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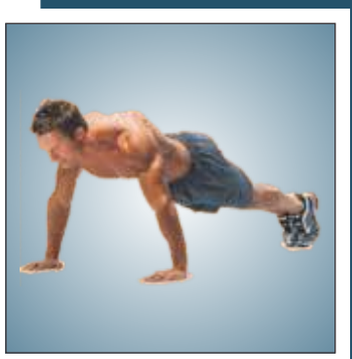
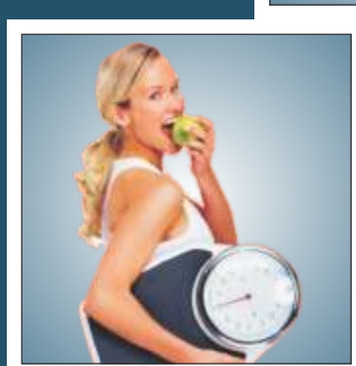
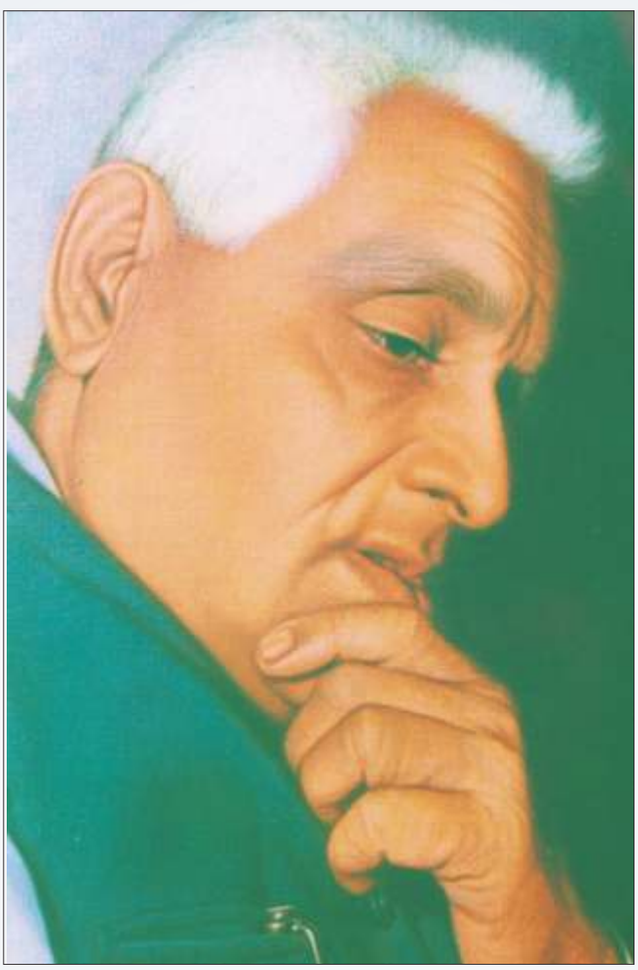




30 Minutes of brisk walking benefit health

Janardan Rai Nagar
Rajasthan Vidyapeeth
(Deemed) University, Udaipur

Our Beloved Founder



Late Manishi Pt. Janardan Rai Nagar

16th June 1911 - 15th August,1997

Popularly known as 'jannu bhai', the Late manishi's vision, farsightedness and sacrifice have enabled us reach the stature we enjoy today. He lit the lamp of knowledge by giving birth to an institution , named 'Hindi Vidyapeeth' on August 21, 1937 to spread education among those who were economically handicapped, and thereby enable them to learn the meaning of freedom Since then, the institution has been catering to the growing educational needs of an economically poor society having a rich socio-cultural heritage. Although the Manishi is not amongst us today, his ideals inspire us to fulfil the mission of imparting qualitative education to the society through preservation of our long cherished sociocultural values. We cherish his deeds and ideals, and strive to walk on the path shown by him.

Vice Chancellor's Message

It gives me immense pleasure to learn that the 9th Volume of Indian Journal of Physical Therapy and Rehabilitation is being published by department of physiotherapy. Sincere effort and keen interest taken by the members of department in the development of academic and research activities deserve all the admiration. I wish to express with a deep sense of joy and satisfaction on the release of this volume and the same moment to continue even in greater magnitude in the coming years so that the department accomplishes commendable place in the luminous field of physiotherapy at the international level.

Wishing all a scintillating success.

Col (Prof.) S.S. Sarangdevot
Vice Chancellor

Principal's Message

I have immense pleasure to gather that the Department of Physiotherapy, Janardan Rai Nagar Rajasthan Vidyapeeth (Deemed) University, Udaipur, is going to publish its 9th Volume of Indian journal of Physical Therapy and Rehabilitation this year.

We must engage in research and voice our opinions by publishing them in this, our local journal. To ensure wide leadership, the journal will carry a variety of articles of general interest, as well as scientific articles, based on topics relevant to our region. Articles in the following categories are welcome: Editorials, Letter to Editor, Major and Minor Reviews, Original Research, Notable Clinical cases, To conference report, New technique I clinical update. With so many categories, I am sure that all of you will be able to make regular contributions to this journal.

This is a major milestone for the physiotherapy field and I encourage all my staff and colleagues in the health care Sec-tor, both public an private, to embrace and support this Journal. The continuing success of this journal should give us a sense of pride and achieve meant. Please contribute articles to this journal in a timely manner to ensure it becomes an important forum for the exchange of ideas and knowledge which will ultimately transfate to better health care.

My Congratulations to the entire team of my Department of Physiotherapy working for this remarkable Endeavour and I wish editor in chief all the best for the successful publication of the journal.

DR. SHAILENDRA MEHTA
Principal
Department of Physiotherapy

The Editor's Desk

It gives me immense pleasure to write editorial for this 9th volume of IJPTR. The Department of Physiotherapy J.R. Nagar Rajasthan Vidyapeeth University Journal with a vision to promote physiotherapy science including all the specialities of Physiotherapy and uptake knowledge through new innovative research papers, case reports and Review articles in various field of physiotherapy specialities. This Journal with consistent precious publications ultimately aims to reach out to the International standards.

Our world is changing we face mounting challenges of Health Care to name a few. Their solution will require new ideas, discoveries, talents and innovations the fruits of research. To achieve them we must start by changing the way we do research there has to be free movement of people & ideas.

At this Juncture i wish to express my profuse thanks to all those who made an appreciable contribution for this journal and further i anticipate that their majestic effort shall continue, so to bring greater glory to our endeavors.

The arena of physiotherapy which as a matter of fact, works as a back bone of medical rehabilitation field should further be developed, for greater benefit to our suffering humanities

I implore & solicit all our members to spare no stone unturned in this noble and glorious mission.

I whole heartedly wish to express my deepest sense of gratitude to Honb'e chancellor & Honb'e Vice chancellor for their untiring help, relentless support and tremendous encouragement without which the present work would not have achieved its glorious completion.

On the behalf of editorial board I request to all the physiotherapist academicians, clinicians, research scholars and students to contribute articles for this Journal.

I pray to Almighty to grant all of us still greater success in times to come.

(Dr. S.B. Nagar)
Editor in Chief

Editorial Board

IJPTR an international peer reviewed Journal for all physiotherapist & Rehabilitation professionals with a forum to discuss to days challenges.

INDIAN JOURNAL OF PHYSICAL THERAPY & REHABILITATION

Volume-9, Issue-1, June 2020

Effectiveness of Isometric Exercise combined with Mobilization with Movement VS Progressive Resistance Exercises on Pain, walking Speed, balance & mobility in OA Knee

Tanvi Chauhan

Abstract: Purpose of Study: to compare the effects of isometric exercise in combination of Mulligan's Mobilization with movement (MWM) VS Progressive Resisted exercises (PRE) on Pain, walking speed, balance and mobility in subjects with OA Knee. Methodology: 50 subjects with a diagnosis of OA Knee were selected directly from Physiotherapy department of Adarsh Hospital, New Delhi. These individuals were randomly assigned into two groups: Group A [PRE group (n = 25)] and Group-B [IECM group-Isometric Exercise combined with Mobilization with Movement (n = 25)]. Both the groups were firstly received pulse Ultrasonic therapy, after that Exercises and mobilizations were given supervised by a Physiotherapist on regular basis for four weeks. In Group A (PRE group) Progressive Resisted Exercises were given as procedure mention below: Patient lying supine, two pillows beneath his exercising knee. Patients were told to lift the leg maximally up without raising his /her thigh (Short Arc Knee extension Exercise.) After that Patients in high sitting position over plinth. Weight cuff was tied at lower end of the leg in all the exercises; for the first 2 weeks all the exercises were carried out using 1kg weight and for the next 2 weeks exercises were carried out by using 1.5kg weight. In Group-B (IECM Group) Isometric Exercise combined with Mulligan's Mobilization with Movement were given as procedure mention below: - firstly Mobilization technique was selected based upon patient's complaint. There are two techniques which were performed: the first is the medial or lateral glide MWM depending on site of pain (medial glide with medial knee pain and lateral glide with lateral knee pain). The second mobilization technique was the "rotation" MWM: for patients with knee pain in weight bearing position rotation MWM was given. At last multiple angle isometrics was given. Data collection: Data collection of all variables was done on day 1, at end of 2nd week and at the end of 4th week. VAS scale was used for measurement of pain, 20 meter walk test was used for measurement of walking speed, Berge balance scale (BBS) was used for measurement balance and Time up & Go test (TUG) was used for measurement mobility. Result & Conclusion: PRE technique is more effective in reduction of pain and good achievement of walking speed, balance & mobility in treating OA knee as compared to Isometric exercise combined with MWM technique.

Key words: MWM (Mulligan Mobilization with movement), PRE (Progressive Resisted Exercises), IECM (Isometric Exercise combined with Mobilization with Movement), VAS (Visual Analogue scale), BBS (Berge balance scale), TUG (Time up & Go test).

INTRODUCTION

Osteoarthritis is the most common disease affecting synovial joints characterized by degenerative structural remodeling of joint cartilage and of underlying subchondral bone, which again lead to pain and disability. Osteoarthritis of knee is the most common form of osteoarthritis. Radiographs confirm the diagnosis of knee OA. Considerable evidence in the literature confirms that strengthening exercises should be employed in the treatment of knee OA; however, confusion exists as to what exercises are the most appropriate and beneficial in meeting the needs of the patient with OA (Brousseau et al., 2005). Traditional exercises tend to focus on the isolation of one or more muscle groups (e.g.,

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quadriceps) in an attempt to address the impairment. Alternately, Dimitrova E studied on Efficacy of mobilizations with movement in patients with knee osteoarthritis; he concluded that, MWM is feasible and efficacious in individuals with knee osteoarthritis. Exercise therapy for people with lower limb OA may take many forms however given the significant impact of muscle weakness on pain and function in OA (O'Reilly SC, Jones A, Muir KR, et al 1998), muscle strengthening is a key component of most exercise regimes for knee and hip OA. High-intensity training (high resistance/load) might be expected to result in greater strength gains in people with lower limb OA than low-intensity training but could potentially overload the joint and exacerbate symptoms. The only study comparing high- and low-intensity strengthening programs found that both were equally beneficial for pain, function, walking time and muscle strength over 8 weeks in people with knee OA (Jan MH, Lin JJ, Liau JJ, et al 2008). A Summary of Systematic Review Nicholas F Taylor et al. 2005 Progressive resistance exercise (PRE) is a method of increasing the ability of muscles to generate force. PRE shows moderate to large effect sizes that may carry over into an improved ability to perform daily activities. Therefore purpose of this study was to compare the effects of isometric exercise in combination of Manual therapy and Progressive Resisted exercises (PRE) on Pain, walking speed, balance and mobility in subjects with OA Knee.

Material & Methods: Evaluation of the study subjects: All 50 patients of OA Knee age range between 55-60 yrs were diagnosed by orthopedic surgeon. Patients were referred to Department of Physiotherapy Jaipur Physiotherapy College, Maharaj Vinayak global University, Jaipur, underwent a detailed clinical examination regarding severity of pain on Visual Analog Scale (VAS), Walking Speed by 20 meter walk test, balance by Berge balance scale (BBS) & mobility by Time UP and GO test (TUG) in OA Knee. These patients were assigned in two groups, A and B, based on computer generated random numbers.

Inclusion Criteria: Unilateral Tibio-femoral OA knee, had knee pain for four months or longer, able to walk 100 feet without resting and without an assistive device and diagnosis of knee OA based on radiographic results obtained by physician report.

