  $p \geq 0.05$ . Post intervention values of TUG and gait parameters were significantly better in experimental group where the patients were received motor relearning program with modified shoe when compared to control group where patients were received motor relearning program alone with  $p \leq 0.05$ . Results of significance p value were with  $p \leq 0.05$  in experimental group was the main outcome of this study which supports the evidence of effectiveness of shoe modification. Independent student t test was used for data analysis with spss software version 16.0 for windows.

**Table 1: Comparison of pre intervention values of mean, SD and p value between control and experimental group with student t test (Source: Author)**

No of Subjects	Variables	Control Group (Spencer Technique) Mean $\pm$ SD	Experimental Group (Myofascial Release) Mean $\pm$ SD	P value
20	Timed Up and Go Test values	22.0 $\pm$ 6.89	22.5 $\pm$ 2.5	0.6121
	Step length	24.54 $\pm$ 13.37	25.24 $\pm$ 12.74	0.5782
	Cadence	35.65 $\pm$ 23.12	36.40 $\pm$ 16.48	0.6342

**Table 2: Comparison of post intervention values of mean, SD and p value between control and experimental group with student t test (Source: Author)**

No of Subjects	Variables	Control Group (Spencer Technique) Mean $\pm$ SD	Experimental Group (Myofascial Release) Mean $\pm$ SD	P value
20	Timed Up and Go Test values	18.7 $\pm$ 5.34	16.4 $\pm$ 0.93	0.0095
	Step length	30.0 $\pm$ 26.47	35.0 $\pm$ 18.82	0.0043
	Cadence	40.2 $\pm$ 22.86	48.0 $\pm$ 22.47	0.0032



**Fig 1: Shoe modification (Source: Author)**



**Fig 2: Patient ambulation with shoe modification (Source: Author)**

## Discussion

There was statistically significant improvement of timed up and go test values and gait parameters of step length and cadence in experimental group subjects where motor relearning program with modified shoe were given. That might be happened because of even 1 cm rise of sole and shoe modification would alter the biomechanics of loading and propulsion. This was echoing the view of a study results in 2014 which stated that combination of 1 cm of insole on unaffected leg with conventional physiotherapy, promoted symmetrical weight distribution during standing and walking, improved gait performance and balance in people with stroke.<sup>17</sup> and study results strengthened the conclusion of study by **Dr.Gajanan Bhalerao** et. al. in 2016 stated that addition of shoe-raise on unaffected side helps to improve step length, stride length cadence & gait velocity as compared to MRP alone. However, there was no additional change seen in Rivermead Visual Gait Assessment Score with the use of shoe raise.<sup>19</sup>

Number of subjects was less and treatment intervention was limited in this study. That can be progressed and explored by increasing the sample size and advanced research study design as randomized control trail with proper sampling and allocations in future research.

## Conclusion

It was concluded that Modified Shoe with Motor Relearning Programme had statistically significant improvement in the Timed Up and Go test values and gait parameters of chronic stroke patients when compared to motor relearning program alone.

**Ethical Clearance:** Taken from Institutional Ethical Review Board, Santosh College of Physiotherapy, Madurai.

**Conflict of Interest:** Nil

**Source of Funding:** Self

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# Efficacy of Motor Imagery on Lower Extremity Functioning and Gait in Chronic Stroke Patients: Systematic review

Ramananandhan Ragunath

Physical Therapist at Movement DOC (B.P.T).

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## Abstract

**Background:** Numerous stroke rehabilitation techniques have been developed in recent years. In order to learn or improve a motor movement or ability, a subject will frequently enter a dynamic condition known as mental practise (MP). Although MP(mental practise) induces brain activation patterns that are comparable to those of movement, functional imaging has yet to prove the clinical efficacy of such treatments in rehabilitation and functional recovery.

**Methodology:** Systematic review of all clinical studies about motor imagery in stroke rehabilitation that were published between 2008 and 2022 in the major scientific databases. We chose three clinical trials evaluating various motor imaging techniques in chronic hemiparesis patients.

**Conclusion:** When combined with traditional physical therapy, mental practice is helpful for the functional rehabilitation of the lower limbs as well as for the restoration of everyday activities and skills. More research is required to identify the ideal treatment protocol and patient profile due to the variety of the studies in terms of the intervention protocol, particular imagery technique, practise duration, patient characteristics, etc.

**Keywords:** Chronic hemiparesis, Gait, Mental practice. (MP), Motor imagery (MI), Stroke rehabilitation.

## Introduction

Motor imagery (MI), according to Jeannerod (1994, 1995), is the outcome of conscious access to the substance of a movement's aim, which is typically carried out during a movement instinctively as you get ready to move<sup>4</sup>. Motor readiness has shared mechanisms and is functionally similar this could be the cause of men's-Motor performance is improved by employing mental practise with MI training. (evaluation of Feltz and Landers in athletes, 1983). Therefore, a significant overlap between active brain

areas for ME(movement execution) and imaging is not surprising.<sup>4,7</sup> Interestingly, a precise representation of a desired action present even if the limb performing the action is absent as it has been seen in patients who have undergone traumatic de-afferentation of half a limb (Schilder , 1935) or limb amputation following a total thoracic spinal cord injury (SCI,(1990) Decety and Boisson.

MI training consists of the imaginary representation of a movement without actually physically performing the movement. This

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**Corresponding Author:** Ramananandhan Ragunath, Physical therapist at Movement DOC (B.P.T).

**E-mail:** [ptdocindia@gmail.com](mailto:ptdocindia@gmail.com)

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ability to imagine a movement, both visually and somesthetically, is used for learning motor skills. This activates neural circuits that involve the primary motor cortex, the cerebellum and the basal ganglia (structures also involved during real movement), and induces functional redistribution and modulation of neuronal circuits. In addition, the motor programming theory suggests that one of the fundamental components for an effective movement to occur is the ability to perform mental representations of that movement. This is because these representations serve as an internal model for facilitating planning action processes<sup>1</sup>.

In clinical practise, clinical research, and public health, stroke is not generally defined. The abrupt onset of localised neurological symptoms has historically served as the clinical definition of stroke. neurological issues that last for more than 24 hours (or result in)causes early mortality) and are brought on by part's acute vascular injury of the mind. One of the vascular causes is insufficient blood flow supply to a portion of the spinal cord or brain (ischemic stroke ,venous or arterial) and spontaneous bleeding into a portion of the surface of the brain (primary intracerebral haemorrhage) or the brain of the mind (subarachnoid haemorrhage)<sup>8</sup>. Technology advancements have prompted an updated definition ,stroke as a sudden onset of specific brain disorders, retina or spinal cord imaging for any time period (CT scans, for example). All patients with sudden onset of neurological symptoms, especially those with stroke risk factors, should be suspected of having a stroke. A timely and precise diagnosis of stroke permits cause-specific early therapies, which may increase survival, facilitate functional recovery, and reduce the likelihood of an early stroke recurrence. Some stroke patients will exhibit unusual stroke symptoms, such as loss of neurological function or gradual development of symptoms. Function lacks a definite anatomical localization. A helpful screening exam in the community is the FAST (Facial drooping, Arm weakness, Speech problems and Test (or Time)) score. While emergency room physicians may employ the FAST or ROSIER scales, stroke specialists will carry out a more thorough evaluation, and systematic neurovascular assessment<sup>8</sup>.

## Methodology

A thorough search was conducted in the Cochrane Library, PubMed and PEDro databases, using the papers published between 2008 and 2022 and languages as the only criteria limited to English. The phrases and words that were 1) "Physical therapy" and "stroke rehabilitation" 2)"MI," and "mental rehabilitation," and 3)"mental stroke rehabilitation" and "practise"; 4) "MI" OR "mental "MI" and "hemiparesis"; 5) "practise" and "stroke"; 6) "mental practise and hemiparesis 7) Chronic Stroke Citation monitoring was employed to supplement the literature search with the relevant trials stumbled upon throughout the search Premium Label Cut your writing time.

### Jadad scale

A Method for assessing the quality of controlled clinical trials

Basic Jadad Score is assessed based on the answer to the following 5 questions.

The maximum score is 5. (table 1)

### Question Yes / No

1. Was the study described as random? 1/0
2. Was the randomization scheme described and appropriate? 1/0
3. Was the study described as double-blind? 1/0
4. Was the method of double blinding appropriate? (Were both the patient and the assessor appropriately blinded?) 1/0
5. Was there a description of dropouts and withdrawals? 1/ 0

### Quality Assessment Based on Jadad Score Range of Score Quality

0-2 Low

3-5 High

### Study selection

By reading the titles and abstracts of the found publications, researcher independently reviewed the search results. The researcher then carefully examined the entire texts of the shortlisted articles,

and ultimately chose those that matched the following inclusion and exclusion criteria ,

### **Inclusion criteria**

1) regulated and clinical studies with randomization; 2) therapies utilising MI for the restoration of functionality of gait and lower extremity functioning following a stroke; 3) samples consented to by a population over the age of 18; 4) situated by individuals with hemiparesis following a stroke ,no matter how the disease originated or when evolution began. Articles that did not meet the criteria for this systematic review were lowering exclusion standards. In the "Title" section, we typed the terms "mental practise" or "mental imagery" or "motor imagery" or "Locomotor imagery training."

### **Exclusions criteria**

Studies in which patients with CVA did not use mental imagery were disregarded. studies of images for goals other than helping people regain or learn how to use their motor skills Patients with stroke were not included. Articles devoted to the using cutting-edge new technology to implement the technique exclusion criteria included studies with fewer than 10 patients, or clinical trials without randomization. We removed articles for which full text versions weren't available.

## **Result**

A total of 309 articles were deemed valid following a database search. The application of inclusion and exclusion criteria showed that there were 3 papers available for inclusion after excluding studies that were duplicated across multiple databases. One of the most frequent consequences is lower extremity dyskinesia. Limit the patient's daily living activities severely. A motor imagery exercise a safe and economical method that can be used in conjunction with physical therapy stroke patients' rehabilitation. There is proof that motor imagery training helps with upper-limb rehabilitation after a stroke. There is little proof that motor imagery training improves the lower limb motor capabilities of chronic stroke patients. Training in motor imagery may be included into traditional therapy among persons who have received rehabilitation from specially trained

physiotherapist with appropriate motor instruction in imagery, but significant resources are required. Additional research is required to alter and improve the current programme and should be directed into making motor imagery training available to more stroke sufferers.

In Mental practice, the majority of studies on metal practise have evaluated its performance in relearning tasks carried out using its arms. However, its use in relearning gait has also been proven useful, albeit in a limited way. Verma et al evaluated a training program's effectiveness that includes a gait rehabilitation circuit with a task-oriented mental pictures A statistically significant improvement was discovered. Most outcome measures include independent and improved functional gait earlier than in the control group. Improvements persisted for at least six weeks thereafter therapy.

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There is proof that motor imagery training helps with upper-limb rehabilitation. After a stroke. There is little proof that motor imagery training improves the lower limb motor capabilities of chronic stroke patients. Training in motor imagery may be included into traditional therapy among persons who have received rehabilitation from specially trained physiotherapist with appropriate motor instruction in imagery, but significant resources are required. Additional research is required to alter and improve the current programme and should be directed into making motor imagery training available to more stroke sufferers. Including motor imagery training in addition to standard neurological-rehabilitation can greatly aid in the rehabilitation of lower limb motor function in decreasing long-term disability and related socioeconomic costs in stroke patients burden. The results of this systematic review may be used to help physical therapists create methods for enhancing stroke patients' functional abilities and, as a result, their quality of life. Physical therapists (PT) can learn the motor imagery training method to strengthen their physical therapy treatment abilities.