Exclusion Criteria: anti-inflammatory medication, neurological disease, uncontrolled low or high blood pressure, uncontrolled cardiopulmonary or respiratory condition, inability to rise from and return to a chair without assistance, Currently actively participating in an exercise program.

Procedure: Group A (PRE group) Progressive resistance exercises group received pulse Ultrasonic therapy applied on each tender point over the affected Knee. Thereafter Progressive Resisted Exercises were given as procedure mention below: Patient lying supine, two pillows beneath his exercising knee. Patients were told to lift the leg maximally up without raising his /her thigh (Short Arc Knee extension Exercise.) Patient at high sitting position over plinth, hand crossed at chest. Patients were told to take the leg maximally up without moving the body forward or backward. Weight cuff was tied at lower end of the leg in all the exercises; for the first 2 weeks all the exercises were carried out using 1kg weight and for the next 2 weeks exercises were carried out by using 1.5kg weight. Patients were instructed to do each exercise Twenty five to thirty repetitions in one set and single set is done by patient in one treatment session. Patients were allowed to take break if they complain of tiredness or discomfort. For both the groups precautions like not to squat, not to sit low, and not to sit crossed leg were advised (Tiwari M et al 2015). Group-B (IECM Group) Isometric Exercise combined with Mobilization with Movement group firstly received pulse Ultrasonic therapy applied on each tender point over the affected Knee. Thereafter Mulligan's Mobilization technique was selected based upon patient's complaint. There are two techniques which

were performed: the first is the medial or lateral glide MWM depending on site of pain (medial glide with medial knee pain and lateral glide with lateral knee pain). The second mobilization technique was the "rotation" MWM: for patients with knee pain in weight bearing position rotation MWM was given. (Rotation MWM was given as medial or lateral glide did not relieve patient's pain in weight bearing position) Rule of three was followed for all the mobilization techniques that is on day 1 three repetitions were given, on day 2, six repetitions and so on day 3, nine repetitions were given (Kulkarni AV, Kamat MM 2017). At last multiple angle isometrics was given. Each subject was asked to do general body warm up for 5 minutes i.e, easy stationary cycling followed by a 5 min rest interval. Resistance was applied at 20,40,60,90 degrees of knee flexion training angle. The contraction time was hold for 10 secs with 10 secs relaxation. The exercise started with 2 sets with 10 repetitions in initial 2 weeks and progressed to 3 sets with 10 repetitions hold for 10 secs with 10 secs relaxation in further 2 weeks (Neha Suri et al 2016).

Data collection: Data collection of all variables was done on day 1, at end of 2nd week and at the end of 4th week. VAS scale was used for measurement of pain, 20 meter walk test was used for measurement of walking speed, Berge balance scale (BBS) was used for measurement balance and Time up & Go test (TUG) was used for measurement mobility.

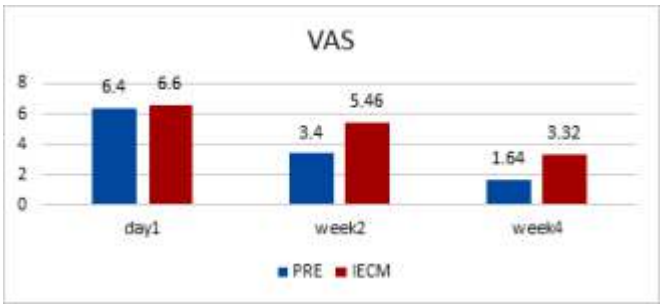
Statistical Analysis: Variables of all the subjects were analyzed on day 1 before the start of therapy, at the end of 2nd week and at the end of 4th week i.e end of therapy. Comparison between the two groups was done on Paired T test. SPSS statistical software was used for data analysis.

Result : In this study Paired t- test was used for all the four variables, namely VAS, 20 meter walk test, Berge balance scale (BBS) and Time up & Go test (TUG) . The variables with respect to the subjects recorded were clearly insignificant at Day 1 (pre treatment session) when compared against each other namely Progressive resistance exercises group (PRE) or the Isometric exercises combined with mobilization group (IECM).

VAS

Intergroup Analysis of VAS Score: On Day 1 (pre treatment session) , the mean of VAS score of PRE Group was 6.40 & mean of VAS score of IECM Group was 6.60. The p–value of the difference between the two by paired t-test was found to be 0.327 which is not statistically significant. At the end of Week 2, the mean of VAS score reduced in both the groups. In PRE Group it reduced to 3.40 and in IECM Group it reduced to 4.56. P value of the difference between the two by paired t-test' was found to be 0.000 which is highly significant.

At the end of Week 4, the mean of VAS score reduced in both the groups. In PRE Group, it reduced to 1.64 and in IECM Group it reduced to 3.32. P value of the difference between the two by un-paired t-test' test was found to be 0.000 which is highly significant. This comparative analysis is demonstrated in Graph-1.

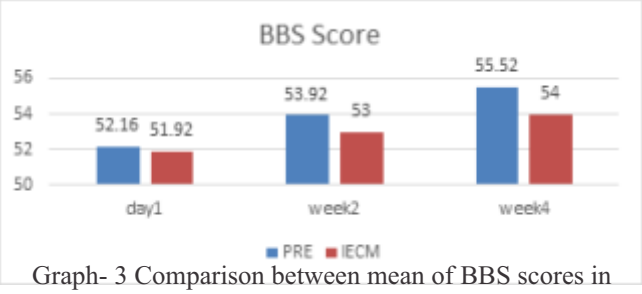


Graph- 1 Comparison between mean of VAS scores in PRE group and IECM group.

BBS (Berge balance scale)

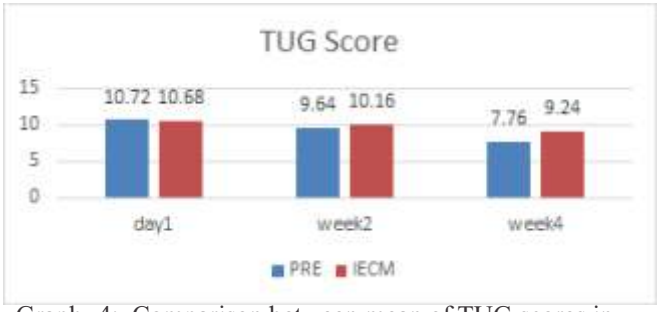
Intergroup Analysis of Berge balance scale (BBS) Score: On Day 1 (pre treatment session) , the mean of BBS score of PRE Group was 52.16 & mean of BBS score of IECM Group was 51.92. The p–value of the difference between the two by paired t-test was found to be 0.056 which is not statistically significant. At the end of Week 2, the mean of BBS score reduced in both the groups. In PRE Group it reduced to 53.92 and in IECM Group it reduced to

53.00. P value of the difference between the two by paired t-test' was found to be 0.000 which is highly significant. At the end of Week 4, the mean of BBS score reduced in both the groups. In PRE Group, it reduced to 55.52 and in IECM Group it reduced to 54.00. P value of the difference between the two by un-paired t-test' test was found to be 0.000 which is highly significant. This comparative analysis is demonstrated in Graph-3



Graph- 3 Comparison between mean of BBS scores in PRE group and IECM group.TUG (Time Up & Go test)

Intergroup Analysis of Time Up & Go test (TUG) Score: On Day 1 (pre treatment session) , the mean of TUG score of PRE Group was 10.72 & mean of TUG score of IECM Group was 10.68. The p–value of the difference between the two by paired t-test was found to be 0.770 which is not statistically significant. At the end of Week 2, the mean of TUG score reduced in both the groups. In PRE Group it reduced to 9.64 and in IECM Group it reduced to 10.16. P value of the difference between the two by paired t-test' was found to be 0.001which is highly significant. At the end of Week 4, the mean of TUG score reduced in both the groups. In PRE Group, it reduced to 7.76 and in IECM Group it reduced to 9.24. P value of the difference between the two by un-paired t-test' test was found to be 0.000 which is highly significant. This comparative analysis is demonstrated in Graph-4



Graph- 4: Comparison between mean of TUG scores in PRE group and IECM group.

Discussion: Traditionally, PRE has been used by young adults who are healthy to improve athletic performance. Also study of P. Maietta Latessa et al. 2007 showed that isotonic training improves functional performance. The fact explained by Moritani & DeVries et al., according to which this increase in quadriceps strength which is evidenced in the first few weeks of resistance training is more associated with neural adaptations which encompass the development of more efficient neural pathways along the route to the muscle. The motor unit (motor nerve fibre and the muscle fibres it innervates) recruitment is central to the early (2 to 8 weeks) gains in strength. Also there are many reasons and explanation, which can be attributed to the facts that isometric training is not as good as isotonic training in increasing functional performance. According to Sagir G Bera et al. isometric exercises can significantly increase the tension of the muscle, thus the person can achieve maximum muscular contractions by performing isometric exercises in contrast to regular isotonic weight training. In addition to gains in muscle strength, isometric exercises can also lead to increase in muscle mass and improvements in bone strength. But the disadvantages are that it is performed in specific angle in a static position, so furthermore, person may experience decrease in speed and functional performance in contrast with the dynamic movements performed in dynamic training which is more functional isometric training can do so, but it improves muscle performance only at the joint angle at which the training takes place in that particular functional range. This specificity of training principle may limit how much isometric training can affect performance of functional tasks beyond the joint angle prescribed in the isometric training.

MWM relocates joint in correct alignment therefore immediate pain relief occurs. This explains hypothetical mechanism for first successful Mulligan MWM but this pain relief cannot last for long term (Bill Vicenzino et al 2007)..

The decision to choose weight training to reduce pain and improving function was supported by Chamberlain (1982). Sibel eyigor 2003 did study on isokinetic against PRE in OA knee patients and found that both programs are equally effective in decreasing pain and improvement in function (walking time) and no statistically significant differences could be found in two groups. The PRE program, as it is cheaper, more easily performed and efficient, may be preferable for the treatment of knee OA which is again supporting our decision to choose PRE as treatment program in our study.

Conclusion: Result of this study shows that Progressive resistance exercises (PRE) are more effective than Isometric Exercise combined with Mobilization with Movement (IECM) in terms of pain relief, improvement in walking speed and achieving balance and mobility in patients with OA Knee.

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Combined Effect of End Range Mobilization and Mobilization with Movement Techniques on Pain and Range of motion in non diabetic frozen Shoulder

Sanjay

Abstract: Purpose of Study : To find out the combined effect of Maitland end range mobilization (ERM) and Mulligan's mobilization with movement (MWM) on pain and Range of Motion in patients with non diabetic frozen shoulder. Methodology: Forty subjects both male & female with age range between 40-60 years with a diagnosis of non diabetic Frozen Shoulder were selected directly from Hay's memorial Hospital & Dept. of Physiotherapy, SHUATS, Prayagraj. These individuals were randomly assigned into two groups: Group A [combined MWM + ERM group (n = 30)] and Group-B [MWM group (n = 30)]. Both the groups were firstly received hydrocolltar pack for 15 minutes and I.F.T. quadripolar mode for 20 minutes after that Exercises were given supervised by a Physiotherapist on regular basis for four weeks. In Group A (combined MWM + ERM technique). Mobilization with movement (MWM) was given by manual application of sustained glide of two types. Firstly Posterior Glide of GH joint with Shoulder Abduction- 10 Glides of 3 sets in one session with 1 minute rest in between sets then Postero- lateral Glide of GH joint with Shoulder Internal Rotation- 10 Glides of 3 sets in one session with 1 minute rest in between sets was given. Thereafter End range mobilization (ERM) given which involves 10 to 15 repetitions of Maitland 4th grade mobilization in end-range position. In Group B (MWM technique) Subjects were received only Mulligan's Mobilization with Movement at GH joint same as describe above. Data collection: Data collection of all variables was done on day 1, at end of 2nd week and at the end of 4th week.VAS scale was used for measurement of pain, Goniometer was used for measurement of joint Range of Motion (ROM) of Shoulder. Result & conclusion: The results of this study show that combined MWM + ERM technique is more effective in reduction of pain and achievement of ROM in treating frozen shoulder as compared to Mulligan's MWM technique.

Key words: MWM (Mulligan Mobilization with movement), ERM (End Range Mobilization), VAS (Visual Analogue scale), ROM (Range of Motion)

INTRODUCTION:

Frozen shoulder, or adhesive capsulitis, was defined by Reeves, as a condition of uncertain etiology characterized by "the spontaneous onset of pain with significant restriction of both active and passive range of movement of the shoulder" (Reeves B 1975). Frozen shoulder can be a primary or idiopathic problem or it may secondarily be associated with another systemic illness. Both primary and secondary frozen shoulders have similar clinical presentations but distinct precipitating factors (Stam H 1994). Although the pathogenesis of frozen shoulder syndrome is unknown, several authors (Cyriax J 1978, Mao C et 1997, Vermeulen HM et al 2006 & 2002) have proposed that impaired shoulder movements are related to shoulder capsule adhesions, contracted soft tissues, and adherent axillary recess.