### Analysis of Result

A total of 3 studies that examine the effectiveness of efficacy of mental exercise or imagery. Trial lengths for homogeneous action protocols ranged from 2 to 10 weeks, with the majority of studies lasting 6 weeks. The number of patients in a sample ranged from 10 to 30. The most common type of intervention is physiotherapy or occupational therapy, which integrates mental practise or visualisation with traditional rehabilitation. In some circumstances, mental imagery is used in conjunction with other specialised treatments like task-oriented circuit

training, constraint-induced movement therapy, or treadmill gait training. However, it is rarely utilised as a stand-alone method because research on its efficacy is typically conducted as an adjuvant to such as treadmill gait training, task-oriented circuit training, or constraint-induced movement therapy. Given that its usefulness is typically investigated as an adjunct to conventional training, it is rarely employed as therapy on its own. Although the majority of trials examined in our study included an initial period of relaxation during which the patient is able to focus and pay attention to the ensuing task.

**Table 1:**

Jadad Scale	Study & Characteristic	Variables	Procedure
5/5	Author- Ayelet Dunskey Type- Half crossover randomized study Duration- 4 weeks Diagnosis-Chronic hemiplegia No.of participants in study- Conventional - 11 Experimental - 11	FESS(fall efficacy Swedish version) 10m walk test Step activity monitor	Study group- 3 min of relaxation prior and after treatment and 3 min of motor imagery done between. (both kinaesthetic and visual) Conventional group- reaching and bimanual tasks done.
3/5	Author - Xiao Yin, et.al Type- RCT Duration- 6 weeks Diagnosis-Chronic hemiplegia No of participant- 32 patients	Fugl meyer Berg balance scale FIM (functional independent measure)	3 min of contract relax prior to treatment 15 min of detailed imagination of simple locomotor activity Final 2 minutes- refocusing on what we have done.
2/5	Author - Gyuchang Lee Type- Experimental study Duration -8 weeks Diagnosis-Chronic hemiplegia No of participant - conventional -11 Experimental - 13	Electrical walk way system (measure spatial and temporal parameters)	Conventional group- Only treadmill training for 30 min/ session , 3 session / week for 8 weeks Experimental group - Treadmill training with motor imagery for 30 min / session, 3 session / week for 8 weeks.

After the conclusion of this stage, the patient is asked to carry out a task mentally (generally using first-person imagery). This could be an exercise that was physically performed at the previous rehabilitation session, or it could be a different exercise that will be practised later. Sessions of mental training typically last for 30 minutes on average. In certain studies, patients are given a video explanation of the method. Sometimes the patient's mental practise session is guided entirely by an audio cassette.

All of the patients in each of these investigations had hemiparesis or hemiplegia, however the degree of impairment varied greatly from patient to patient. Studies on hemiplegia following chronic stroke, which is the most common, were also covered in papers. many surveys, including the Fugl-Meyer Scale for Lower Extremity Functioning, the Tinetti Balance Scale, the Electrical Walk Way System for Gait Analysis, and the 10m Walk Test. After the mental exercises were finished, verification techniques were employed to clock each evoked gesture and compare it to the real time it took to accomplish it. As an alternative, some patients were questioned about the order of actions required to complete the job.

### Conclusion

Our analysis led us to the conclusion that patients can relearn skills and apply the gains they make to new situations when motor imaging is used in conjunction with traditional therapy. By enhancing its functionality and utilisation in daily activities, it also alters the paretic arm's quality and range of motion. Mental practise enhances spatio-temporal gait characteristics as well, especially when combined with certain methods since it lowers the fear of falling and encourages gait retraining earlier in the process. Last but not least, using mental practise as an adjunct to traditional therapy in patients with retained imagery skills is viable when implementing a mental practise strategy. Increases in session time should be made gradually. A safe and inexpensive approach called mental practise can help people with

subsequent hemiplegia from stroke function better. To determine the best candidates for this therapy, the sort of intervention, the amount of training, and other factors, more research is required.

**Conflict of Interest:** Nil

**Source of Funding:** Self Funded

**Ethical Clearance:** Ethical clearance has been obtained from the Institutional Ethics Committee.

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## A Cross Sectional Study to Identify Perceived Barriers and Facilitators to Physical Activity and Exercise Participation of People with Post Stroke Depression

Reshna Ratnakumar<sup>1</sup>, Jasrah Javed<sup>1</sup>, K Senthil<sup>2</sup>, R Vasanthan<sup>3</sup>

<sup>1</sup>Student, <sup>2</sup>Professor, <sup>3</sup>Principal, The Oxford College of Physiotherapy, Bangalore, Karnataka.

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### Abstract

**Background:** Physical activity and exercises after stroke may prevent the disability and stroke recurrence; yet, psychological impairments like depression may inhibit post stroke exercise and subsequently limit recovery. Though it remains less clear how best is to encourage exercise uptake by individuals with depression after stroke.

**Objective:** The objective of this study was to identify the perceived barriers and facilitators to physical activity and exercise participation among post stroke depressed individuals.

**Methods:** Descriptive cross-sectional design was adopted using purposive sampling of stroke survivors. Fifty stroke survivors were screened and identified for depression using HAM-D.25 depressed and 25 non-depressed stroke survivors have been grouped into active and inactive groups based on exercise and physical activity guidelines. IPAQ scale has grouped them into physically active and physically inactive based on 3 METs. Using the EBBS scale, the percentage of positive responses for different domains for benefit and barrier scale was calculated. The significant difference in the percentage of response in barrier and benefit domains was analyzed using Chi-square test.

**Results:** There was significant difference in percentage of response in each benefit domain of EBBS between depressed and non-depressed active groups. Similarly there was significant difference in percentage of response in each barrier domain of EBBS between depressed and non-depressed inactive groups. Ten major perceived barriers were reported in depressed non-active group in which exercising cause fatigue (100%) was the highly reported response.

**Conclusion:** The study concluded that interventions could be designed for promoting the facilitators more and addressing the barriers to exercise and time management which is likely to reduce the healthcare costs of management of stroke.

**Keywords:** Barrier, Facilitator, Physical activity, Exercise, Post stroke depression

### Introduction

Stroke affects 17 million individuals annually and

is the cause of disability globally.<sup>1</sup> Worldwide, stroke is the second leading cause of death and the third

leading cause of disability.<sup>2</sup> In India, the prevalence of stroke ranged from 44.29 to 559/100,000 persons per year and the incidence of stroke ranged from 105 to 152/100,000 persons per year respectively.<sup>3</sup> Stroke is defined as the sudden death of brain cells due to lack of oxygen when the blood flow to the brain is lost by blockage or rupture of an artery to the brain is a leading cause of dementia and depression.<sup>4</sup>

Residual effects of stroke are the leading cause of chronic physiological and psychological disability which alters an individual's behavior and emotion.<sup>5</sup> Physical disorders in stroke patients usually includes muscle weakness, paralysis, stiffness, pain, spasticity, contractures, foot drop changes in sensation which usually affects one side of the body.<sup>6</sup> The psychological sequelae to stroke includes emotional and behavioral changes and cognitive impairments. Much attention is paid to motor dysfunctions and physical dysfunctions following stroke, but the associated psychological dysfunctions are often ignored. Depression, Apathy, Catastrophic reaction, generalized anxiety disorder, post-traumatic stress reaction, fear of falling and anger are the psychological disorders usually seen in individuals with stroke.<sup>7</sup> Depression is defined as common mood disorder characterized by persistent sadness and lack of interest or pleasure in any of the activities.<sup>8</sup> Evidence suggests that depression is a modifiable risk factor which is independently associated with stroke morbidity and mortality.<sup>9</sup>

Post stroke depression is complications of stroke.<sup>10</sup> Approximately one third of stroke survivors develop PSD at some point after stroke. The frequency of PSD is highest in the first year, at nearly 1 in 3 stroke survivors, and with an incidence of 55%.<sup>11</sup> It was found that a nearly threefold increased risk in subjects aged 55–64 years, but not in those  $\geq 65$  years.<sup>12,13</sup> Lesions in more frontal brain areas and lesions involving the basal ganglia are more prone to lead to PSD. Patients with left hemispheric stroke are also more susceptible for PSD.<sup>14</sup>

PSD has been shown to have a negative impact on the functional impairments and results in higher mortality rates. It has been associated with delayed rehabilitation as well as social withdrawal and poor performance in activities of daily living.<sup>16-19</sup> PSD is also associated with severe disability, anxiety, lower

Quality of Life, speech and language dysfunction, anhedonia, feeling of despair, cognitive impairment and lack of medication compliance.<sup>20</sup>

## Methodology

Descriptive cross-sectional design was adopted using a purposive sampling of stroke survivors patients. Fifty five stroke survivors were approached to take part in the study of which 5 got excluded (two participants with expressive dysphasia and one with profound deafness, one with severe visual impairments and one was on anti-depressant medications).

### Procedure

Fifty participants undertook the screening for depression using HAM-D scale. Twenty five depressed and Non-depressed stroke subjects were identified. Those who met exercise guidelines recommendations were grouped into active and inactive. Participants were then interviewed to obtain information on physical activity using International Physical activity questionnaire (IPAQ) and categorized into physically active and physically inactive based on 3METs. The information on perceived facilitators and barriers was collected by Exercise Barriers and Benefits Survey scale. Percentage of positive (+) response for different domains in barrier and benefit scale was calculated.

### Statistical Analysis

Chi-square test was done to analyze the statistical significant difference in the percentage of positive responses. Also the frequency percentage for each items in barrier and benefit scales were calculated to obtain the major barriers and facilitators in depressed stroke survivors.

## Results

In the study there was not much difference in the age range of all the subjects in the study. In the study also, females are comparatively less as compared to males (24%). Majority (72%) of the subjects had ischemic stroke. There is no stark difference in the duration of stroke, cognition levels (MMSE) and Depression score range (HAM-D) between the subjects. IPAQ identified 26 active subjects and 24 inactive subjects' based on 3METs. Depressed stroke

survivors were having low physical activity levels, as these subjects spend most of their time sitting/ sleeping. 64% of depressed stroke survivors showed low physical activity levels in the transportation, sports and recreational –related activities. There was a significant difference in the percentage of subject

response to benefits between active depressed and non- depressed group ( $p < 0.05$ ). There was also significant difference in the percentage of subject response to barriers between inactive depressed and non-depressed stroke survivors ( $p < 0.05$ ).

**Table 1: Physical activity of study subjects based on IPAQ**

S.No.		IPAQ		
		>3METs	<3METs	Total
1.	Non-depressed stroke survivors(n=25)	14	12	26
2.	Depressed stroke survivors (n=25)	12	12	24

**Table 2. Percentage of positive subject response for each domain of EBBS-Benefits scales Subscales.**

Benefit Domains Of EBBS	NDA=14	DA (N=9)	p value*
	% of Positive Response	% of Positive Response	
1.Psychological Outlook	82	63	.00262
2.Preventive Health	75	59	.01612
3.Physical Performance	70	55	.02846
4.Social Interaction	86	64	.00032
5.Life Enhancement	80	47	.00001

Abbreviation=NDA= Non-depressed active, DA= Depressed active

$p < .05$ \* = Significant difference

Abbreviation=NDA= Non-depressed active, DA= Depressed active

**Table 3: Percentage of positive subject response for each domain EBBS-Barrier Subscales.**

Barrier Domains Of EBBS	NDI (N=11)	DI(N=16)	p-value*
	% of Positive Response(+)	% of Positive Response(+)	
1.Exercise Millieu	23	50	.00007
2.Time Expenditure	24	54	.00001
3.Physical Exertion	80	93	.00714
4.Family Discouragement	32	59	.00012

Abbreviation= NDI= Non-depressed inactive, DI= Depressed inactive

\* $p < .05$  = Significant difference

**Table 4: Perceived barriers as per EBBS barrier domains in depressed non-active stroke subjects**

Items In Barrier Scale	Frequency of positive response in NDI(n=11)	Frequency of positive response in DI (n=16)
1.EXERCISE MILIEU		
a. Far exercise place	0(0%)	10(63%)
b. Inconvenient facility schedules	5(45%)	5(45%)
c. Few exercise places	0(0%)	9(56%)
d. Embarrassed to exercise	0(0%)	8(50%)
e. Costs to exercise	10((90%)	7(43%)
d. Funny clothes	0(0%)	9(56%)
2.TIME EXPENDITURE		
a. Too much time	7 (64%)	12(75%)
b. Time from family	1(9%)	6(37%)
c. Take time	0(0%)	8(50%)
3.PHYSICAL EXERTION		
a. Exercise is tiring	<b>9(82%)</b>	14(88%)
b. Exercise is fatiguing	11(100%)	16(100%)
c. Exercise is hardwork	8(73%)	13(81%)
4.FAMILY ENCOURAGEMENT		
a. No spouse encouragement	2(18%)	9(56%)
b. No family encouragement	5(45%)	10(62%)

Abbreviation= NDI= Non-depressed inactive, DI= Depressed inactive

### Discussion

The purpose of this study was to identify the perceived barriers and facilitators to physical activity and exercise participation among post stroke depressed individuals. The findings of this study could inform intervention and resource development addressing behavior change related to exercise and physical activity for individuals with post stroke depression. This study highlights the need for future interventions to explicitly target the barriers to physical activity and exercise in depressed stroke individuals.

In the study, females were comparatively less as compared to males (24%) and 20% of females were depressed. Majority (72%) of the subjects had

ischemic stroke. The study found 56% of subjects with mild depression, 32% with moderate depression and 12% with severe depression. There was no stark difference in the duration of stroke, cognition levels (MMSE) and depression score range (HAM-D) between the subjects.

### Physical Activity Levels In The Study Subjects

#### *Components Of Physical Activity*

The present study used IPAQ scale as the outcome measure to identify the number of subjects who are physically active and physically inactive in depressed and non- depressed population. The findings of this study showed that there were 26 physically active and 24 physically inactive



depressed and non-depressed populations. Findings also showed that non-depressed stroke survivors were mostly moderately active (56%). Job -related activities, house work, maintenance, caring for family, gardening and walking in leisure time were the major contributors to physical activity. 68% of depressed stroke survivors were having low physical activity levels in the transportation , sports and recreational activities-related activities as these subjects spends most of their time watching television, chatting around , sitting/sleeping. In non-depressed inactive and depressed inactive groups, 14% of subjects were active physically because of walking alone.

### **Perceived Facilitators And Barriers To Exercise And Physical Activity.**

In the present study EBBS evaluates the perceived barriers and facilitators to PA and exercise participation in depressed and non- depressed individuals after stroke. There was significant difference in the percentage of subject response to benefits between active depressed and non-depressed group ( $p < 0.05$ ). There was also significant difference in the percentage of subject response to barriers between inactive depressed and non-depressed stroke survivors ( $p < 0.05$ ).

#### **Perceived Facilitators**

The study results show the percentage of subject response for each item under each Benefit Subscales in non-depressed active group and depressed active groups. In general, most respondents either agreed or strongly agreed with most benefit items in the EBBS scale. None of the respondents completely disagreed with any of the benefit statements.

#### **Perceived Barriers**

The study results showed the percentage of positive subject response for each domain under each Barrier subscales in non-depressed inactive and depressed inactive subjects. 93% of depressed active subjects have positively responded to the barriers in physical exertion domain of EBBS-barrier scale For example, "Exercise is tiring", "Exercise is hard work", "Exercise is fatiguing"

### **Conclusion**

This study provides insight into the perceived barriers and facilitators to engagement in physical activity and exercise for adults with post stroke depression. Physical inactivity is a modifiable risk factor for primary and recurrent stroke and increased physical activity after stroke may not only enhance stroke recovery but also may positively affect the health-related quality of life of stroke survivors.

**Conflict Of Interest:** Nil.

**Source Of Funding:** None

**Ethical Clearance:** Ethical committee of The Oxford College of Physiotherapy, Bangalore, Karnataka

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## Effectiveness of Integrated Neuromuscular Inhibition Technique and Instrument Assisted Soft Tissue Mobilisation in the Management of Upper Trapezius Myofascial Trigger Points

Rutika Thakur<sup>1</sup>, Prachi Mande<sup>2</sup>, Muskaan Lokwani<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>2</sup>BPTh, <sup>3</sup>BPTh, NDMVP College of Physiotherapy, Vasant Dada Nagar, Adgaon, Nashik.

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### Abstract

**Background:** This study was designed to inspect the effectiveness of Integrated Neuromuscular Inhibition Technique (INIT) and Instrument Assisted Soft Tissue Mobilisation (IASTM) on Upper Trapezius Myofascial Trigger Points.

**Purpose:** To compare the effectiveness of integrated neuromuscular inhibition technique and instrument assisted soft tissue mobilization in the management of upper trapezius myofascial trigger point

**Materials and Methods:** Sixty subjects with Active Trigger Points (53 females and 7 males) were divided randomly into two equal groups. Group "A" received INIT three times/week while Group "B" received IASTM once/week for two weeks. Numeric Pain Rating Scale (NPRS), Neck Disability Index (NDI) and Active Cervical Range Of Motion (CROM) were used to evaluate subjects at two intervals (Pre-Treatment and Post-Treatment).

**Results:** Statistical analysis show that there is a significant change within-group for NPRS, NDI and CROM (Lateral Flexion) pre and post treatment with a  $p < 0.0001$  for both Groups A and B. Between-group analysis is statistically significant with  $p = 0.0026$  for NPRS,  $p = 0.0569$  for NDI and  $p < 0.0001$  for AROM thus with superiority for INIT in reducing pain and improving ROM.

**Conclusion:** Integrated Neuromuscular Inhibition Technique is more effective than Instrument Assisted Soft Tissue Mobilisation in the Management of Upper Myofascial Trigger Points.

**Key Word:** Integrated Neuromuscular Inhibition Technique (INIT), Instrument Assisted Soft Tissue Mobilisation (IASTM), Myofascial Trigger Points.

### Introduction

The cervical spine is the most intricate region of the spine, and so are the muscles of that region.

Neck and shoulder muscles work as a unit, every upper extremity movement will be reflected in the neck musculature. There is substantial evidence that

**Corresponding Author:** Muskaan Lokwani, BPTh, NDMVP College of Physiotherapy, Vasant Dada Nagar, Adgaon, Nashik.

**E-mail:** Id:muskaanlokwani0@gmail.com

such ergonomic risk factors as repetition, awkward posture, contact stress and force if exceeds workers biomechanical capabilities, it may lead to work-related mechanical neck pain<sup>1</sup>.

Integrated Neuromuscular Inhibition Technique (INIT) is used to decrease the pain intensity, increase the function and range of motion due to the increased blood supply by intermittent pressure, muscle relaxation by strain-counterstrain and tone reduction by muscle energy technique<sup>2</sup>.

Instrument Assisted Soft Tissue Mobilisation (IASTM) is the use of a specially designed instrument to mobilize soft tissue, with the aim of reducing pain and improving the range of motion and function. IASTM minimizes stress on practitioner's hand and enables greater penetration and better access to fascia and release restrictions<sup>3</sup>.

### AIM

To compare the effectiveness of Integrated Neuromuscular Inhibition Technique and Instrument Assisted Soft Tissue Mobilisation in the Management of Upper Trapezius Myofascial Trigger Points.

### Material and Method

It was an experimental study conducted on 60 subjects with Upper Trapezius Trigger Points, age between 20-26 yrs was taken from NDMVP hospital. Convenient sampling with random allocation method was used in the study.

#### Inclusion criteria:

- Age group 20 to 26 years<sup>2</sup>.
- Pain of more than 3 but not more than 7 on Numeric Pain Rating Scale (NPRS)<sup>4,5</sup>.
- Average time of computer work of at least 14hours/week<sup>6,7</sup>.
- Reduced cervical range of motion (Lateral flexion)<sup>2</sup>.

#### Exclusion criteria:

- Received treatment for upper trapezius trigger points in the past 3 months<sup>2</sup>.

- Cervical spine surgery in the previous 12 months<sup>8,9</sup>.
- Whiplash injury in the previous 6 months<sup>10</sup>.
- Malignancy<sup>2</sup>.
- Fractures of the cervical spine in the previous 12 months<sup>7</sup>.
- Cervical radiculopathy<sup>2</sup>.
- Bilateral upper trapezius trigger points<sup>2</sup>.

#### Outcome measures:

Assessment was performed at baseline (before starting of treatment) and after two weeks of study.

- Numeric Pain Rating Scale (NPRS)<sup>4,5,11</sup>
- Neck Disability Index (NDI)<sup>2,12</sup>
- Active Cervical range of motion<sup>2,4,13</sup>

### Procedure

Participants were included considering the inclusion and exclusion criteria. Procedure was explained to the participant & participants were then asked to sign the consent form. Assessment of all the included participants was done according to the assessment form. Participants were randomly divided into two groups i.e group 'A' and 'B'. Assessment was performed at baseline and after 2 weeks of study.

#### Group A: Integrated Neuromuscular Inhibition Technique (INIT):

**1. Ischemic compression technique:** *Subject position:* To reduce tension at the upper fiber of trapezius the subject was positioned at supine. *Therapist position:* To perform Ischemic compression to the upper trapezius, the therapist stood at the head of the couch near the affected side. *Technique:* The therapist used a pincer grip moved throughout the fibers of the upper trapezius and made note of any active trigger points. Once the trigger point was identified, therapist applied an intermittent ischemic compression by using thumb and index finger (pincer grip). The pressure was applied in an interrupted pathway five seconds on and five seconds off then continuously for 90secs depending on the tolerability of subjects. *Repetitions:* 1 time/session<sup>14</sup>. *Duration:* 3 sessions/week for 2 weeks<sup>15</sup>



**Fig 1: Ischemic Compression**

**2. Strain- Counterstrain technique:** *Subject Position:* To reduce tension at the upper fiber of trapezius the subject was positioned at supine. *Therapist Position:* To perform Strain- Counterstrain to the upper trapezius, the therapist stood at the head of the couch near the affected side. *Technique:* The therapist applied pressure at trigger point and the subject was asked about the level of pain. The subject's head was laterally flexed towards the affected side passively by one hand of the therapist. The other hand held the subject's forearm and moved the affected side shoulder passively to 90degree of abduction and external rotation. The position was maintained for 90 secs. After 90secs the subject was brought back to original position passively and slowly. The therapist asked the patient about the degree of pain. A sense of "ease" was noted as the tissues reached the position in which pain vanished from the palpated point nearly by 70%. *Repetitions:* 1 time/session<sup>16</sup>. *Duration:* 3sessions/week for 2 weeks.<sup>1</sup>



**Fig 2: Strain Counter Strain**

**3. Muscle Energy Technique (MET):** *Subject position:* To reduce tension at the upper fiber of trapezius the subject was positioned at supine. *Therapist Position:* The therapist stood at the head of the couch near the affected side. *Technique:* The subject was asked to laterally flex the neck to opposite side just short of the restriction barrier. The affected side shoulder was stabilized by one hand of the therapist and the other hand on the mastoid area at the side of the head. The subject was requested to move the stabilized shoulder and ear towards each other. The contraction was maintained for 10 sec with 20% of maximum voluntary contraction, followed by 5 seconds of relaxation. The muscle was stretched by laterally flexing the neck to opposite side. The stretch was maintained for 30 secs. *Repetitions:* 3 times/session<sup>2</sup>. *Duration:* 3 sessions/week for 2 weeks<sup>15</sup>.