Frozen shoulder affects 2-5% of the general adult population (Neer et al., 1989) and 10-20% of people with diabetes (Kevin et al., 1997). Incidence is slightly higher in women than in men and is somewhat more common in the non dominant arm (Dan et al., 1987). This condition most frequently affects persons aged 40-60 years (Uitvlugt et al., 1993). Pathogenesis of adhesive capsulitis is unclear

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but there are synovial inflammations with subsequent reactive capsular fibrosis.

To regain the normal extensibility of the shoulder capsule, passive stretching of the shoulder capsule in all planes of motion by means of end-range mobilization techniques (EMTs) has been recommended but data to support the use of these treatments are lacking (Yang et al, 2007). Vermulen et al (2000) showed effective result of End Range Mobilization after 3 months of treatment. There are an increasing number of reports that showed clinically beneficial effects of Mulligan's mobilization-with-movement (MWM) treatment technique (Mulligan, 2000). The most frequent reported effect is that of an immediate and substantial pain reduction accompanied by improved function. Mulligan showed effective results in patients treated with frozen shoulder (Mulligan, 1992). Therefore the purpose of the study was to find out the combined effect of end range mobilization and mobilization with movement on pain and Range of Motion in patients with non diabetic frozen shoulder.

Material & Methods: Evaluation of the study subjects: All 40 patients both male & female with age range between 40 to 60 years who were diagnosed with Frozen Shoulder were referred to Department of Physiotherapy Jaipur Physiotherapy College, Maharaj Vinayak global University, Jaipur, underwent a detailed clinical examination regarding the range of motion of shoulder and severity of pain on Visual Analog Scale (VAS). These patients were assigned two groups, A and B, based on computer generated random numbers.

Inclusion Criteria: Presence of painful stiff shoulder for at least 3 months and limited ROM of shoulder defined as 25% or greater restriction as compared with non-involved shoulder in any two of these motions (Flexion, Abduction, or Medial/Lateral Rotation).

Exclusion Criteria: Presence of inflammatory arthropathy involving shoulder, Diabetes mellitus, any surgical intervention or fracture of affected shoulder, Neuromuscular Disease, intra articular injection in last 3 months or current corticosteroid therapy, pregnancy, diagnosis of cancer within twelve months or any contraindication to exercise.

Procedure: Group A (combined MWM + ERM group) received hydrocollator pack, I.F.T, Mobilization with movement and End range mobilization technique. The patient's ROM in all directions was checked before the start of each session. Mobilization with movement (MWM) was given by manual application of sustained glide of two types. Firstly Posterior Glide of GH joint with Shoulder Abduction- 10 Glides of 3 sets in one session with 1 minute rest in between sets then Postero- lateral Glide of GH joint with Shoulder Internal Rotation- 10 Glides of 3 sets in one session with 1 minute rest in between sets was given (Mulligan, B. 1992).

End range mobilization (ERM) involves 10 to 15 repetitions of Maitland 4th grade mobilization were given in end-range position; the direction of mobilization was altered by varying the plane of elevation or by varying the degree of rotation (Maitland, G.D 1977).

Group-B (MWM Group) received hydrocollator pack, I.F.T and Mobilization with movement. Mobilization with movement (MWM) was given by manual application of sustained glide of two types. Firstly Posterior Glide of GH joint with Shoulder Abduction- 10 Glides of 3 sets in one session with 1 minute rest in between sets then Postero- lateral Glide of GH joint with Shoulder Internal Rotation- 10 Glides of 3 sets in one session with 1 minute rest in between sets was given (Mulligan, B. 1992). . Exercise was given for 4weeks. Both groups were given exercises in the form of Codmen's Pendulum Exercises, Finger Ladder and AROM exercises 10 repetition of each movement supervised by a Physiotherapist on regular basis for four weeks.

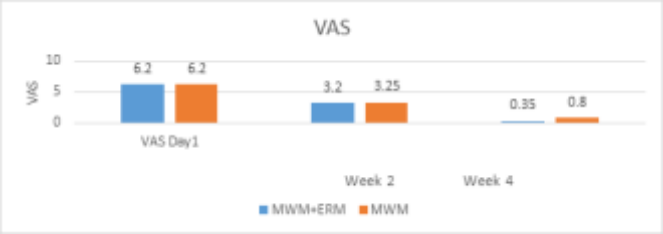
Outcome measures: VAS is a 10cm scale with ten divisions at a distance of one centimeter, 0 being no pain; 10 being the worst pain. Scale values are then obtained by measuring the distance from zero to that mark.VAS provides a reliable method for measuring pain and is sufficiently sensitive to detect distinct differences in pain experience. Goniometer has been proven to be a reliable and valid measure of shoulder movement and henceforth we used it to have a reliable measurement of ROM.

Statistical Analysis: Variables of all the subjects were analyzed on day 1 before the start of therapy, at the end of 2nd week and at the end of 4th week i.e end of therapy. Comparison between the two groups was done on Paired T test. SPSS statistical software was used for data analysis.

Results:

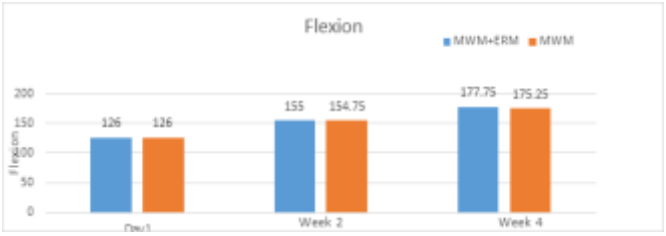
All two variables with respect to the subjects recorded were clearly insignificant at Day 1 (pre treatment session) when compared against each other namely combined Mobilization with Movement & End range Mobilization group (MWM+ ERM group) or Mobilization with Movement group (MWM group).

Intergroup Analysis of VAS score: On Day 1 (pre treatment session) , the mean of VAS score of Combined MWM + ERM Group was 6.20 & mean of VAS score of MWM Group was 6.20. The p–value of the difference between the two by un-paired t-test' test was found to be 1.00 which is not statistically significant. At the end of Week 2nd, the mean of VAS score reduced in both the groups. In Combined MWM + ERM Group it reduced to 3.20 and in MWM Group it reduced to 3.25. P value of the difference between the two by un-paired t-test' test was found to be 0.804 which is significant. At the end of Week 4th, the mean of VAS score reduced in both the groups. In Combined MWM + ERM Group it reduced to 0.35 and in MWM Group it reduced to 0.80. P value of the difference between the two by un-paired t-test' test was found to be 0.016 which is highly significant. This comparative analysis is demonstrated in Graph-1.



Graph1. - Comparison between mean of VAS scores in MWM + ERM group and MWM group.

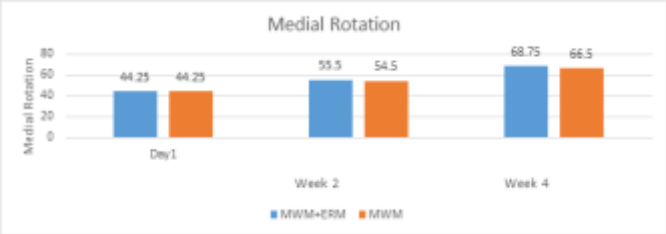
Intergroup Analysis of Flexion ROM score: On Day 1 (pre treatment session) , the mean of Flexion ROM score of Combined MWM + ERM Group was 126 & mean of Flexion ROM score of MWM Group was 126. The p–value of the difference between the two by un-paired t-test' test was found to be 1.00 which is not statistically significant. At the end of Week 2nd, the mean of Flexion ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 155 and in MWM Group it increased to 154.75. P value of the difference between the two by un-paired t-test' test was found to be 0.867 which is significant. At the end of Week 4th, the mean of Flexion ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 177.75 and in MWM Group it increased to 175.25. P value of the difference between the two by un-paired t-test' test was found to be 0.047 which is highly significant. This comparative analysis is demonstrated in Graph-2.



Graph 2. - Comparison between mean of Flexion ROM scores in MWM + ERM group and MWM group.

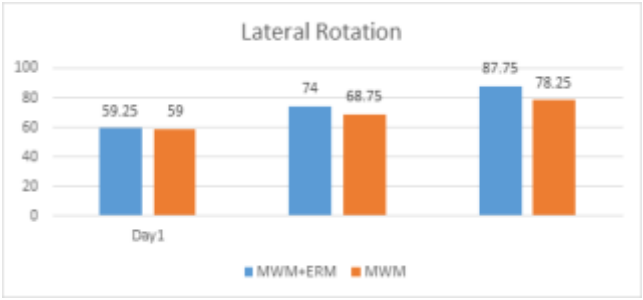
Intergroup Analysis of Medial Rotation ROM score: On Day 1 (pre treatment session) , the mean of Flexion ROM score of Combined MWM + ERM Group was 44.25 & mean of Medial Rotation ROM

score of MWM Group was 44.25. The p–value of the difference between the two by un-paired t-test' test was found to be 1.00 which is not statistically significant. At the end of Week 2nd, the mean of Medial Rotation ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 55.50 and in MWM Group it increased to 54.50. P value of the difference between the two by un-paired t-test' test was found to be 0.359 which is significant. At the end of Week 4th, the mean of Medial Rotation ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 68.75and in MWM Group it increased to 66.50. P value of the difference between the two by un-paired t-test' test was found to be 0.025 which is highly significant. This comparative analysis is demonstrated in Graph-3.



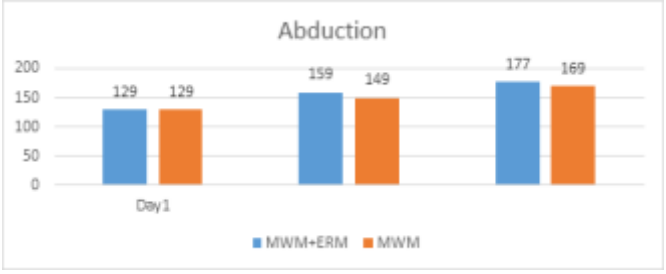
Graph 3. - Comparison between mean of Medial rotataion ROM score in MWM + ERM group and MWM group.

Intergroup Analysis of Lateral Rotation ROM score: On Day 1 (pre treatment session) , the mean of Lateral Rotation ROM score of Combined MWM + ERM Group was 59.25 & mean of Lateral Rotation ROM score of MWM Group was 59.00. The p–value of the difference between the two by un-paired t-test' test was found to be 0.863 which is not statistically significant. At the end of Week 2nd, the mean of Lateral Rotation ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 74 and in MWM Group it increased to 68.75. P value of the difference between the two by un-paired t-test' test was found to be 0.003 which is significant. At the end of Week 4th, the mean of Lateral Rotation ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 87.75 and in MWM Group it increased to 78.25. P value of the difference between the two by un-paired t-test' test was found to be 0.00 which is highly significant. This comparative analysis is demonstrated in Graph-4.



Graph 4. - Comparison between mean of Lateral rotation ROM score in MWM + ERM group and MWM group.

Intergroup Analysis of Abduction ROM score: On Day 1 (pre treatment session) , the mean of Abduction ROM score of Combined MWM + ERM Group was 129 & mean of Abduction ROM score of MWM Group was 129. The p–value of the difference between the two by un-paired t-test' test was found to be 1.00 which is not statistically significant.At the end of Week 2nd, the mean of Abduction ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 159 and in MWM Group it increased to 149. P value of the difference between the two by un-paired t-test' test was found to be 0.00 which is significant.At the end of Week 4th, the mean of Abduction ROM score increased in both the groups. In Combined MWM + ERM Group it increased to 177 and in MWM Group it increased to 169. P value of the difference between the two by un-paired t-test' test was found to be 0.00 which is highly significant. This comparative analysis is demonstrated in Graph-5.



Graph 5. - Comparison between mean of Abduction ROM score in MWM + ERM group and MWM group.

Discussion: The results of the present study suggest that subjects in these two groups had shown significant improvements in the flexion, abduction, Medial & Lateral rotation ranges of motion respectively and there is decrease in pain level as measured by VAS. However, comparison between two groups, reveal that there is less improvement in Mulligan mobilization with movement (MWM) group as compare to combined MWM+ERM group in terms of range of motion and shoulder pain level.