**Fig 3: MET and Upper Trapezius Stretching.**

**GROUP B: Instrument Assisted Soft Tissue Mobilisation (IASTM):**

*Subject position:* The subject was seated in a comfortable position with his forehead resting on his or her forearm on a table in front of him or her. *Therapist position:* The therapist stood behind the subject near the affected side. *Technique:* A lubricant was applied to the skin prior to the treatment. First the tool was used to find the areas of restriction. Sweeping technique- The M2T blade was used at an angle of 45 degrees to apply slow stroke along the upper trapezius muscle from its origin to insertion. *Treatment duration:* 3 mins. The technique was performed without causing any discomfort or pain to the subject. The muscle was passively stretched by laterally flexing the neck to opposite side. The stretch was maintained for 30 secs and was repeated 3 times. *Duration:* 1 session/week for 2 weeks<sup>17</sup>.



**Fig. 4: IASTM Technique and Upper Trapezius Stretching**

**Home exercise programme:**

1. **Chin tucks**<sup>1</sup>: The subject held the position for 10 secs and then relaxed. *Repetitions:* 10 repetitions/day for 2 weeks<sup>18</sup>.
2. **Shoulder shrugs**<sup>1</sup>: The position was held for 2secs.. *Repetitions:* 10 repetitions/day for 2 weeks<sup>18</sup>.
3. **Neck Isometrics**<sup>1</sup>:
  - *Neck Flexion*:. The position was held for 5-8secs.
  - *Neck Extension*: The position was held for 5-8secs.
  - *Neck Lateral Flexion*: The position was held for 5-8secs.
  - *Neck Rotation*: The position was held for 5-8secs and was repeated the same for left side rotation.
  - *Repetitions:* 10 repetitions/day for 2 weeks<sup>18</sup>.
4. **Self Stretch**<sup>1,3</sup>: The stretch was held for 30 secs. *Repetitions:* 3 times/session<sup>3</sup>. *Duration:* 5 times/week for 2 weeks<sup>3</sup>.

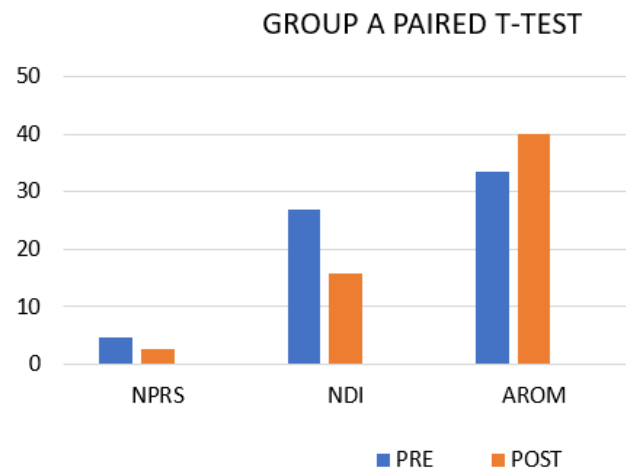
**Ergonomic Advices:**

Ergonomic advices are used to improve workspaces and minimize the risk of injury<sup>1</sup>.

- ❖ General Ergonomics modifications:
  - Neck should not be maintained in a fixed position for long.
  - Lifting heavy weight on head and shoulder should be avoided.
  - Holding phone in between neck and shoulder should be avoided.
  - Good posture during work should be maintained.

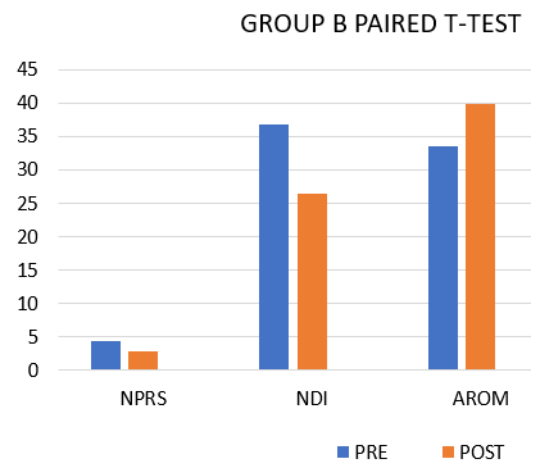
- ❖ Ergonomics modifications for computer users:
  - Top of the monitor should be positioned at eye level.
  - Head should be neutral and chin parallel to the ground.
  - Back should be rested comfortably against the backrest at the chair.
  - Chair with good lumbar support should be used.
  - Elbows should be bent at 90degree and should close to the body.
  - Fingers must be relaxed and wrist should be neutral.

**DATA ANALYSIS**



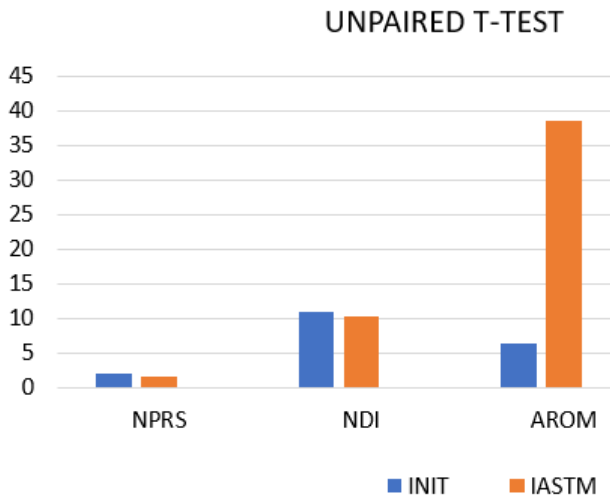
**Graph No. 1:**

INTERPRETATION: Graph No.1 shows that the values are extremely statistically significant.



**Graph No. 2:**

INTERPRETATION: Graph No.2 shows that the values are extremely statistically significant.



**Graph No. 3:**

INTERPRETATION: Graph No.3 shows that the value are extremely statistically significant

**Result**

- The study was conducted on 60 subjects. Both the group had 30 subjects each.
- For NPRS, the mean was 2.10 for Group A (INIT) and 1.60 for Group B (IASTM), p value was =0.0026 and t value was =3.1514 which shows that the result was very statistically significant.
- For NDI, the mean was 11.07 for Group A (INIT) and 10.32 for Group B (IASTM), p value was =0.0569 and t value was =0.7503 which shows that the result was not quite statistically significant.
- For AROM, the mean was 6.47 for Group A (INIT) and 4.70 for Group B (IASTM), p value was <0.0001 and t value was =1.77 which shows that the result was extremely statistically significant.

**Discussion**

The purpose of this study was to compare the effectiveness of Integrated Neuromuscular Inhibition Technique and Instrument Assisted Soft Tissue Mobilisation in the Management of Upper Trapezius Myofascial Trigger Points.

In this study, 60 subject were assigned, 30 were

in Group A and 30 in Group B. Group A received INIT 3 sessions/week and Group B received IASTM 1 session/week for a duration of 2 weeks. Both these groups received same set of Home Exercise Program and Ergonomic Advice.

The outcome measures were NPRS, NDI and AROM performed at baseline and after 2 weeks of study.

According to Graph no.2, IASTM is effective in reducing the pain and disability and improving ROM. This may come from its ability to induce tissue micro-trauma, thus resulting in regional inflammatory process and increases the release of fibroblast. In, addition, the friction between tissue and the instrument increases the local temperature which improves tissue oxygenation and removes local waste metabolites. M2T blade is been used to soften tight fascia by applying rhythmic strokes over the fascia till the adhesions and cross-linkages are broken and release of the fascia occurred<sup>3</sup>.

According to Graph no.3 the present study shows improvement in both the groups i.e. INIT and IASTM for all measured variables but the superiority for INIT in reducing the pain and functional disability and improving ROM.

The effect of INIT is the result of combined effect of three manual treatment techniques. Firstly, Intermittent Ischemic Compression-Alternating pressure allows a pumping effect, a flushing, as compression is released. It allows a circulatory influence on the ischemic tissues. Lighter compression, meets tissue tension, engaging the restriction barrier and allows gentle stretching of the affected tissues. It plays its role in reduction of pain by stimulation of A-beta fibres that affects the pain gate during pressure and increase circulation when the pressure is released. This allows a drainage of the cellular metabolic byproducts commonly associated with the pain production in the MTrP. Thus, this technique restores a normal metabolic functioning of the tissue which is affected. Ischemic Compression decreases the sensitivity of painful nodules in muscles and the local pressure works to equalize the length of sarcomeres in the involved TrP and consequently decreases the pain.

Secondly, Strain-Counterstrain allows improvement of function and ROM by placing the muscle at the passive shortened position. This technique acts on the muscle spindle mechanism and its associated reflex mechanism (which controls spasm) to promote more normal firing of the spindle and a more normal level of tension in the muscle which results in more normal relationship within the various soft tissues surrounding that area. This resetting occurs only when the muscle is at ease, thus works to reduce the hyperactivity of the myotatic reflex arc and to reduce overwhelming afferent nerve impulses leading to overflow of neurotransmitters.

Finally, MET plays an important role in improving the function by working on autogenic inhibition of muscle and increases ROM by changes in muscle extensibility- reflex relaxation, viscoelastic changes and stretch changes. After 7-10 secs of an isometric contraction, muscle tension increases and activates the Golgi Tendon Organ (GTO) leading to relaxation of the muscle by autogenic inhibition thus allowing for an effective stretching of the muscle.<sup>1,2,9,19,20</sup>

The consequence of this research came in agreement with Alshaymaa S Abd El-Azeim, , Salah Eldin B Ahmed et.al (2018) who concluded that the subjects who received INIT found a more significant improvement in VAS, Arabic Neck Disability Index and CROM in patients with Upper Trapezius Myofascial Trigger Points<sup>2</sup>.

Dr. Pooja Wakde, Dr. Deepak Anap concluded that INIT was effective in decreasing the pain and disability, improving muscle strength and ROM in participants with sub-acute trapezitis<sup>18</sup>.

Abdul Rashad, Erum Tanveer, et.al concluded that INIT was found to be effective in reducing pain and improving CROM in patients with Upper Trapezius Trigger Points<sup>21</sup>.

Amit V Nagrale, Paul Glynn, et.al concluded that INIT has proven to be more beneficial in relieving pain, reducing stiffness and improving functional stability as compared to MET in isolation in patients with Upper Trapezius Trigger Points<sup>20</sup>.

### Conclusion

Integrated Neuromuscular Inhibition Technique

is more effective than Instrument Assisted Soft Tissue Mobilisation in the Management of Upper Trapezius Myofascial Trigger Points.

**Ethical Clearance:** Taken from institutional ethical committee

**Funding:** Self

**Conflict of Interest:** Nil

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## Comparison of Muscle Energy Technique versus Eccentric Training on Hamstrings Extensibility among Adolescent Girls

Smriti<sup>1</sup>, Jaspreet Kaur<sup>2</sup>, Amandeep Singh<sup>3</sup>, Abhay Kapoor<sup>4</sup>, Saloni<sup>5</sup>

<sup>1</sup>MPT Student, <sup>2</sup>Associate Professor, <sup>3</sup>Associate Professor, <sup>4</sup>MPT Student, <sup>5</sup>MPT Student, Baba Farid University of Health Sciences, Faridkot.

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### Abstract

**Background:** Hamstrings extensibility is affected as a result of lack of physical activity causing a limitation of extension motion of the knee joint, increases posterior pelvic tilting and reducing lumbar lordosis that can result in nonspecific low back pain.

**Aim:** To compare the effects of muscle energy technique versus eccentric training on hamstrings extensibility among adolescent girls.

**Methods:** Based on Inclusion and Exclusion criteria, 60 adolescent girls of age group 15-24 years were assessed & selected using Active Knee Extension Test for a lag in extension of around 20 degrees during performance of the test. The subjects were divided into three groups of 20 each. Group A (Control Group) was given Conventional treatment as Hot Pack as warm up over the Hamstrings muscle for both the lower limbs & Static Stretching. Thereafter, Group B (Experimental Group 1) was given Muscle Energy Technique & Conventional treatment and Group C (Experimental Group 2) was given Eccentric Training & Conventional treatment for total 6 sessions as 3 sessions a week for 2 weeks respectively.

**Results:** Data was meaningfully assorted through calculation of Mean and Standard Deviation. Thereafter, T test was applied for comparison between the MET group and Eccentric Training group and Control Group. The level of significance was fixed at  $p < 0.05$ . There was significant difference within and between the MET group and Eccentric Training group for both the limbs.

**Conclusion:** The study concluded that MET was better than Eccentric Training in improving Hamstrings extensibility among Adolescent Girls.

**Keywords:** active knee extension test, adolescent girls, eccentric training, hamstring flexibility, muscle energy technique, sit and reach

### Introduction

As we recognize that adolescence is the

period of growth and development of a human framework throughout during which many physical modifications occur, physiologically and physically

as well. As keeping in with the current edge scenario, girls in this period may develop low back pain due to reasons like postural errors, lack of physical exercise, menstrual disorders, and sedentary way of living etc.<sup>3</sup>. It is found that each sedentariness and really high levels of physical activity have been associated to the occurrence of Low Back Pain in adolescents<sup>11</sup>.

The hamstrings muscle group is made up of the semimembranosus, the semitendinosus and the biceps femoris muscles and is accountable for hip extension in conjunction with knee flexion besides providing stability of the hip and knee joints throughout walking<sup>8</sup>. Hamstrings muscle tightness is usually associated with the incapacity of the knee to extend completely when the hip is flexed and is accompanied by discomfort or pain along the posterior thigh or knee<sup>12</sup>. A possible outcome of shortening of the hamstrings is the limited of motion of the knee joint, which bounds a person's ability to run and walk. Furthermore, it will increase posterior pelvic tilting and reduces lumbar lordosis, contributing to a flat back that can bring about low back pain<sup>13</sup>.

Flexibility is described as a physical feature accountable for the voluntary execution of greatest joint range of motion either by a single or numerous joints, within the morphological limitations, without any risk of injury. Thus, good flexibility may be of remarkable benefits for both athletic and non-athletic population<sup>5</sup>. Hamstring tightness is considered as the inability to acquire greater than 160° of knee extension with hip at 90° of flexion<sup>19</sup>. Flexibility exercises are considered to increase tissue elasticity, thereby increasing range of motion of certain joints<sup>16</sup>. Mechanical, thermal, ice, stretch and spray, ultrasound, soft tissue massage, short wave diathermy, myofascial release therapy, and muscle energy technique are some of the successful ways of treating hamstring tightness<sup>4</sup>.

For this reason physiotherapy is often aims at increasing flexibility of hamstrings<sup>9</sup>. One of the methods for treatment of shortened hamstrings is Muscle Energy Technique (MET) which is a technique that involves a maximal contraction of muscle followed by a static stretch<sup>7</sup>. MET has been found to be useful in management of trigger points

in the myofascial pain and found that MET is very effective in treating myofascial pain and restoring resting length of the affected muscle<sup>18</sup>. MET is a manual technique evolved by osteopaths and is used by several manual therapy professions and is proved to be effective for a variety of purposes such as a lymphatic or venous pump to aid the drainage of fluid or blood thus increasing the range of motion of restricted joints<sup>2</sup>. The benefits of MET include strengthening weak muscles, preparing the muscle for subsequent stretching, restoring normal tone in hypertonic muscles and improved joint mobility<sup>1</sup>.

Eccentric Training alludes to muscular action in which muscles are lengthened in a controlled manner. It is likewise referred to as negative resistance training<sup>10</sup>. Eccentric contractions permits the muscle to lengthen naturally and this length is acquired by eccentrically contracting the antagonist muscle to move the joint through complete available range in a slow controlled manner so as to stretch the agonist muscle group<sup>17</sup>. Eccentric Training, involves dynamic muscle contractions that produce force while lengthening. It is an effective training strategy to improve muscle length but also is used to increase in strength and protect against muscle damage<sup>6</sup>.

A number of treatment protocols are available for increasing extensibility of Hamstrings muscle. But there is dearth of studies as per peer review about the comparison of the Muscle Energy Technique and Eccentric Training on Hamstrings Extensibility in Adolescent Girls.

## Methods

### Participants

As per the discussion with the statistician it was determined that a sample size of 60 participants were needed for the present study conducted under Baba Farid University of Health Sciences, Faridkot in 2022. Participants were adolescent girls aging from 15-24 years who were not involved in any routine sports training and conditioning program and had decreased hamstrings muscle extensibility on both the lower limbs. The subjects were free from any pathology, recent trauma and surgery of Lumbar Spine and Lower Limb. Written informed consent were provided by all participants prior to participation.

## Procedure

60 subjects were selected by purposive sampling and the subjects were divided into 3 Groups of 20 each as Group A (Control Group), Group B (Experimental Group 1) & Group C (Experimental Group 2).

Hamstrings Extensibility was evaluated on both the lower limbs by using Active Knee Extension Test (AKET) and Sit & Reach Test respectively.

**Active Knee Extension Test:** The subject was in supine with a strap placed across the anterior superior iliac spines and another across the mid-thigh of the non-testing lower extremity. The subject actively maintains his testing hip at 90° of flexion and the knee fully flexed. The goniometer was aligned with its fulcrum placed at lateral condyle of femur, stationary arm aligned with lateral aspect of thigh and movable arm aligned with lower leg secured with a strap at the thigh and lower leg respectively. The subject was asked to actively extend his knee and readings were obtained at the goniometer.

**Sit and Reach Test:** The subject was instructed to be in long sitting position with shoes removed with soles of their feet against the sit and reach box. The subject was instructed to perform a smooth forward curling action with both hands over laid in front of them. The subject was instructed to momentarily hold that position when maximal flexion was achieved. The best of three trials were recorded with a rest of 30 sec between the trials.

Group A (Control Group) including 20 subjects were given a Conventional treatment as Hot Pack on Hamstrings muscle over the posterior aspect of thigh of both the lower limbs for 10 min. Thereafter, Static Stretching of Hamstrings was given for both the lower limbs with 30 seconds hold for 3 repetitions respectively. Protocol was given for 3 sessions per week for two weeks.

Group B (Experimental Group 1) including 20 subjects were given Conventional treatment as Hot Pack on Hamstrings of both the lower limbs for 10 min. Thereafter, Static Stretching of Hamstrings was given for both the lower limbs with 30 seconds hold for 3 repetitions. Thereafter, Muscle Energy Technique was given. The subjects were made to lie supine. The hip was flexed with the knee extended by the therapist to the position where hamstring stretch sensation was encountered, and moderate isometric contraction of the hamstrings muscle was elicited for five seconds. The subject was asked to relax the muscle so that the knee was further extended to a new barrier. The procedure was given with rest for 5 seconds & hold of 10 seconds for 10 repetitions. Protocol was given for 3 sessions per week for two weeks.

Group C (Experimental Group 2) including 20 subjects were given a Conventional treatment as Hot Pack on Hamstrings of both the lower limbs for 10 min. Thereafter, Static Stretching of Hamstrings were given for both the lower limbs with 30 seconds hold for 3 repetitions respectively. Thereafter, Eccentric Training was given. The subjects were made to lie supine with fully extended legs. Around the heel of the subject a 3 feet long piece of black elastic resistance band was wrapped the ends of the band were held in each hand. This was followed by keeping the opposite knee locked in complete extension and the hip neutral throughout the entire activity. Next the test hip was brought into full hip flexion by pulling on the resistance band attached with the foot and both arms, making sure that knee was locked in full extension at all times. With the pulls the hip into full flexion the subject was instructed to simultaneously resist the hip flexion by eccentrically contracting the hamstring muscle during the entire range of hip flexion. The procedure was given with a hold of 10 seconds for 10 repetitions. Protocol was given for 3 sessions in a week for two weeks.

**Results**

**Table 1: Comparison of PRE and POST intervention values of Hamstrings Extensibility by AKET of Left side**

T Test	Left											
	Pre-Test		Post-Test		Pre-Test		Post-Test		Pre-Test		Post-Test	
	Group A	Group B	Group A	Group B	Group A	Group C	Group A	Group C	Group B	Group C	Group B	Group C
Mean	42.75	44.5	42.55	31.60	42.75	45.30	42.55	38.00	44.50	45.30	31.60	38.00
S.D.	7.51	9.18	7.35	8.97	7.51	8.09	7.35	6.46	9.18	8.09	8.97	6.46
t-value	0.66		4.22		1.03		2.07		0.29		2.58	
Result	NS		S		NS		S		NS		S	

**Table 2: Comparison of PRE and POST intervention values of Hamstrings Extensibility by AKET of Right side**

T Test	Right											
	Pre-Test		Post-Test		Pre-Test		Post-Test		Pre-Test		Post-Test	
	Group A	Group B	Group A	Group B	Group A	Group C	Group A	Group C	Group B	Group C	Group B	Group C
Mean	42.95	42.70	42.75	33.20	42.95	46.40	42.75	39.15	42.70	46.40	33.20	39.15
S.D.	6.03	7.77	5.97	7.59	6.03	4.94	5.97	4.95	7.77	4.94	7.59	4.95
t-value	0.11		4.42		1.97		2.07		1.79		2.93	
Result	NS		S		NS		S		NS		S	

**Table 3: Comparison of PRE and POST intervention values of Hamstring Extensibility by Sit and Reach**

T Test	Pre-Test		Post-Test		Pre-Test		Post-Test		Pre-Test		Post-Test	
	Group A	Group B	Group A	Group B	Group A	Group C	Group A	Group C	Group B	Group C	Group B	Group C
	Mean	5.23	5.55	5.03	17.28	5.23	6.13	5.03	12.13	5.55	6.13	17.28
S.D.	7.35	8.02	7.02	7.83	7.35	8.25	7.02	8.21	8.02	8.25	7.83	8.21
t-value	0.13		5.20		0.36		2.93		0.22		2.03	
Result	NS		S		NS		S		NS		S	

**Discussion**

T test was applied for comparison between Group A, Group B and Group C. For groups A and B t value for AKET left was 4.22, AKET right was 4.42, sit and reach was 5.20 which was statistically significant with  $p < 0.05$ . For groups A and C t value for AKET left was 2.07, AKET right was 2.07, sit and reach was 2.93 which was statistically significant with  $p < 0.05$ . For groups B and C t value for AKET left was 2.58, AKET right was 2.93, sit and reach was 2.03 which was statistically significant with  $p < 0.05$ .