The mechanical stimulation associated with mobilization is believed to induce pain relief by a direct stimulation of the dorsolateral periaqueductal grey (dPAG) region of the brain; which gives off descending pathways that influence inhibitory interneurons at the spinal level Vicenzino B et al 2001 & Skyba D a et al 2003). It also, indirectly alleviates pain by improving synovial fluid circulation and washing out of pain metabolites (Maitland GD 1983). However, the superior effect of Mulligan technique could be attributed to correction of positional faults and restoration of joint arthrokinematics, which in turn permits pain free motion. Furthermore, the active participatory nature of this technique stimulates proprioceptors and inhibits pain (Kachingwe AF et al 2008).

One study was done by Jeyakumar, et al (2018) to evaluate effectiveness of the two manual techniques, i.e. Mulligan (MWM) and Maitland mobilization technique along with hot pack application and exercises on the adhesive capsulitis of the shoulder joint. When the responses were compared between the groups, the result showed significant difference at 4 weeks of intervention, which means that Maitland is better than Mulligan in relieving the pain.

Lin et al (2008) had found the reduction in GH joint stiffness and increase in passive abduction range of motion, immediately after End-range mobilization of the shoulder joint that is consistent with the findings obtained in the present stud. The use of intensive mobilization techniques may help to decrease the risk of further stiffness or joint contracture progression in patients with adhesive capsulitis.

The findings obtained by Teys et al (2008) using the Mulligan's mobilization with movement(MWM) in the plane of scapula in the restricted shoulder results in significant improved ROM and Pressure pain threshold (PPT) are consistent with the findings obtained in the present study.

Vicenzino et al (2007) reports espousing clinically beneficial effects of Mulligan's mobilization-with-movement (MWM) treatment techniques by substantial pain reduction accompanied by improved function in shoulder disorders by reducing positional faults at joints. The evidence from the pain science studies that have attempted to characterize the hypoalgesic effect has indicated that it may be non-opoid in nature as well as exhibiting features that are complex and widely distributed to other systems, such as the motor and sympathetic nervous systems.

Kachingwe et al (2008) found, there was significant increase in active ROM and decrease in pain, in patients with Shoulder dysfunction by using MWM techniques as described by Mulligan (1999).

In the study done by Goyal et al. (2013) it was found that, both End range mobilization and Movement with mobilization techniques increases both active and passive ROM and reduces disability significantly in 20 Frozen shoulder patients after 3 weeks intervention, but the more statistical significant result was found with combined intervention of ERM and MWM techniques in both active and passive ROM and SPADI scores in 10 frozen shoulder patients after 3 weeks intervention.

Conclusion: It was concluded that the combination manual therapy (ERM+MWM) should be incorporated in the treatment protocol of frozen shoulder patients to achieve pain reduction & better gain in the ROM.

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Effect of single session of kinesthetic imagery session to improve throwing distance in recreational sports athletes

Ketul Parmar *, Maneesh Arora**

Objectives: To investigate the acute effects of kinesthetic motor imagery technique after the session for 30 seconds in the recreational sports athletes, to check this effect in throwing distance.

Design: Experimental

Setting: On filed sports ground setting

Participants: 52 recreational sports athletes (18-25 years) who were taking part in the sports for 3 to 4 times weekly. Participants selected according to inclusion and exclusion criteria belonging to the target residents available.

Main Outcome Measures: Throwing distance. Participants have to throw the shot-put (weight= 6 kg) from a starting line.

Results: All the statistical analysis was performed using IBM-statistical package version (SPSS 20). On comparing pre technique results to post technique results with paired T-test there was a significant difference found at 0.01 significance level in the experimental group. But there is no significant difference found in the control group.

Conclusion: The conclusion for the study concluded that the kinesthetic motor imagery technique improves the relevance of the kinesthetic cues within the recreational sports athletes.

Keywords: Acute effects, Imagery technique, Shot put performance

INTRODUCTION

Imagery is a very popular technique being used by practitioners in motor control systems & sports psychology.1 The author also proposed that imagery is a dominant tool in skilled performance via forming & reinforcing neural networks. Imagery can help to improve learning, self-efficacy and sports performance in the athletes.2

The definition of imagery is to use of own senses to create or recreate of experience or visual image in the memory that gives a feeling of reality as seeing the image with a person's own eyes.3 Study shows national athletes are more beneficial regarding imagery comparing to recreational athletes. Even national athletes are using imagery in their daily practice week.4 There are various studies that support the imagery technique used for different types of purposes. Imagery is a technique that is thought to assist in pain management, to reduce tension & to reduce anxiety.2 Author suggested imagery technique can be used as a psychological rehabilitation tool even gives beneficial results in Anterior cruciate ligament reconstruction. Imagery included in the psychological tool for the athletic training program.5

Different types of imagery are used by individuals like Visual, auditory and Kinesthetic. Visual & Kinesthetic imagery techniques are mostly used. Variety of published literature available for using these two techniques. In sports, motor imagery is a technique in which the player has to visualize the movement, the player is not allowed to do any type of body movements.6 Studies shown outcomes of motor imagery to improve strength & strength within resistance training programs.6,7 Motor imagery shown an effect on the excitability of the spinal segment.8 Motor imagery activates the same areas in the brain which activates in actual motor

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preparation & physical execution but in conjugation with reduced intensity.9

The pieces of evidence have shown activation of premotor, parietal and primary motor cortex during the use of motor imagery.10 Activation of subcortical regions such as cerebellum & basalganglia seen during use of motor imagery.11,12 During the use of motor imagery effector specific facilitation of corticospinal pathways is seen at the peripheral level.13 Low threshold muscle activity also seen while using motor imagery.14 Functional magnetic resonance imaging studies shown that pixels activated during muscle contraction are also shown activation of muscles used during imagery of that particular movement.15 There is one published meta-analysis on the neural correlation of action summarized data collection from experiments examining motor imagery included 303 experiments and 4902 participants.16

Lesions in the parietal lobes may have impairment in the use of motor imagery.17 Lesions with left prefrontal lesions & with patients with parietal lesions are not able to imagine a movement.9 Person who has disorders of basal ganglia have difficulty to imagine movement.18 The study found that by use of motor imagery toe abduction could be learned but only for subjects who are known that task to perform at a minimal level.19 For novel subjects it is not possible to start a new emulation cycle, because in novel subjects there is no representation of action exists. There is no particular timing to use motor imagery it can be used at any time of the day.20

Kinesthetic imagery technique might be defined as an imagery international training that requires the sensory stimuli of how the subject can execute an action, involving the effort & force which are needed during the whole movement.21 Kinesthetic imagery capacity of one person is the capability to sense their own body parts and imagine how a full movement experiences during that task.22 The kinesthetic motor imagery technique covers attention to simulating the proprioceptive and sensorimotor sensations that happen during actual action execution.23 The involvement of the inferior parietal lobule, supplementary motor area, Broadman's area no 9, area no 24, area no 44, basal ganglia & cerebellum seen in finger movements during kinesthetic motor imagery.24

In kinesthetic imagery technique person have to "feel" the whole movement.25 Person should mentally perceive muscle contractions. In comparison, between kinesthetic imagery and visual imagery; participants using kinesthetic imagery techniques were more stable.25 The practical guidelines with explanation & planning to use imagery were given in the PETTLEP model.26 Thus, reviewing all these I hypothesized that a single session of kinesthetic imagery helps to improve throwing distance in recreational athletes. So, the aim of the study was to try to find the effect in throwing distance following a single session of kinesthetic imagery technique in the recreational athletes.

Research design: Experimental

Research settings:

The research was carried out at following places,

1. Sports ground of Department of Physiotherapy of Sardar Bhagwan Singh University, Balawala, Dehradun
2. Maharana Pratap Sports College, Raipur, Dehradun

Target population: 400 male recreational athletes

Study population: Participants selected according to inclusion and exclusion criteria belonging to the target residents available. Recreational athletes took part in the research study. Participants who were residing in Banda Bahadur Boys hostel, Balawala, Dehradun and Maharana Pratap Sports College, Raipur, Dehradun were included in the study

Sample Size selection: A sample size of 52 was taken Among the target people 60 subjects were choose for the research study. To figure out sample

size 3 subjects were taken for the pilot-trail study. According to sample size power estimation 52 samples were taken for the study. (26 for each group) 5 subjects were kept as substitutes in case of drop outs in the study. Sample size estimation predicted with the use of SPSS Statistical version 2020 software. Study Significance level 0.01 is taken.

Sampling criteria: Lottery method was used for sampling criteria. Each subject's name was written in small chits. Then examiner took out the one-by-one chit and according to that one- by-one subject were allocated to following groups: 1) Experimental category group 2) Control category group.

Selection criteria

Inclusion criteria

1. Males who participate in sports 3-4 times/ week
2. Males between ages 18-24 years.
3. Kinesthetic component score on Movement imagery questionnaire (MIQ-3) score $\geqslant 6$

Exclusion criteria

1. Any shoulder or Back injury
2. Subjects who are doing any training which enhances throwing ability
3. Subjects who have any type of problem in throwing
4. Subjects who are taking any mental training
5. History of any musculoskeletal, cardiovascular and neurological injury

Instruments used

1. Measuring tape
2. 6 kg shot put ball

Reliability-Validity: Measuring tape- Measuring tape is universally accepted instrument and quite reliable for measuring the distances. Movement imagery questionnaire (MIQ-3) Scale is used to check kinesthetic component of imagination in participants. The questionnaire has test- retest reliability of r = 0.83 for period of 1 week and internal consistency of r = 0.91 for the kinesthetic scale.

PROCEDURE

This study was approved by Sardar Bhagwan Singh University Institutional Ethics Committee. After obtaining approval recreational sports players were approached. They were collected in groups and explained about the study. Those who were willing to participate and who are fulfilling inclusion and exclusion criteria were recruited for the study. A written Informed consent form was obtained from them according to the statements of the Declaration of Helsinki (2013). As all were more than 18 years old, no parental/guardian consent was needed.

The study was performed on 52 subjects with mean age of 18-25 who were recreational athletes. Before the experiment, each participant of the experimental group has to answer the questions to check the capacity to participating for imagination. For that author used a version of the movement imagery questionnaire (MIQ-3) which is made up of 4 movements that examine the individual capacity of kinesthetic tasks. An average score $\geqslant$ of 6 was taken as baseline criteria for inclusion in both groups.

PROTOCOL

52 Subjects selected on basis of imagery questionnaire score and inclusion & exclusion criteria

↓

6 Kilogram weighted shot put was given to subjects

↓

Ask subjects to throw shot put for 3 times and best out of three distances was recorded
Kinesthetic imagery technique was given for 30 seconds

↓

Post intervention again asked subject to throw shot put 3 times

↓

Distance was recoded and Data Analyzed

Afterward, a short-put ball of 6 kg was given to the subjects to throw it. Subjects have to throw the short-put in standing position only they are not allowed to use their traditional throwing method. The distance was measured with the use of measuring tape & recorded. A single session of kinesthetic imagery session for 30 seconds was given to the subjects. Immediately after the application of the kinesthetic imagery technique again shot-put ball was given to the subject to throw. A new distance is measured and recorded. All the data was collected at the same time of the day and the same place to prevent the environmental context bias in the study.

Imagery script for the experiment is as follows: "Try to imagine yourself performing the whole action with your eyes close as I say Start. You have to feel the whole movement of shot-put execution. You have to feel your joint actions and try to feel the weight of the shot put in your hand. Then try to feel you are taking your position of a throw like bending elbow, taking a stance, etc. Then try to feel you are throwing shot put far ahead from the distance where you put in the last trial. You have to think you crossed your last trial distance barrier. Try to concentrate for 30 seconds. Stop thinking when I command stop"

For the control group, short-put ball was given & ask them to throw it. Then distance was recorded after throw. A reading task or simple mathematical calculation for a time period of 30 seconds was given. After that throwing distance was measured again.

There is no rest given after imagery technique intervention. Subjects have to throw shot put immediately. The total time for all procedures is around 4-5 minutes for each participant. No information about the purpose of the study was given to the participants until after they completed the experiment for a single blinding purpose.