The result of Group B which received MET came out to be significant in correlation to the study

conducted to see the effect of hamstrings and calf muscles on flexibility and sprinting performance in Sprinters. The above study revealed that effect of MET on the length of hamstrings and calf and shows significant change in sprinting performance when comparing the values of the study. The concept for MET and its practice based applications to lengthen and increase in tissue extensibility produces viscoelastic and structural change. This is followed by astronomically mediated changes in extracellular fluid dynamics and fibroblastic transduction for the therapeutic effect of MET as mentioned by Naik<sup>14</sup>.

The result of Group C who received eccentric training came out to be significant in correlation to

the study which compared the effects of eccentric training and static stretch on flexibility of hamstring in high school and college athletes. The group receiving eccentric training showed significantly higher gains in flexibility than the static as well as control group not only from one bout of training, but also over a six week training program. This is because the muscle adapts to the imposed demand of eccentrically training which reduces the injury rates since most injuries takes place during the eccentric phase of activity. Eccentrically training through a complete range of motion, improves the functional ability of the extremity by improving not only the flexibility but also the strength in that range. Also, strength gains from eccentrically training a muscle would also improve the performance.

Eccentric training is strengthening the muscle by contracting it as it lengthens. A patient eccentrically training through a complete range of motion will be gaining range of motion and strength at the same time, thus, making the activity more functional. This type of training is also time saving by combining the strengthening and flexibility components into one activity as mentioned by Nelson<sup>15</sup>.

The comparison between all the three groups i.e. Group A (control group), Group B (MET) and Group C (Eccentric training) showed significant improvement of hamstring flexibility in adolescent girls of group B and group C, whereas, Group A did not show any improvement. The improvement was more in Group B who received MET for hamstring than group C which received Eccentric Training.

### Conclusion

On the basis of the results, it can be concluded that, the current study showed evidence to state that MET provided highest gains for hamstring extensibility in adolescent girls followed by eccentric training group than the control group.

**Ethical Clearance:** Taken from Institutional Ethical committee, Baba Farid University of Health Sciences, Faridkot.

**Source of funding:** Self

**Conflict of Interest:** Nil

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## Telerehabilitation as a Tool Given on Physical Fitness and Quality of Life in Overweight and Obese College Students Amidst Covid 19 Pandemic: Single Group Pre Post Design

Tamilalagan<sup>1</sup>, M.Premkumar<sup>2</sup>, K.Sangeetha<sup>3</sup>, S. Kavitha<sup>4</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Professor cum PhD Research Scholar, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar Campus, Mangaluru, Karnataka - 575001, <sup>3</sup>Final Year Student, <sup>4</sup>Assistant Professor, Santosh College of Physiotherapy (Affiliated to the Tamilnadu Dr.MGR Medical University), 15B, GST Main Road, Tirunagar, Madurai, Tamilnadu - 625006.

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### Abstract

**Background:** Remote rehabilitation via advanced communications through network, online etc given in this advanced digital era is collectively known as telerehabilitation. American telemedicine association initially explained the term of telerehabilitation based on the facilities in current advance digital world. Covid -19 pandemic enhanced the services of telerehabilitation as first line rehabilitation treatment method that need rehabilitations services in their domicile. Thus based on telerehabilitation has been warranted to administer in providing physical therapy services for subjects who have been diagnosed both positive and negative COVID.

**Aim & objectives of the study:** To analyze the uses of exercise training through telerehabilitation applied during COVID-19 isolation period on overweight and obese college students on physical fitness and quality of life.

**Data Analysis and Results:** Notable improvement in the variables of weight in kg and Body Mass Index (BMI) in obese and overweight as well as their quality of life which is measured by SF - 36 questionnaire in college students after rehabilitation through telerehabilitation method where the subjects were trained with aerobic exercises, breathing exercises along with core stability exercises on physical fitness and quality of life with significance equal or less than 0.05 and confidence interval at 95%.

**Conclusion:** statistically significant improvement in weight in kg and BMI which reflected in their physical fitness and quality of life (SF - 36) in overweight and obese college students after the intervention of telerehabilitation consists of aerobic exercises, breathing exercises and core stability exercises applied to them during this COVID 19 Pandemic.

**Key words:** Telerehabilitation, Quality of Life, Overweight, Obese Students, Covid 19 Pandemic.

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**Corresponding Author:** Tamilalagan, Assistant Professor, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar Campus, Mangaluru, Karnataka - 575001.

**Email ID:** [tamilalagan.physio@gmail.com](mailto:tamilalagan.physio@gmail.com)

**Contact No:** 8778352557

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## Introduction

Technological aspects have advanced in every area of medical rehabilitation in recent years, from providing cutting-edge assessments to actually delivering specialized therapies.<sup>1</sup> The administration of treatment programs to people of all ages via digitalization by a diverse group of professionals, as defined by the American Telemedicine Association, is changing the rehabilitation landscape and services.<sup>2</sup>

Therapeutic treatments, Remote progress and education monitoring, consulting, Practicing, and a method of handling persons with impairments are just a some of the management given.<sup>3</sup> Telerehabilitation's impact varies from clients simple approach to the professionals, continuity of care facilitation, and less expensive therapist-centered benefit.<sup>4-6</sup>

Many healthcare institutions at Wuhan, In December 2019, the Hubei province of China reported a number of cases of pneumonia with no obvious aetiology.<sup>7,8</sup> They shared the same clinical signs as the SARS pandemic of 2003.<sup>9-12</sup> Third wave of corona virus to trigger public health outbreaks, COVID-19 spreads more quickly and widely than SARS and Middle East Respiratory Syndrome put together. With millions of confirmed cases and tens of thousands of fatalities in 210 countries and territories, COVID-19 is presently an epidemic on a global scale.<sup>13</sup>

Obesity is described by the World Health Organization (WHO) as abnormal or excessive fat buildup that poses a health concern.<sup>13</sup> There are several aspects to take into account, including excessive and unhealthy eating patterns, age, a lack of exercise, gender, educational attainment, and sociocultural features, hormonal and metabolic factors, social standing, and inherited factors. Obesity is caused by a combination of variables, including regular intervals, extremely low-energy diets, smoking, alcohol consumption, childbirth, and medication use. Regular physical activity in a safe home setting is required to maintain a healthy lifestyle during the COVID-19 epidemic.<sup>15,16</sup>

For patients receiving care at home, telerehabilitation need to be the first option for therapy., according to the most recent edition of a comprehensive assessment assessing rehabilitation

procedures published in COVID-19.<sup>17</sup> The usefulness of Telerehabilitation-based many additional studies that were published during this time period emphasized strategies in the physiotherapy and rehabilitation practices of patients with COVID-19 positive and negative, as well as another condition.<sup>18,19</sup>

Furthermore, in eligible patients, Telerehabilitation procedures should be used throughout the in-hospital time to physiotherapists may operate safely and effectively while reducing the danger of transmission.<sup>18-24</sup>

The main aim of the study to investigate the impact of exercise training via Telerehabilitation on overweight and obese students' physical fitness and quality of life during their COVID-19 isolation period.

The goal is to assess how Telerehabilitation used during the COVID-19 outbreak affects students who seem to be overweight or obese in accordance with the level of physical fitness and quality of life.

By doing this study with the level of significance of application of telerehabilitation during the COVID-19 epidemic on physical health and quality of life will be more useful particularly in treating obese students.

## Methodology

### Study Design:

Single Group Pre Post Design.

### Study Setting:

Abhinav Pain and Physiotherapy Clinic, Madurai.

### Study Duration:

6 Months

### Study Sampling:

Convenient Sampling.

### Study Population:

In and around Madurai District.

### Study Sample:

10 Subjects

**Criteria of Selection:****Inclusion Criteria:**

Age: 20 to 25 years

Sex: Both

BMI: 26 to 30

**Exclusion criteria:**

Noncooperative Patients

Psychological Disorders

Serious Co - morbidities Conditions

Systemic Disorders

**Variables:**

Weight in kg

BMI – Body Mass Index

**Interventions:**

Aerobic Exercises

Breathing Exercises

Flexibility Exercises

Core Stabilization Exercises

**Material and Tools:**

Pen

Paper

Laptop

Weight Machine

**Procedure:**

This study used a convenient sampling strategy to recruit 10 subjects who matched the selection criteria. The subjects' permission to participate in this study was obtained. Their demographic information, BMI, and weight in kilograms were obtained and documented before to the intervention.

The Telerehabilitation programme, which was used on overweight and obese people, lasted 16 weeks and consisted of three 60-minute sessions per week. Our fitness routine included a 30-minute brisk walking programme, as well including breathing exercises and mat exercises focused on bodily stability. Before and after our exercise training, we performed warm-up and cooling-down exercises for the chest, arms, and legs that lasted five minutes each. Each core stabilization exercise was repeated 10 times. Our Telerehabilitation Program's final 10 minutes included five breathing exercises, including diaphragmatic, segmental breathing, and chest wall mobility exercises.

Post intervention data of BMI and weight in kg were recorded and documented.

Data was analyzed with suitable statistical method for windows.

**Data Analysis and Results**

The mean and standard deviation of weight in kg, BMI and SF -36 values were shown in the table 1. That results show there was statistically significant improvement in the pre and post mean values of weight, BMI and SF-36 values after the intervention telerehabilitation program which comprises of aerobic exercise program, breathing exercises with diaphragmatic and segmental expansion exercises, flexibility exercises and core stability exercises.

Notable improvement in the variables of weight in kg and Body Mass Index (BMI) in obese and overweight as well as their quality of life is measured by SF - 36 questionnaire in college students after rehabilitation through telerehabilitation method where the subjects were trained with aerobic exercises, breathing exercises along with core stability exercises on physical fitness and quality of life with significance equal or less than 0.05 and confidence interval at 95%.

**Table 1: Comparison of Mean, SD, T, and P values of weight in kg and BMI between Pre- and Post-Test Duration in Overweight and Obese Subjects**

No of Subjects	Variables	Mean		SD		T Value	P Value
		Pre	Post	Pre	Post		
10	Weight in kg	72.7	68.9	22.68	24.32	1.75281	0.048325
	BMI	27.03	25.62	2.11	2.19	2.14794	0.022710
	SF - 36	78.86	95.36	7.34	8.24	8.3476	0.00001

p<0.05

### Discussion

The results of this study show that after telerehabilitation, which consists of aerobic exercises, breathing exercises, and core stability exercises, in obese and overweight students, the variables of weight in kg and Body Mass Index (BMI) have statistically improved in terms of their level of physical fitness and quality of life with  $p \leq 0.05$ .

This change in the variables illustrates how subjects' active engagement in telerehabilitation during the Covid 19 epidemic improves overweight and obese pupils' physical standards. The Covid 19 epidemic forced students to adopt a more sedentary physical lifestyle, which resulted in weight gain and inactivity. However, science is continuously expanding to meet new, unexpected, or unanticipated requirements. It brings up the possibility of telerehabilitation procedures to meet our demands in this regard. This project is well-designed to combat the threat of overweight and obese student problems caused by the pandemic.