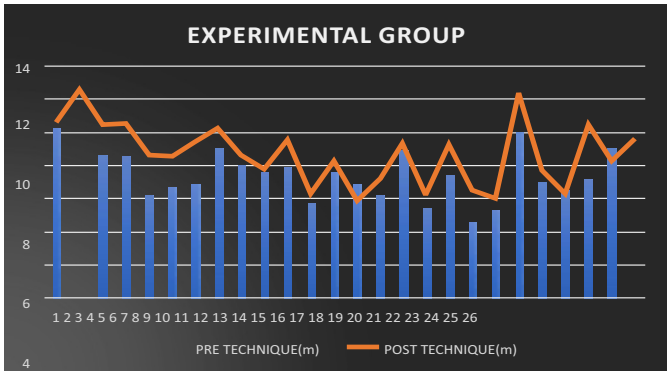
STASTISICALANALYSIS

All the statistical analysis was performed using IBM-statistical package for social sciences (SPSS), version (SPSS 20), descriptive statistics including mean, standard deviations and standard error were computed for all variables.

TABLE 1.1: Comparing the results between pre technique results and post technique results in the experimental group.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRE vs POST	-1.2592	1.18715	.23282	-1.73912	-.78012	-5.410	25	.000

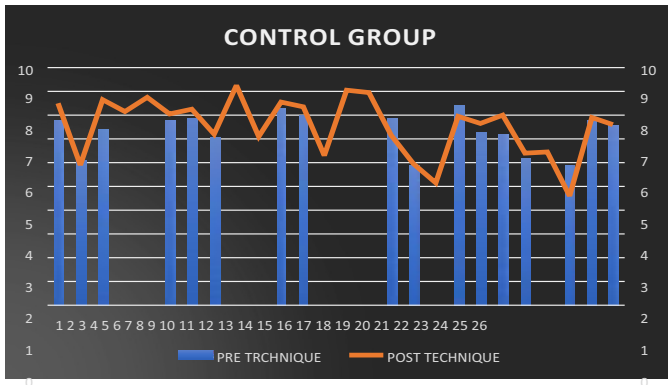


Graph 1.1: Graph 1.1 showing of pre- and post-values of throwing distance.

TABLE 2.1: Comparing the results between pre technique results and post technique results in the control group.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
PRE - POST	-.12192	.49978	.09801	-.32379	.07994	-1.244	25	.225



Graph 2.1: Graph 2.1 showing of pre- and post-values of throwing distance in control group.

TABLE 3.1: Comparing the results between pre technique results of experimental group and pre technique results in the control group.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PRE VS PRE	Equal variances assumed	2.006	.163	.124	50	.901	.04462	.35854	-.67553	.76476
	Equal variances not assumed			.124	46.210	.902	.04462	.35854	-.67700	.76623

The p value is > 0.1, accepts Ho. This means variance are not significant different So, we can assume that they are equal. Baseline characteristics of study can be equal.

TABLE 4.1: Comparing the results between pre technique results of experimental group and pre technique results in the control group.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Post vs Post	Equal variances assumed	4.032	.050	2.660	50	.010	1.18231	.44444	.28962	2.07500
	Equal variances not assumed			2.660	43.319	.011	1.18231	.44444	.28620	2.07842

The p value is near to 0.1, rejects Ho. This means variance are significant different.

The p value is near to 0.1, rejects Ho. This means variance are significant different. So, we cannot assume that they are equal

RESULTS

1) On comparing pre technique results to post technique results with paired T-test there was significant difference found at 0.01 significance level in experimental group. (Table 1.1)
2) On comparing pre technique results to post technique results with paired T-test there was no significant difference found within control category group. (Table 2.1)
3) After comparison of pre technique results of experimental category group and pre technique results of control group there was significance found. This concluded that baselines criteria for the both categories were same. (Table 3.1)
4) After comparison of post technique results of experimental category group and post technique results of control group there was no significance found. This concluded that intervention technique is more successful comparing to control category group in (Table 4.1)

DISCSUSSION

The primary aim of this study is to investigate the effect of a single session of kinesthetic imagery technique to improve throwing distance in recreational sports athletes. There is less literature that I found the acute results of the kinesthetic imagery technique could improve sports specific task and mainly in the field of throwing distance. The throwing task involved in the study is primarily the quantitative task. Throwing distance is measured as an outcome measure in the study which shows significant improvement after kinesthetic imagery session. To best our knowledge this is the first study to investigate the single session of kinesthetic imagery technique to improve sports specific performance.

Although the effect was in small magnitude it could be of great importance in sports like shot put where a small margin of throwing distance creates greater impact in winning the competition. Small distance in centimeters of throwing distance plays very dominant role in this game.

The result from the previous data collection offers support to the primary aim of this study, a single session of kinesthetic imagery intervention helps to improve throwing distance in recreational sports players. The results of this study offer support to the studywhich found the acute effect of imagery technique to improve basketball throwing performance.27

This study investigates the kinesthetic imagery task

involved in 2 components: (1) kinesthetic motor imagery performance of the sports-specific task (2) Imagine about outcome goals in positive way. The study moreover included a successful imagery depiction of all the consequences of performance outcome for example "setting a new personal best outcome" 28

In this study intervention technique of kinesthetic imagery technique was given for a short- term period of 30 seconds to check short-term effects. In this study kinesthetic imagery technique was used in the acute manner i.e., effect was checked immediately after the intervention in contrast with the other published studies where chronic use of motor imagery was investigated.29,30

The short-term effects of kinesthetic imagery technique indicated by the results are interesting. Continuing the activity for the medium and long term make the intervention technique ineffective and reduce the acute effect of the strategy.27 This study supports the study which brings the evidence short term imagery training session significantly improves plantar maximal force and rate of force development.31

Scientific reasoning for strength and flexibility behind the improvement for using kinesthetic imagery technique was supported by a vast literature. There are studies which support the concept of improvement in strength and flexibility after the session of kinesthetic imagery session. Strength gain is present due to cortical command and an increase of resting spinal excitability.

[9]One study found similar results to this study that training involving internal motor imagery of strong muscle contractions show significant improvement in voluntary muscle strength.32 The previous research proved that strength gain after motor imagery could be existing because of neural adaptations but there is no role of muscular changes for the gain.33,34 So, I can assume that there are chances of improvements in the flexibility and strength as throwing distance was increased after the experimental technique. These gains for this area are more correlated to the psychological effects rather than to complete physiologicaladaptations. These gains are present due to greater cortex identification and motor units' activation in a higher manner.

Overall imagery techniques may help to improve the presentation of individuals after enhancing intrinsic motivation and personal self-confidence in conjugation regulating the anxiety related to a competitive sport.4 So, this study hypothesized that imagery technique impacted the participant's ability to improve motivation and self-confidence to enhance strength to a greater extent and also has effects on the technical key components to improve sports performance.

On another hand, motivational components refer to the use the goal-oriented responses in the game and arousal level management. Imagery technique plays the role of a promising tool as a training alternative to improve self-confidence and motivation to reduce physical overtraining.35

Motor imagery is very useful to serve both cognitive and motivational functions in demand for general and specific levels to improve performance. 36,37,38 Cognitive components of such motor imagery use help to improve technical skill improvement and refer to the imagery component of particular game strategies.

The effectiveness of imagery practices mostly based on performance improvements shown using different motor skills such as tennis serves, basketball free throws, golf putts, dart throws.39

The ideal approach to get the best results would be probably to subdivide participants on the basis of their imagery skill levels. The recreational athletes who were taken in this study were unaware of the technique of my interventional experiment and even they were unaware of the results. But in this study, I included the participants whose MIQ-3 score $\geqslant 6$, who were classified as good imagers.40 So I can say that they learned the technique very fast according to

my instructions and gave a positive direction to this study.

There are certain elements of limitations in this study. For example, the lack of uniformity in the participants' imagination levels. They all do not have the same imagination skills. But using the MIQ-3 questionnaire in this study gives strong support to reduce this element of limitation. Each participant was given the same instructions of imagination from the imagery script. So, we can say that they were controlled but not manipulated as done in one study.41

In this study, the experiment was done at a particular time of the day for the same duration in the same environment to prevent conflicts of the environment to study. Motor imagery modulated during the time of the day. The Circadian effect could be helpful to efficiently schedule motor imagery training programs.

To summarize, the results of this study suggest that the use of a single session of kinesthetic imagery technique in acute sports conditions has positive effects on sporting performance. We believe that the effects could be even beneficial if the players had been trained in using this particular technique of kinesthetic imagery technique.

Future scope: Further scope in the future of this study would-be long-term use of kinesthetic imagery practice to improve different types of sporting performance such as football, gymnastics, shooting sports, etc.

Competing interests: The authors declare that they have no competing interests

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To Compare the Effectiveness of Muscle Energy Tecnique and Soft Tissue Massage Technique for Improvment of Pain And Functional Disability on Mechanical Low Back Pain Patients

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ABSTRACT

BACKGROUND: Low back pain is ranked first as the cause of disability and the inability to work. It is found to occur at least once in a lifetime in about 90% of the world's population. Low back pain is leading cause of disability in people under 45 years of age and account for 50% of all disability claims in west. Every year 3-4% of the population is temporarily disabled and 1% of the working age population is disabled totally and permanently because of LBP. Age, gender, occupation, recurrent weight lifting, weakness of abdominal muscles, obesity, smoking, increased lumber lordosis and scoliosis are some of the known risk factors of LBP. NEED OF THE STUDY: No study has been done to find the effectiveness the muscle energy technique and soft tissue massage technique for improvement of pain and functional disability mechanical low back pain patients. There for the need of the study arises to compare the effectiveness the muscle energy technique and soft tissue massage technique for improvement of pain and functional disability mechanical low back pain patients. The need of the study was to evaluate the effect of the muscle energy techniques and soft tissue massage techniques for improvement of pain and functional disability on mechanical low back pain patients. AIMS AND OBJECTIVES: To compare the effectiveness between Muscle energy technique and soft tissue massage technique for improvement of pain and functional disability on mechanical low back pain patients. METHODOLOGY: 30 patients with diagnosed chronic mechanical low back pain was randomly be selected according to inclusion and exclusion criteria and divided into two groups Group A: muscle energy technique Group B: soft tissue massage technique. Both the groups were assessed for the pain status using visual analog scale and functional disability using oswestry low back pain disability questionnaire. These parameters were assessed before the start of the program as pre test values and at the and of 20 week as post test values. Group A received Muscle Energy Technique and Group B Soft tissue massage Technique. RESULT: The mean age of group A was 27.13 years and group B was 26.87 years. The statistical analysis correlates the study by proposing that groups taken for study either group A treated by Muscle Energy Technique and Group B Soft tissue massage Technique showed significant effect in improvement in pain and functional disability. The group A treated with Muscle Energy Technique had higher significant when compared to group B treated with Soft tissue massage Technique. The mean improvement in pain scores of VAS was 4.94 in group A and 3.6 in group B. the mean improvement in functional disability measured by oswestry LBP questionnaire was 26.73 in group A and 18.6 in group B. it was resulted that group A received Muscle Energy Technique had a superior effect over Group B received Soft tissue massage Technique. CONCLUSION: This study concluded that muscle energy technique was more effective in improvement of pain& functional disability for mechanical low back pain. KEY WORDS: VAS, MET, STM.

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INTRODUCTION

Low back pain is usually nonspecific or mechanical. Mechanical low back pain arises intrinsically from the spine, intervertebral disks, or surrounding soft tissues. Red flags include progressive motor or sensory loss, new urinary retention or overflow incontinence, history of cancer, recent invasive spinal procedure, and significant trauma relative to age. Imaging on initial presentation should be reserved for when there is suspicion for cauda equina syndrome, malignancy, fracture, or infection. Plain radiography of the lumbar spine is appropriate to assess for fracture and bony abnormality, whereas magnetic resonance imaging is better for identifying the source of neurologic or soft tissue abnormalities.(1) Low back pain is ranked first as the cause of disability and the inability to work. It is found to occur at least once in a lifetime in about 90% of the world's population. Low back pain is leading cause of disability in people under 45 years of age and account for 50% of all disability claims in west. Every year 3-4% of the population is temporarily disabled and 1% of the working age population is disabled totally and permanently because of low back pain (LBP). Age, gender, occupation, recurrent weight lifting, weakness of abdominal muscles, obesity, smoking, increased lumber lordosis and scoliosis are some of the known risk factors of LBP.(1)

There are multiple treatment modalities for mechanical low back pain, but strong evidence of benefit is often lacking. Moderate evidence supports the use of nonsteroidal anti- inflammatory drugs, opioids, in the short-term treatment of mechanical low back pain. There is little or no evidence of benefit for acetaminophen, antidepressants (except duloxetine), skeletal muscle relaxants, lidocaine patches, and transcutaneous electrical nerve stimulation in the treatment of chronic low back pain. There is strong evidence for short-term effectiveness and moderate-quality evidence for long-term effectiveness of yoga in the treatment of low back pain.(2)

Various spinal manipulative techniques (osteopathic manipulative treatment, spinal manipulative therapy) have shown mixed benefits in the acute and chronic setting. Physical therapy modalities such as the McKenzie method may decrease the recurrence of low back pain and use of health care. Educating patients on prognosis and incorporating psychosocial components of care such as identifying comorbid psychological problems and barriers to treatment are essential components of long-term management.(2)

Mechanical low back pain refers to back pain that arises intrinsically from the spine, intervertebral disks, or surrounding soft tissues. This includes lumbosacral muscle strain, disk herniation, lumbar spondylosis, spondylolisthesis, spondylolysis, vertebral compression fractures, and acute or chronic traumatic injury. Repetitive trauma and overuse are common causes of chronic mechanical low back pain, which is often secondary to workplace injury. Most patients who experience activity-limiting low back pain go on to have recurrent episodes. Chronic low back pain affects up to 23% of the population worldwide, with an estimated 24% to 80% of patients having a recurrence at one year.(2)

LBP is the most common health problem that affects work performance and quality of life. It's defined as pain, stiffness and discomfort experienced in the area lying on the posterior aspect of the body from the lower margin of the twelfth rib to the lower gluteal folds that could be referred into one or both lower limbs lasting for at least 1 day. LBP may be classified by duration as acute (pain less than 6 weeks), sub-acute (6 to 12 weeks), or chronic (more than 12 weeks) or by the underlying cause (non-mechanical or mechanical).

Mechanical low back pain (MLBP) or Unspecified is defined as low back pain not attributable to recognizable, known specific pathology. It is the leading cause of disability amongst the major musculoskeletal conditions which leads to

Impairments, Activity limitations and Participation restrictions. Therefore it becomes a psychosocial/economic burden on individuals, families, communities, industries and government. Existing literature shows globally 40% to 50% of people have LBP at some point in their lives and there exists a challenge in Africa on the best rehabilitation methods for low back pain which could prevent chronic pain and disability as evident in a literature. (2)

Musculoskeletal disorders are a comorbid condition strongly linked to LBP. A moderate association was found when considering the whole musculoskeletal chapter, a stronger association was found when considering the somatoform symptoms related to the musculoskeletal cluster. In patients with low back pain (LBP), alterations in fiber typing in Multifidus and erector spinae are assumed to be possible factors in the etiology and/or recurrence of pain symptoms as it negatively affects muscle strength and endurance. Most patients that suffer from MLBP experience pain in the lower area of the back (lumbar and sacroiliac regions) and mobility impairment. Pain can also radiate in the lower extremities, or generalized pain can be present. Patients with MLBP can also experience movement and coordination impairments. This could affect the control of voluntary movements of the patient.(2)Muscles Energy Technique(MET): The participant will be asked to lie supine on a couch with the hip at the edge and both lower limbs freely off the couch. The participant would place one of his legs over the therapist's shoulder and push up with the opposite leg into therapist's hand. A total of 4 contractions will be resisted by force equal to the participant's, held for 5sec with 5sec rest b/w each contraction. Also, restriction barrier (i.e. where movement is not possible due to impairment resulting from LBP) will be identified and the patient will be instructed to make a contraction of about 20-30% 0f maximal voluntary isometric contraction, held for 8-10secs, relaxed for 2-3secs and the limb will be moved to a new barrier. The procedure is repeated for about 4-6 times.[19] Lewit et al., (1984) in their study found that MET when applied, while the back muscles, there was a greater relief in pain, spasm, and tenderness in the affected muscle.(19)

Muscles Energy Technique as a physiotherapy procedure was found to be effective to be effective in the management of acute and subacute Mechanical Low Back Pain, however, its effectiveness in MLBP is yet to established in terms of preventing recurrence, reducing pain, improving trunk stability, Quality of Life, Functional Disabilities, activity limitation and Participation restriction associated with MLBP. The technique is classified as an active technique in which the patient voluntarily uses his muscles from a precisely controlled position in a specific direction, against a distinctly executed counterforce by the therapist.

MET may be used to lengthen a shortened or spastic muscle, to strengthen weakened muscles, to reduce localized oedema, or to mobilize restricted joint motion of the body. The function of any joint in the body which can be moved by voluntary muscle action, directly or indirectly, can be influenced by MET. Although, the physiological mechanisms underlying the therapeutic effects of MET are unclear, but may involve a variety of neurological and biomechanical mechanisms, including hypoalgesia altered proprioception, motor programming and control, and changes in tissue fluid. Therefore the purpose of this study is to determine the effectiveness of MET, its influence on the reducing level of pain perception, Stability of Spine, quality of life, functional disability, activity limitation and participation restriction of patients with the chronic MLBP.(19)

Soft Tissue Massage Technique- Massage is the manipulation of the soft tissue in body. The soft tissue massage is a generic term for any modality that used to treat the soft tissues in the body including muscle, fascia, and scar tissue. The soft tissue massage applied in the longitudinal direction

along the length of the muscle with the therapist finger tips and massage cream.The effects of massage therapy are presumably produced by more than onemechanism. It has been proposed to increase the extensibility of soft tissue including muscle, Tendon , fascia, the joint capsule and ligaments, by preventing the formation of fibrosis and adhesions. Massage therapy involves the use of biomechanical pressure exerted on deformable muscle tissue for the purpose of improving muscle extensibility and joint ROM. It is said to improve muscle-tendon unit compliance by reducing its active and passive stiffness Increased muscle-tendon unit compliance is achieved by mobilising soft tissue and elongating shortened or adhered fibrous connective tissue.

Massage therapy aims to stimulate the proprioceptive receptors of the skin and underlying tissues through touch and pressure and is believed to improve mechanical function of the musculoskeletal system. It has been proposed to increase the extensibility of soft tissue including muscle, tendon, fascia, the joint capsule and ligaments, by preventing the formation of fibrosis and adhesions. (7)

The soft tissue massage was applied in the longitudinal direction along the length of the muscle with the therapist's fingertips and massage cream. The therapists were told that the massage should be at an intensity that may produce some discomfort but that this discomfort should not extend past the cessation of the massage. The therapists were allowed to, concentrate more on one area of concern for the participant if this location was the focus of the symptoms. Finger Kneading and thumb kneading Massage: restoring mobility to supraspinous ligaments, quadretus lumborum, erector spine and glutei. (9)

Massage was directed at each of the following areas:

1. Osseous and ligamentous structure: These structures are responsible for the passive stiffness that is imparted onto the lumbar spine. Any injury to this structures involving the tissue may cause functional instability of the spine. Excessive loading to the area may cause weak muscular control, leading to the disc no longer being able to provide optimal passive stiffness or stability.
2. Thoacolumber fascia: this area provides a link between the lower and upper limb and works as a 'retinacular strap' of the muscles of the lumbar spine due to their orientation around the spine and acts as a activated proprioceptor. The thoracolumber fascia is built up of three layers anterior, middle and posterior layers.
3. Paraspinals muscle: This component consist of the lumber extensor muscles, which includes two major groups; the erector spine and local muscles such as rotators and multifidus. The erector spine muscles are primarily thoracic muscles which have long moment arms that are ideal for lumbar spine extension. The local muscles acts as position sensors for the spinal segment and work as segmental stabilisers.
4. Quadrratus Lumborum muscle: this is a large, thin, quadrangular muscle that has direct insertions to the lumbar spine and is a major stabilisers of the spine. Akuthota and Nadler state that is consist of three major components; the internal oblique, external oblique and longitudinal fascicles. The external oblique muscles acts eccentrically in lumber extension and lumbar torsion..Exercises such as isometric or eccentric trunk twists can be performed to strengthen this muscle and aid in stability and strength.
5. Hip girdle musculature: The hip girdle area has a significant role within the kinetic chain in transferring force from the lower extremities to the pelvis and spine. Studies using people with LBP have identified poor endurance and delayed firing of the hip extensor (gluteus maximus) and abductor (gluteus medius) muscles, implying that these muscles also have a role in spinal stability.

6. Diaphragm and pelvic floor muscles: the diaphragm and pelvic floor muscles play a role in spinal stability. Studies have identified that inspiration and expiration during breathing and the subsequent movement of the diaphragm has an important effect on achieving stability of the spine.

Need of the study

Low back pain remains a common disabling condition (Bogduk and Mcguirk 2002 Walker et al., 2004), with a lifetime prevalence of 60-90% and an annual incidence of 5%. No population appears immune. Up to 35% of sedentary workers and 47% of physical laborers' relate a history of low back pain. The cause of low back pain among 95% of population is mechanical and (Hollingworth et al., 2002).[9]Work-related injuries are related to lumbar spine, and more than one-third of the costs for work injury claims are due to lumbosacral spine problems.

Physical therapy plays a major role in the management of mechanical low back pain. Even though many physiotherapy interventions like exercise, modalities, bracing, massage therapy, ergonomics, and postural advises exists; there is still a need for an effective relief from mechanical low back pain.[4] Among subjects experiencing Mechanical Low back Pain, 90% have the possible recurrence of symptoms in their life due to improper follow up of Good posture, Exercises and Ergonomics. Mechanical back pain could be to any sort of back pain caused by inserting abnormal stress and strain on muscles of the backbone. Typically, mechanical pain results from dangerous habits, like poor posture, poorly designed seating, and incorrect bending and lifting motions. Mechanical low back pain (LBP) remains a vital health drawback and a serious explanation for incapacity within the operating age, and in most of the cases, there is no clear underlying pathology. There are several factors inflicting mechanical low back pain, like excessive masses to normal spinal structures. The loads transmitted to the spine are affected by posture, body mechanics, trunk strength, and also flexibility in addition to strength of the muscles of the pelvic arch and lower extremities. Exercises could be a treatment of selection of LBP that specializes in sustained posture or continual movement, which will cause marvelous improvement in pain intensity.

Muscle energy technique decreasing pain, improvement of body part quality, and return to normal functioning in daily activities. Muscle energy technique is an associate degree of osteopathic manipulation. The muscles of patients were used, on request, to type a singular controlled position, in a very specific direction, and against a distinctly executed therapist- applied counterforce. Muscle energy technique could be a post-isometric relaxation, because it reduces the tone of a muscle or cluster of muscle after a brief period following an isometric contraction. This study was designed to check the effectiveness of muscle energy technique and soft tissue massage technique in rising pain, practical incapacity, and lumbar spine quality in patients with mechanical low back pain.(9)

The improvement in the mechanical low back pain was stressed in the study with the use of muscle energy techniques and soft tissue massage techniques. The need of the study was to evaluate the effect of the muscle energy techniques and soft tissue massage techniques on mechanical low back pain. MET is found to be effective in reducing lumbopelvic pain as a sole treatment and reducing disability in MLBP when combined with neuromuscular re- education and resistance training. A recent systematic review done on MET concluded that MET is effective in the treatment of LBP. MET is a versatile technique traditionally used to muscular strain, pain, local oedema and joint dysfunction and to improve functional disability to relieve muscle tension and increase the strength of the muscle. Morre described it as the “application of an accurately determined and specifically directed manual force to the body, in order to improve mobility in areas that are restricted in a joint

connective tissue or in skeletal muscle(15) Massage therapy aims to stimulate the proprioceptive receptors of the skin and underlying tissues through touch and pressure and is believed to improve mechanical function of the musculoskeletal system. It has been proposed to increase the extensibility of soft tissue including muscle, tendon, fascia, the joint capsule and ligaments, by preventing the formation of fibrosis and adhesion.(10)

Aim of the study:

To compare the effectiveness of Muscle energy technique and soft tissue massage technique for improvement of pain and functional disability on mechanical low back pain patients.

Objectives of the study:

1. To evaluate the effects of muscle energy technique for improvement of pain and functional disability on mechanical low back pain patients.
2. To evaluate the effect of soft tissue massage technique for improvement of pain and functional disability on mechanical low back pain patients.
3. To compare the effectiveness between muscle energy technique and soft tissue massage technique for improvement of pain and functional disability on mechanical low back pain patients.
4. To find out the new facts about the physiotherapy techniques are going to be used in this study if present at any point.

Hypothesis

Alternative Hypothesis:

It states that there is significant difference between effects of muscle energy technique and soft tissue massage technique for improvement of pain and functional disability on the mechanical low back pain patients.

Null Hypothesis:

It states that there is no significant difference between effects of muscle energy technique and soft tissue massage technique for improvement of pain and functional disability on the mechanical low back pain patients.