The findings of this study corroborate those of Beste Ozturk et. al. 2021, who drew the conclusion that providing fitness training via Telerehabilitation during the COVID-19 epidemic was an efficient, secure, and useful therapy option for overweight and obese persons. Future research is required to determine the effectiveness of Telerehabilitation in this population.<sup>28</sup>

The results of this study support the claim made by Jaini Patel et. al. in 2020, that a brief, supervised virtual Telerehabilitation programme enhances walk test performance, regular mobility, and wellness quality of life in patients with cardiac, pulmonary, and cancer. By promoting regular physical activity even during strict house lockdowns and lowering

the danger of new viral mutations, the use of a step counter in conjunction with frequent instruction during home-based treatments may enhance health.<sup>29</sup>

**Ethical Clearance:** Taken from Institutional Ethical Review Board, Santosh College of Physiotherapy, Madurai.

**Conflict of Interest:** Nil

**Source of Funding:** Self

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## Variability in Flexibility of Dominant and Non-Dominant Shoulder Joints among Healthy Young Adults

Jyoti S. Jeevannavar<sup>1</sup>, Purohit Sneha Jalamsingh<sup>2</sup>, Nidhi Misalankar<sup>2</sup>, Kacha Priyanka Rajesh<sup>2</sup>

<sup>1</sup>Professor, S.D.M. College of Physiotherapy, S.D.M. University, Dharwad, Karnataka, India, <sup>2</sup>Interns, S.D.M. College of Physiotherapy, S.D.M. University, Dharwad, Karnataka, India.

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### Abstract

**Background:** The shoulder joint comprises of a large humerus head and smaller glenoid fossa. It is an incongruous ball and socket type of joint. The joint has sacrificed its articular congruency for more range of motion. The dominant upper limb is involved in activities of daily living (ADLs) such as self-grooming, eating, lifting objects etc. Range of motion of the shoulder may be influenced by various factors and also dominance.

**Objective:** The study aims to identify variation in flexibility of the shoulder joint in dominant and non-dominant upper limbs and to identify the various factors influencing it.

**Method:** This cross-sectional study included young healthy adults of either gender between the age group of 18-26 yrs. Participants with history of shoulder injuries, dislocations, generalised hypermobility were excluded from participation. The total sample size was 169 with 37 males and 132 females. The participants performed Apley's scratch test for flexibility measurement bilaterally for both dominant and non-dominant shoulder.

**Result:** The total number of sample size was 169 out of which 37 were males and 132 were females. Data from 169 participants (165 right-hand dominant and 4 left-hand dominant) was analysed, and it was discovered that the dominant shoulder showed more flexibility than the non-dominant side. There was no gender difference in shoulder flexibility. It showed that the age was inversely proportional to flexibility of the shoulder joint. BMI shows to have a negative influence on the joint flexibility.

**Discussion:** This study showed the dominant side shoulder to have more positive values according to the Apley's scratch test compared to the non-dominant side. The flexibility values showed negative correlation with BMI.

**Conclusion:** Flexibility in the dominant shoulder joint is more compared to the non-dominant joint. BMI influences the flexibility of the joint. The shoulder flexibility decreases with age. Gender doesn't seem to have significant variation in the shoulder joint flexibility.

**Key words:** Shoulder joint; Flexibility; BMI; Age; Hand dominance; Gender.

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**Corresponding Author:** Nidhi Misalankar, Intern, S.D.M. College of Physiotherapy, S.D.M. University, Dharwad, Karnataka, India.

**Email ID:** [nidhimislanakar20@gmail.com](mailto:nidhimislanakar20@gmail.com)

**Contact No:** 7022124205

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## Introduction:

The shoulder joint comprises of a large head of the humerus and a smaller glenoid fossa.<sup>1</sup> It is an incongruous, ball and socket triaxial type of joint, which enables great mobility of the upper extremity, allowing us to move the hand within a sphere of movement. It has three rotatory and three translatory degrees of freedom.<sup>2</sup>

Both static and dynamic restraints provide joint stability. Static stability is provided by the capsule, ligaments, glenoid labrum and the joint morphology. Dynamic stability reinforces the static restraints, which include tendons of the rotator cuff and muscle contractions.<sup>2</sup>

The joint has sacrificed articular congruency to increase the mobility of the upper extremity and thus is susceptible to degenerative changes, instability, and derangement.<sup>1</sup>

Flexibility is a physiological characteristic that allows an individual to execute the voluntary movement of maximum joint angular amplitude within morphological limits, free of pain and restrictions which is closely associated with muscle extensibility, range of motion, and plasticity of ligament and tendons.<sup>3</sup>

Limited flexibility of the shoulder affects activities of daily living such as self-grooming (brushing teeth, combing hair, washing face), eating, difficulty in lifting object above shoulder level, and limited ability to perform repetitive activities.<sup>2</sup>

## Objective

To identify variation in shoulder flexibility between dominant and non-dominant shoulder joints among healthy individuals between the age group 18 to 26 years.

## Methodology

Ethical clearance was obtained for the study from Institutional Ethical Committee. This cross-sectional

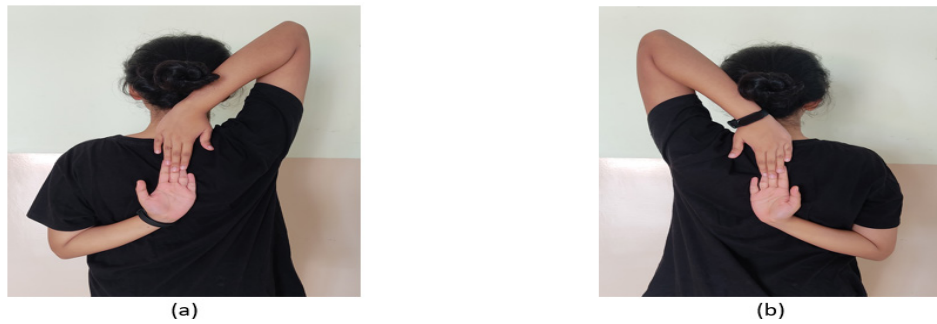
study was conducted among 242 university students present on the day of data collection. 169 students were included and 73 students were excluded due to various reasons. Participants of this study were normal healthy adults aged between 18 to 26 years of either gender. Initially, the demographic data i.e., name, age, gender, and dominance were documented. Thereafter, subjects were assessed for shoulder joint flexibility in both dominant and non-dominant upper limbs by using the Apley's scratch test (Shoulder reach flexibility test)

**Inclusion Criteria** - Normal healthy adults aged between 18 to 26 years of either gender were included in the study.

**Exclusion Criteria** - Participants with any shoulder injury, history of recurrent shoulder subluxation, general laxity, hypermobility of joints, chronic and acute shoulder pain, or any musculoskeletal or neuromusculoskeletal conditions which may interfere with the performance of the test were excluded from participation.

## Testing Procedure:

Appropriate loose clothing was ensured that does not restrict movement. The test was performed in standing position. Placing one hand behind the head and back over the shoulder, and reaching as far as possible down the middle of the back, the palm touching the body and the fingers directed downwards. The other arm was placed behind the back, palm facing outward, and fingers upward and attempting to touch or overlap the middle fingers of both hands. If the finger tips touch, then the score was taken as zero. If they did not touch then, the distance between the fingertips was measured (as a negative score), if they overlapped it was measured by how much distance (as a positive score).<sup>3</sup>



**Figure 1: Performance of the Apley's back scratch test a) Right side b) Left side**

### Result

The data to identify variation of shoulder flexibility among dominant and non-dominant upper limbs was collected from 169 young adults and was subjected to analyses using Statistical Package for the Social Sciences (SPSS) version 20.0.

As the Kolmogorov Smirnov test showed that the data collected was not normally distributed it was subjected to nonparametric tests like Mann Whitney U test, Kruskal Wallis test and Spearman's correlation.

The 169 participants consisted of 37 (22%) males and 132 (78%) females with a mean age of 21.3 ( $\pm 2.4$ ) and 21.8 ( $\pm 2.0$ ) respectively. Ages of the female and male participants were not significantly different with a z-score of 1.82 and *p*-value of 0.067.

Age shows to have a negative correlation with shoulder flexibility in both dominant and non-dominant upper limbs, according to Spearman's rho. It gave  $r_s = -0.2$  and  $p = 0.002$  for dominant side while  $r_s = -0.2$  and  $p = 0.001$  for the non-dominant side. Although the correlation was technically weak it was statistically significant for the given sample.

165 (98%) participants in the study were right-hand dominant while 4 (2%) were left-hand dominant.

The mean flexibility of the dominant shoulder among the female participants was 2.3 ( $\pm 4.3$ ) while in male participants was 2.4 ( $\pm 4.7$ ) which was statistically not significant with a U-value of 2385.5, z-score of -0.2129 and *p*-value of 0.8.

The mean flexibility of the non-dominant shoulder among the female participants was -1.4

while in male participants it was -1.2 which was statistically not significant with a U-value of 2263, z-score of -0.67 and *p*-value of 0.5.

The result is not significant at  $p < 0.05$ . Thus, according to the data analysis gender did not seem to influence the shoulder flexibility.

However, the difference in the flexibility of Male participant's dominant and non-dominant upper limb showed a U score of 499.5 with a z-score of 1.99 and *p*-value of 0.046.

Similarly, the difference in the flexibility of Female participant's dominant and non-dominant upper limbs showed a U score of 5515.5 with a z-score of 5.15 and *p*-value of  $< 0.00001$ .

The variation in the flexibility of dominant and non-dominant shoulder including both the genders gave a U value of 9371 and z score of 5.5 at a *p*-value of  $< 0.00001$ .

Frequency distribution of participants according to BMI into underweight [23(13%)], normal [109(64%)], overweight [28(16%)] and obese [7(4%)] with a mean flexibility of 2.3 ( $\pm 6$ ) and -2.3 ( $\pm 8$ ); 2.8 ( $\pm 4$ ) and -0.4 ( $\pm 6$ ); 0.2 ( $\pm 4$ ) and -4.5 ( $\pm 7$ ); 1.1 ( $\pm 5$ ) and -4.3 ( $\pm 9$ ) respectively on dominant and non-dominant sides; showed a significant variation between the four BMI classes with a *p*-value of 0.003 when subjected to Kruskal Wallis rank sum test for multiple independent samples. The *p*-value was below the respectable critical threshold of 0.05 so post-hoc pairwise multiple comparison tests were conducted to discern which of the pairs had significant differences. Conover test suggests that there is a significant difference between overweight and normal weight.

**Table 1: Post hoc analysis for Kruskal Wallis test**

	Normal Weight	Obesity	Overweight
Obesity	1.00000		
Overweight	0.00097*	0.4	
Underweight	1.00000	1.0000	0.15

\* $p \leq 0.05$  was statistically significant

Thus, it can be inferred that BMI seems to affect the shoulder flexibility with significant variation among normal weight and overweight participants.

### Discussion

This study intended to identify any variations in the flexibility of the dominant and non-dominant shoulder joints of normal young adults. The number of young adults included after screening for inclusion and exclusion criteria was 169. The mean age of both male and female participants was not significantly different. However, it was observed that as age increased the shoulder flexibility decreased. This result is supported by other articles which also report similarly.<sup>5,7</sup>

Gender did not influence the shoulder flexibility as reported by another study.<sup>7</sup>

It was found that the shoulder joint of the dominant arm has more flexibility than the non-dominant arm. This result is in concurrence with other studies.<sup>3,8</sup> This could be possible due to repeated involvement of the dominant limb in activities of daily living (ADL's) such as self-grooming activities like combing, putting on shirt, buttoning of shirt; eating and lifting objects.

Participants with greater BMI had lower shoulder flexibility. This result is in coherence with another article which also reports that individuals with higher BMI have lower shoulder joint flexibility.<sup>3</sup> Other articles also suggest that BMI negatively correlates with shoulder joint flexibility.<sup>4,6,9,10</sup>

This could be attributed to the fact that high BMI is usually seen in people with sedentary lifestyle, leading to stiff joints and tight muscles without regular movement. Inactivity can lead to chemical changes in connective tissue of joints, thus restricting the flexibility.

### Conclusion

The study concludes that flexibility in the shoulder is influenced by age, BMI and dominance. The flexibility is greater in the dominant shoulder joint, which needs to be taken into consideration during measurement of outcome measures while delivering rehabilitation services.

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**Conflict of interest:** The authors have no potential conflicts of interests to disclose with respect to the research, authorship, and/or publication of this article.

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## Benefit of Stability Exercise on Swiss Ball Exercise along with Treadmill Walking in Physiotherapy College Girl Students with PCOS Symptoms: Single Group Pre Post Design

M.Prem Kumar<sup>1</sup>, S. Jeya Preethi Angela<sup>2</sup>, S. Kavitha<sup>3</sup>

<sup>1</sup>PhD Research Scholar, Professor, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar Campus, Mangaluru, Karnataka - 575001, <sup>2</sup>Final Year Student, <sup>3</sup>Assistant Professor, Santosh College of Physiotherapy (Affiliated to The Tamilnadu Dr. MGR Medical University), Madurai Kanyakumari Main Road, Tirunagar, Madurai, Tamilnadu - 625014.

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### Abstract

**Background:** Polycystic ovarian syndrome (PCOS) is a common disorder seen in women at their reproductive age with a prevalence rate of 4 to 12%. Diagnosis of hyperandrogenism or chronic anovulation without any adrenal or pituitary conditions can be called as PCOS. Swiss ball exercises are found to be a better alternative which is safe for the joints, and also demands moderate physical exertion without loading joints to stress. A combined aerobic and Swiss ball exercise protocols help in muscle strengthening, preventing loss of lean muscle mass, reducing obesity, and improves disease-related hyperandrogenism and insulin sensitivity in PCOS.

**Aim & objective of the study:** To analyze and understand the effect of swiss ball exercises along with aerobic exercises among college girls with polycystic ovarian syndrome.

**Data Analysis and Results:** This study results shows that there is statistically significant improvement in the variables of Menorrhhea Impact Score (MIS) pre and post mean values of 4.99 and 0.99 in subjects with  $p < 0.05$ . Thus null hypothesis has been rejected and alternate hypothesis has been accepted for this study.

**Conclusion:** The study is concluded that there is statistically significant improvement in Menorrhhea Impact Questionnaire score in college girls in and around Madurai with Poly Cystic Ovarian Syndrome after the intervention of Swiss Ball Exercises along with Aerobic Exercises Program for 6 weeks.

**Key words:** PCOS, Poly Cystic Ovarian Syndrome, Menorrhhea Impact Questionnaire, MIQ, Swiss Ball Exercises, Aerobic Exercises, College Girls.

### Introduction

Polycystic ovarian syndrome (PCOS) is a common disorder seen in women at their reproductive age

with a prevalence rate of 4 to 12%<sup>1</sup>. Diagnosis of hyperandrogenism or chronic anovulation without any adrenal or pituitary conditions can be called as

**Corresponding Author:** M. Premkumar, PhD Research Scholar, Professor, Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar Campus, Mangaluru, Karnataka - 575001.

**Email ID:** 80pk2009@gmail.com

**ORCID ID:** 0000-0001-6182-2014

PCOS<sup>2</sup>. The condition was first described by Stein and Leventhal in 1935, which was a combination of oligo-amenorrhea and polycystic ovaries often associated with hirsutism, obesity or acne<sup>3</sup>. Thus the key findings in subjects with PCOS are hyperandrogenism and chronic anovulation<sup>2</sup>. Clinical features also include acanthosis nigricans and male pattern alopecia<sup>4</sup>.

There is a growing consensus that exercise can restore menses and improve insulin sensitivity without decreasing body weight<sup>5</sup>. In support of this, aerobic training in this study did not result in a significant change in body mass or body composition however despite exercise compliance and supervised training, there was considerable variability among the subjects with weight change from +4kg to -6 kg. Intra-individual variability in weight change is commonly observed in exercise only interventions<sup>6-8</sup>. It is postulated that aerobic training induces metabolic and/or behavioral compensations which attenuate weight loss in compliant subjects<sup>6-8</sup>.

A lowering of metabolic rate and reduction in energy expenditure from non-exercise activities are primary candidates of metabolic compensation whereas compliance to the intervention and an increase in dietary intake are examples of behavioral compensation. In our study compliance was excellent and the change in resting metabolic rate was not different between those subjects who lost weight and those who did not. We did not impose a dietary intervention and of course an increase in dietary intake the most likely candidate for the increase in body weight. Studies in overweight/obese women support an increase in energy intake with exercise however the extra calories consumed do not equal or exceed the energy expenditure in exercise<sup>9-10</sup>. A major challenge for studies implementing exercise only interventions in PCOS women is how to handle dietary intake; perhaps dietary counseling should be provided to maintain dietary intake<sup>11</sup>.

It is found that obesity commonly occur in women with PCOS, which may lead to decrease in strength, postural control and altered biomechanics of lower limbs.<sup>12</sup> Swiss ball exercises, through its activation of global and local core muscles, significantly improves the postural control of individuals with PCOS along with weight reduction. Physical activities demanding

greater amplitude of joint motion may put excessive stress on the joints of those who are obese, and may be a major factor leading to non-compliance<sup>12</sup>.

Swiss ball exercises are found to be a better alternative which is safe for the joints, and also demands moderate physical exertion without loading joints to stress. A combined aerobic and Swiss ball exercise protocols help in muscle strengthening, preventing loss of lean muscle mass, reducing obesity, and improves disease-related hyperandrogenism and insulin sensitivity in PCOS<sup>12</sup>.

Due to lack of studies on effectiveness of swiss ball exercises along with aerobic exercises on Menorrhoea Impact Score (MIS) based on Menorrhoea Impact Questionnaire (MIQ) leads to do this observational study. The main aim of the study was to analyze and understand the effect of swiss ball exercises along with aerobic exercises among college girls with polycystic ovarian syndrome.

By doing this study with its outcomes, the symptoms of PCOS can be managed early. The consequences of PCOS may be stalled by the interventions of Swiss Ball Exercise with Aerobic Exercises among college girls.

## Materials and Methods

78 college girls of Santosh Physiotherapy College from Madurai, Tamilnadu with diagnosed Poly Cystic Ovarian Syndrome for the past 6 months in the age of 18-24 years and BMI of 18.5 to 24.0 were recruited by convenient sampling method in this observational study with their written informed consent. Subject's demographic data of age, sex, BMI and address were recorded. Subjects were intervened with 20 minutes of abdominal curls with swiss ball exercises ( Pic.2 ) on the 75 mm inflated swiss ball along with aerobic exercises on treadmill ( Pic. 1) with 10% grade and 5 mph speed for 20 minutes a session with 10 minutes of warm up and 10 minutes of cool down of total 60 minutes a session, 5 sessions for a week for 6 weeks were given to the subjects under the supervision of Physiotherapist who possessed 3 years of Post Masters Degree clinical experience. Subject's pre test Score of Menorrhoea Impact Questionnaire (MID) were recorded and documented.

Subjects were intervened with swiss ball exercises along with aerobic exercises for 60 minutes a session; 5 sessions for a week; 6 weeks. Data were analyzed by using paired student t test with spss 20.0 version for windows.  $P \leq 0.05$  kept as significant for all analysis.

### Data Analysis and Results

**Table 1: Demographic Variables – Age and BMI.**

No of Subjects	Variable	Mean±SD
78	Age	23.0 ± 1.57
	Sex	22.33 ± 1.45
	PCOS in months	5 ± 1.47

Table 1 shows the pre test values of Demographic Variables of Age, BMI and PCOS in months of the subjects.

**Table 2: Comparison of Pre and Post Mean, Standard Deviation, 't' Value and 'p' value of score of MIQ in subjects.**

No of Subjects	Variables	Mean Value		SD		T Value	P Value
		Pre	Post	Pre	Post		
78	MIQ Score	15.9	23.1	4.99	0.99	-9.31242	0.00001

Table 2 shows that the pre and post mean, standard deviation, t value and p value of MIQ Score in before and after the intervention of Swiss Ball with Aerobic Exercises in subjects. There is statistically significant improvement in MIQ scores with p with  $p \leq 0.05$ .

### Discussion

This study results shows that there is statistically significant improvement in the variables of Menorrhagia Impact Score pre and post mean values in subjects (Table 4.3.1) with  $p < 0.05$ . Thus null hypothesis has been rejected and alternate hypothesis has been accepted for this study.

There is significant improvement in Menorrhagia Impact Score in subjects with the intervention Swiss Ball Exercises and Aerobic Exercises with this study results and outcomes. Physiologically there are changes in metabolic activities due to aerobic exercises interventions which are resulted by aerobic mechanisms of energy production in our body. These aerobic exercises lead to hormonal changes particularly insulin which is instrumental to bring the symptoms of PCOS – Poly Cystic Ovarian Syndrome and its symptoms.

Swiss Ball Exercises brings needed core muscles and pelvic floor muscles strength which are framing the outer cover of Uterus and structural stability to Uterus. Thus the subjects with PCOS recruited in this study got more benefits along with aerobic exercises program.

This study results strengthened the view of Prakash J et al., 2021 in their study, concluded that the addition of Swiss ball exercise programme along with aerobic training is beneficial in women with PCOS in reducing body weight, abdominal fat and irregular menses. It is also a safe alternative to high



**Pic 1: Subject performing aerobic exercise on treadmill**



**Pic 2: Subject performing aerobic exercise on treadmill**

load exercises, avoiding stress over joints. Swiss ball exercises also improve postural control in subjects with PCOS. Thus the exercise protocols help in providing a non- pharmacological alternative in women with PCOS in modifying their lifestyle and in the management of their condition<sup>13</sup>.

These study results reflecting the concepts of Leanne M. Redman et al, 2011 in their study stated that the recommendations for adopting regular physical activity in the treatment of metabolic and reproductive function in women with PCOS. Importantly regular exercise in women with PCOS has benefits that exceed weight loss with improvement management of the metabolic and reproductive derangements. Exercise studies of longer duration are needed to carefully characterize the mechanisms between changes in insulin sensitivity and ovarian morphology, sex steroid concentration and reproductive function<sup>14</sup>.

But it was a relatively short duration of study and subjects with 19 to 23 year of age were only included in this study. Certain factor such as nutritional factors, psychological status could not control during the period of study. Further this study can be done in comparative or experimental design.

### Conclusion

The study is concluded that there is statistically significant improvement in Menorrhoea Impact Questionnaire score in college girls in and around Madurai with Poly Cystic Ovarian Syndrome after the intervention of Swiss Ball Exercises along with Aerobic Exercises Program for 6 weeks.

**Ethical Clearance:** Taken from Institutional Ethical Review Board, Santosh College of Physiotherapy, Madurai.

**Conflict of Interest:** Nil

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## Call for Papers / Article Submission

Indian Journal of Physiotherapy and Occupational Therapy has commenced publication since 2006. IJPOT will be published four times in a year.

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The journal encourages research from theoretical perspectives, research reports of evidence based practice as well as praxis research work that focuses on the interface between theory and practice and how each can support the other. In addition, the journal strongly encourages reports of research carried out within or involving countries in the Asia— Pacific region.

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- Findings • Conclusion
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- References in Vancouver style.
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