METHODOLOGY

1. STUDY DESIGN: Comparative study
2. SAMPLE DESIGN: Randomized
3. SAMPLE SIZE: 30 patients diagnosed with Mechanical low back pain.
4. STUDY CENTER: GBH American hospital 101, Kothi Bagh ,Bhat Ji Ki Bari, Udaipur(raj.)
5. DURATION OF THE STUDY: 20Weeks, 15 minute session per day, 5 day/weeks

INCLUSION CRITERIA:

1. Age between 30-50 years
2. Both male and female patients
3. Diagnosed Mechanical Low Back Pain

EXCLUSION CRITERIA:

1. Patient with widespread neurological symptoms
2. Recent traumatic injury.
3. Spinal tumor and stenosis
4. Spinal surgery
5. Any metal implants
6. Vertebral compression fracture
7. Ankylosing spondylitis ,spondylolysis
8. Patient less than 30 yrs and above 50yr

OUTCOME MEASURES

1. Visual analog scale(VAS)
2. Oswestry low back pain disability questionnaire (OLBPDQ)

STUDY MATERIALS:

1. Consent form
2. Assessment form
3. Data collection sheet
4. Pillow
5. Paper
6. Pen
7. Pencil
8. Couch
9. Lubricant oil
10. Scale
11. Cotton

PROCEDURE: After the 30 patients were selected through inclusion and exclusion criteria and after receiving the consent form they were divided into 2 groups each consisting of 15 patients receiving the intervention for 20weeks. The first group A was treated with muscle energy technique and group B was treated with soft tissue massage technique. .

GROUP A:

Post isometric relaxation procedure (PIR) was used as Muscle energy technique (MET)(19) to patient's group of muscles to lengthen a shortened or contracted muscle, and to mobilize restricted articulation into its proper position. The effects of MET may involve a variety of biomechanical mechanisms such as the change in tissue fuids, altered proprioceptions, motor programming and control and neurophysiologic responses. The basic concept of PIR is to contract the tense muscle isometrically and then to encourage it to lengthen during a period of complete voluntary relaxation. Gravity is used to encourage release of muscle tension and taken up the slack. These studies have been done in mechanical LBP patients

The post isometric relax technique(PIR)(20) principle is followed in muscle energy technique. The Post isometric relax technique group also showed improvement in lumbar flexibility. Post isometric relaxation (PIR) exercise helps in contraction and relaxation method as well as facilitation an inhibition of muscles that accompanies breathing. PIR helps in flexibility of muscle because of its contraction and relaxation method.(20)

The patient made to sit at the edge of a table, the non tested leg kept leg in flexion at both hip and knee and the experimental limb to hang. Extend the knee of the opposite thigh up to the barrier. Then the patient is asked to flex the hip against minimal resistance and to breathe in for 10 seconds. The patient is then told to 'let go' (relax) and exhale slowly. Wait for 10 to 20 seconds or longer as long as relaxation is taking place.

Good And Bad Postures For Reduce Low Back Pain

RESULTS AND DATA INTERPRETATION

The present study was carried out to compare the efficacy of Muscle Energy Technique (MET) and Soft Tissue Massage Technique for improvement of pain and functional disability on Mechanical Low Back Pain in patients. The present study examined the cause of MLBP in patients, intensity of low back pain by VAS, and functional disability using Oswestry Low Back Pain Disability Questionnaire (OLBPDQ) and comparison of both the technique on effectiveness on mechanical low back pain patients. The data obtained during the study was tabulated and statistically analyzed for interpretation of the result. The findings of the presents study have been presented and discussed in this chapter under the following major holdings.

1. Demographic presentations of data
2. Analysis of pre and post test values of Visual Analog Scale (VAS) within group A.
3. Analysis of pre and post test values of Visual Analog Scale (VAS) within group B.
4. Analysis of pre and post test values of Oswestry Low Back Pain Disability Questionnaire (OLBPDQ) within group A.
5. Analysis of pre and post test values of Oswestry

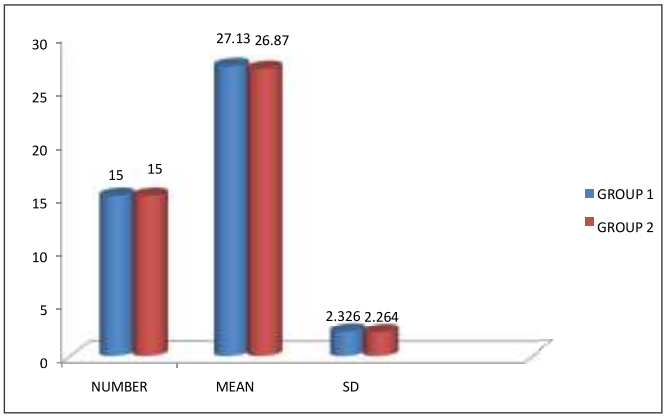
Low Back Pain Disability Questionnaire (OLBPDQ) within group B.

6. Analysis of pre and post test values of Visual Analog Scale (VAS) between groups.
7. Analysis of pre and post test values of Oswestry Low Back Pain Disability Questionnaire (OLBPDQ) between groups.
8. Mean improvement in all the parameters between groups.

1. DEMOGRAPHIC PRESENTATIONS OF DATA IN GROUPS:

Tables 5.1 Demographic presentation of data in groups

		AGE IN YEAR	
GROUPS	NUMBER	MEAN	SD
Group A	15	27.13	2.326
Group B	15	26.87	2.264
Total	30	27.00	2.259



Demographic Presentations of Data In Groups

INTERPRETATION

30 patients with diagnosed mechanical low back pain of age group between 30-50 yrs were randomly selected according to inclusion and exclusion criteria and divided into two groups with 15 patients in each groups. Group A had a mean age of 27.13 years and group B had a mean age of 26.87 years. The demographic data has been presented in table 1 and figure 1

2. ANALYSIS OF PRE AND POST TEST VALUES OF VISUAL ANALOG SCALE (VAS) WITHIN GROUP A:

The pain score of each patient in group A was assessed by using Visual Analogue Scale before the start of the treatment as pre-test values and at the end of 20 weeks as post-test values.Thed a t a hasbeenpresentedi

ntable5.2anddepictedinfigure5.2.

Table 5.2 : Analysis of Pre-Test ans post test values of pain scores using visual analogue scale (VAS) for singnificance within group A

	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Sign ifica nce
Pretest	6.87	15	1.060	1.060	-	-	-	
VAS	-	-	-	-	4.94	17.373	0.0251	
Posttest	1.93	15	1.163	1.163	-	-		

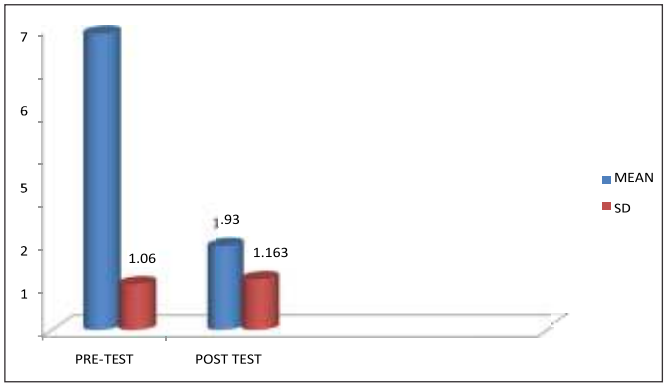


Figure5.2: Pre – Test And Post Test Values Of Pain Scores Using 1visual Analog Scale (vas) Within Group A:

INTERPRETATION:

The above table shows the mean of pre and post test values were 6.87 and 1.93, respectively.

The mean improvement in pain score of Group A was 4.94. The't' value 17.373 and 'p' value 0.025 for pain score using VAS within Group A analysis. When compared to table values the above 'p' values is lessor at $p< 0.05$, which is highly significant, it indicates that group A treated with MET had significant improvement in in pain intensity within group A.

3. ANALYSIS OF PRE AND POST TEST VALUES OF PAIN SCORESUSING VISUAL ANALOG SCALE (VAS) WITHIN GROUP B:

The pain score of each patient in group B was assessed by using Visual Analogue Scale before the start of the treatment as pre-test values and at the end of 20 weeks as post-test values. The data has been presented in table 5.3 and depicted in figure 5.3.

Table 5.2 : Analysis of Pre-Test ans post test values of pain scores using visual analogue scale (VAS) for singnificance within group B

	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
Pretest	6.8	15	1.373	0.3546	-	-	-	
VAS	-	-	-	-	3.60 -	10.739	0.0289	
Posttest	3.20	15	1.207	0.3117		-		

* Significant difference (P<0.05)

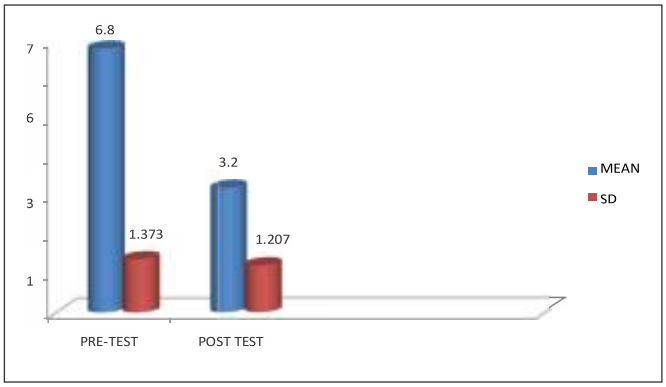


Figure5.3: Pre – Test And Post Test Values Of Pain Scores Using 1visual Analog Scale (vas) Within Group B:

INTERPRETATION:

The above table shows the mean of pre and post test values were 6.8 and 3.2, respectively. The mean improvement in pain score of Group B was 3.6. The't' value 10.739 and 'p' value 0.0289 for pain score using VAS within Group B analysis. When compared to table values the above 'p' values is lessor at p< 0.05, which is highly significant, it indicates that group B treated with MET had significant improvement in in pain intensity within group B.

1. ANALYSIS OF PRE AND POST TEST VALUES OF DISABILITY SCORES USING OLBPQ FOR SIGNIFICANCE WITHIN GROUPA.

The functional disability score of each patient in group A was assessed by using Oswestry Low Back Pain Disability Questionnaire (OLBPDQ) before the start of the treatment as pre-test values and at the end of 20 weeks as post-test values. The data has been presented in table5.4and depicted in figure 5.4.

Table 5.4 : Analysis of Pre-Test ans post test values of pain scores using visual analogue scale (VAS) for singnificance within group A

	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
Pretest	35.93	15	4.636	1.197	-	-	-	
VAS	-	-	-	-	26.73 -	22.95	0.0105	
Posttest	9.20	15	5.240	1.353		-		

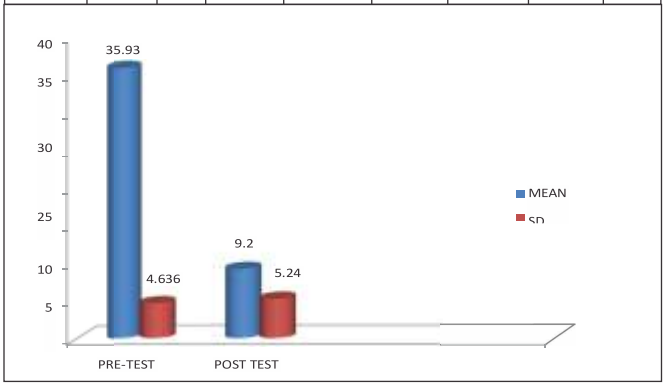


Figure 5.4: Pre And Post Test Values Of Functional Disability Scores Using OLBPQ Within Group A:

INTERPRETATION:

The above table shows the mean of pre and post test values were 35.93 and 9.20, respectively. The mean improvement in pain score of Group A was 26.73. The't' value 22.95 and 'p' value 0.0105 for functional disability score using OLBPDQwithin Group A analysis. When compared to table values the above 'p' values is lessor at p< 0.05, which is highly significant, it indicates that group A treated with MET had significant improvement in in pain intensity within group B.

5. ANALYSIS OF PRE AND POST TEST VALUES OF DISABILITY SCORES USING OLBPDQ FOR SIGNIFICANCE WITHIN GROUPA.

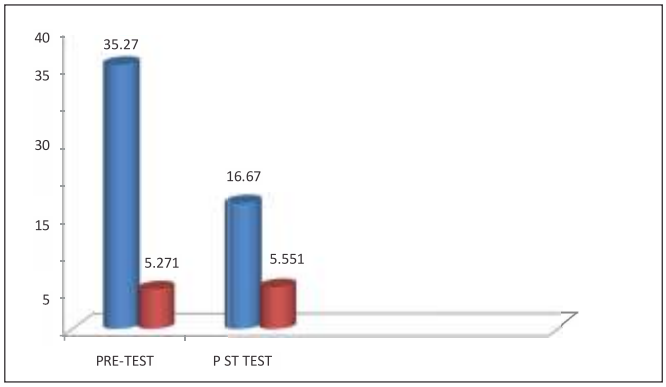


Figure 5.4: Pre And Post Test Values Of Functional Disability Scores Using OLBPQ Within Group A:

The functional disability score of each patient in group A was assessed by using Oswestry Low Back Pain Disability Questionnaire (OLBPDQ) before the start of the treatment as pre-test values and at the end of 20 weeks as post-test values. The data has been presented in table 5.4and depicted in figure 5.5.

Table 5.5 : Analysis of Pre-Test ans post test Disability Scores Using OLBPDQ for Significance within Group B:

	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Sign ifica nce
Pretest	35.27	15	5.271	1.361	-	-	-	
VAS	-	-	-	-	18.6-	9.67	0.0269	
Posttest	16.67	15	5.551	1.433		-		

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Yoga And Exercise For Symptoms Of Depression And Anxiety In People With Post Traumatic Stress Disorder (PTSD) : A Randomized Control Trial

Shailendra Mehta

ABSTARCT

BACKGROUND: Post- traumatic stress disorder (PTSD) is a mental health condition that's triggered by a terrifying event – either experiencing it or witnessing it. Symptoms may include flashbacks, nightmares, depression and severe anxiety, as well as uncontrollable thoughts about the event.

Most people who go through traumatic events may have temporary difficulty adjusting and coping, but with time and good self-care they usually get better. If the symptoms get worse, last for months or even years, and interfere with your day to day functioning, you may have PTSD.

Getting effective treatment after PTSD symptoms develop can be critical to reduce symptoms and improve function.

OBJECTIVES OF THE STUDY:

To evaluate the changes in symptoms of depression and anxiety as a result of interventions involving combination of Exercise and Yoga in post-traumatic stress disorder. Researchers have shown a reduction in anxiety and depression in a general population through combining exercise and yoga as an integrated approach, suggesting a possible synergy between these treatment modalities. How well researchers can extrapolate this finding to a post-traumatic stress disorder population remains undetermined

METHODOLOGY:

Randomized control trial, total 30 patients were screened, out of whom 14 patients refused to participate. 16 patients were allocated in two groups as follows: 8 to the YEX (n=8) and 8 to the EX (n=8). 16 patients completed the proposed protocol and were conducted to the revaluation. Depression and anxiety status measured by Beck depression inventory, state trait anxiety inventory- Y1, STAI-Y1 State trait anxiety inventory- Y2 was taken on first day and completion of training at 6 weeks. The statistical analyses was done using software called GRAPHPAD PRISM. The statistical analyses used were descriptive analysis to find out the mean and SD. Data was normally distributed so Inter group comparison was analyzed by using parametric of paired 't' test. Intra group pre and post value comparison was analyzed by using unpaired' test.

SYMPTOMS:

Post –traumatic stress disorder symptoms may start within one month of a traumatic event, but sometimes symptoms may not appear until years after the event. These symptoms cause significant problems in social or work situations and in relationships. They can also interfere with your ability to go about your normal daily tasks.

PTSD symptoms are generally grouped into four types : intrusive memories, avoidance, negative changes in thinking and mood, and changes in physical and emotional reactions, symptoms can very over time or vary from person to person.

RESULT:

Beck depression Inventory (BDI) : The beck depression scale demonstrated decreases in depression score at pre- evaluation in both the group.

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When analyzing within group score obtained by BDI, both the groups. YEX and EX groups showed improvements in all post test scores throughout the intervention period. The posttest parameters in the BDI were significantly decreases in YEX group (p=0.004)

State trait Anxiety Inventory : The STAI-Y1 demonstrated decrease in state anxiety score at pre and post evaluation in both group. But significant improvement found in Experiments group (p=0.0062). the STAI- Y2 shows larger changes in mean score before and after intervention but not statistically significant in both the groups (p= 0.2550).

CONCLUSION:

Individuals with post traumatic stress disorder –related disability can achieve additional mental-health benefits from an integrative approach involving participation in a combined exercise and Yoga program

KEYWORDS:

Post-traumatic stress disorder, anxiety, depression, back depression inventory, straight trait anxiety inventory Y1 & Y2, Yoga.

INTRODUCTION:

If you have disturbing thoughts and feelings about a traumatic event for more than a month, if they're severe, or if you feel you're having trouble getting your life back under control, talk to your doctor or a mental health professional, Getting treatment as soon as possible can help prevent PTSD symptoms for getting worse.

If you or someone you know has suicidal thoughts, get help right away through one or more of these resources:Reach out to close friend or loved one. Contact a minister, a spiritual leader or someone in your faith community. Make an appointment with your doctor or a mental health professional. An increased risk of mental – health conditions can complicate life further after a stroke. Some cases of mental – health conditions, such as depression.

Regardless of their origins, mental – health conditions such as depression and anxiety are potential risk factors for PTSD has been related to longer hospitalization and reduced functional recovery, suicidal ideas, , poor communicative function, impaired memory, visual perception and language, reduced social activities, and higher risk for mortality.

Given that people who had PTSD are more likely to experience depression anxiety relative to general population, this highlights the need to broaden care beyond the emphasis on physical function outcomes to include interventions which address both physical and mental health determinants of quality of life.

One approach to supporting health related quality of life for people who have had a PTSD in involves participation in physical activity programsParticipation in physical activity programs has been shown to improve gait velocity, mobility and balance in PTSD patients.

In terms of mental health, a study by mead et al has provided support for an exercise- related reduction of depression in the general population. Researchers have paid little attention to the applicability of this finding to a PTSD population, and only one randomized controlled trial (RCT) tentatively supports reduced depressive symptoms with physical activity. Although physical activity can provide physical health benefits for people with PTSD the extent which mental health benefits can be gendered form exercise might be limited by reduced exercise tolerance resulting form sedentary behavior and diminished movement efficiency due to disability 12 in the PTSD population. Both of these factors may make it difficult for Individuals to reach appropriate exercise intensities and volumes necessary to derive mental health benefits.

Mental health benefits from exercise participation in a PTSD population may be improved upon with an adjunctive approach involving yoga.

Yoga is a system of self- development which has evolved over many to sands of years since is

inception in ancient societies based in southern Asia. Yoga is derived from the Sanskrit root verb 'yuj' which is translated to mean unite and this implies an emphasis on the union of mind, body and spirit. More practically, it can be interpreted to mean that yoga practices can be used holistically to address not just the individual's physical needs (e.g. their physical activity) but also their mental (e.g. cognitive function) and emotion (e.g. positive mood states)

The use of movements and postures called asana, combined with breathing techniques of pranayama will combine to reduce the mental turmoil. It is common.The mechanisms by which yog supports mental health have not yet been delineated but likely involve a combination of biological, psychological ad social benefits.Yoga asana has been shown to increase brain levels of gamma-amino butyric acid (GABA), a neurotransmitter for which low levels have been associated with depression and anxiety. In addition, pranayama breathing practices have also been shown to be effective in management of mental health conditions such as post- traumatic stress disorder (PTSD) in war veterans and survivors of natural disasters possibly by encouraging neoplastic changes that down-regulate fear and stress response.Finally, meditation has been shown to impart long term changes in the brain associated with prevention of mental health conditions including a decreased density of amygdala grey matter associated with reeducation in levels of stress- signaling molecules and increased levels of dopamine. When these yoga practices are combined together, there may be potential for greater relaxation and control over emotions, mood and anxiety.

INTRUSIVE MEMORIES

- Symptoms of intrusive memories may include:
- Recurrent, unwanted distressing memories of the traumatic event
- Reliving the traumatic event as if were happening again (Flashbacks)
- Upsetting dreams or nightmares about the traumatic event.
- Sever emotion distress or physical reactions to something that reminds you of the traumatic event.

AVOIDANCE

- Symptoms of avoidance may include:
- Trying to avoid thinking or talking about the traumatic event.
- Avoiding places, activities or people the remind you of the traumatic event.

Negative changes in thinking and mood

- Symptoms of negative changes in thinking and mood may include:
- Negative thoughts about yourself, other people or the world
- Hopelessness about the future.
- Difficulty maintaining close relationships
- Feeling detached from family and friends
- Changes in physical and emotional reactions
- Symptoms of changes in physical and emotional reactions (also called arousal symptoms) may include:
- Being easily startled or frightened.
- Overwhelming guilt or shame.
- For children 6 years old and younger, signs and symptoms may also include :Re-enacting the traumatic event or aspects of the traumatic event through play.
- Frightening dreams that may or may not include aspects of the traumatic event.

MATERIALS:

1. Patient consent form
2. Assessment form
3. Treatment table i.e. couch
4. Weight cuff
5. Yoga mat
6. stepper

MATERIALS AND METHODOLOGY

STUDY DESIGN : randomized control trial

STUDY SETTING : Department of Physiotherapy, Janardanrainagarrajasthanvidhyapeeth (deemed to be) university , dabok

SAMPLE SIZE : 8 subjects in each group

SUBJECTS: male and female diagnosed as PTSD that will be referred to physiotherapy OPD

INCLUSION CRITERIA:

1. Moderate to severe depression (19-29 on beck depression inventory (BDI))
2. Minimum of six months elapsed time since the PTSD incidence
3. Individuals had to be able to ambulate for 100 meters or more with or without the use of an assistive walking device

EXCLUSIVE CRITERIA:

1. Presence movement disorders like hemiplegia, Ataxia, Cervical dystonia, Chorea, Dystonia, Functional movement disorder, Huntingtion's disease, Multiple system atrophy, Myoclonus.
2. Unable to follow two step verbal commands
3. Currently research participants in any other physical activity related stuies
4. Currently practicing any yoga related activities including tai chi

OUTCOME MEASURES:

1. Beck depression inventory
2. State trait anxiety inventory- Y1 STAI- Y1(to measure state anxiety)
3. State trait anxiety inventory- Y2 STAI- Y2(to measure trait anxiety)

   The beck depression inventory (BDI) is a 21-item, self –rated scale that evaluates key symptoms of depression.. Individual scale items are scored on a 4-point continuum (0=least,3most), with a total summed score range of 0-40. higher scores indicate greater depressive severity. BDI(cut-off≥7) resulted in a specificity of 0.95 for detecting major depression whereas the have a sensitivity of 0.71.

The state –trait anxiety inventory (STAI) is a psychological inventory based on a 4-point likert scales and consist of 40 questions on a self report basis. The STAI measures two types of anxiety, state anxiety, or anxiety about an event, and trait anxiety, or anxiety level as a personal characteristic. Higher scores are positively correlated with higher levels of anxiety

Feasibility outcomes:

1. Participants ' recruitment and retention,
2. Adherence to the yoga treatment (yoga group – class attendance and home – practice completion),
3. Adherence to exercise treatment (exercise- class attendance),
4. Safety of yoga and exercise treatments.
5. STUDY SAMPLE
6. A total 30 patients were screened of whom 16 patients met the study criteria 2 patients refused to participate. 14 patients were allocated in two groups as follow: 8 to the YEX (n=8) 14 patients completed the proposed protocol and were conducted to the revaluation.
7. Sample size in both the group was n=14

STATISTICALANALYSIS:

1. Fourteen were subjects were randomly divided I a 2 groups : YEX group & EX group, each having eight subjects.
2. Depression and anxiety status measured by beck depression inventory, state trait anxiety inventor – Y1, STAI-Y1 state trait anxiety inventory -Y2 was taken on first day and completion of training at 6 weeks.
3. The statistical Analysis was done using software called GRAPHPADPRISM.
4. The statistically analyses used were descriptive analysis to find out the mean and SD.
5. Data was normally distributed so Inter group comparison was analyzed by using parametric of parried 't' test.
6. Intra group pre and post value comparison was analyzed by using unpaired' test.
7. For both the group level of significant was consider to be 95% ($P<0.5$)

Variables	YEX group (n=8)	EX group (n=8)
Mean (SD) Age (years)	65.1(15.4)	67.(12.7)
Gender Male Female	7(87.5) 1(12.5)	4 (83.3) 2 (16.7)
BDI score	23.63(2.92)	23.75 (2.96)
STAI-Y1	37.57(12.37)	38.14 (6.067)
STAIY2	35.86(11.38)	41.14 (7.42

DISCUSSION:

1. Previous work has provided initial evidence to support mental health benefits from physical activity in a PTSD populations. And from yoga participation in a general population.
2. This pilot study is aimed to investigate the additional mental health benefits that can be derived from adding a yoga program to structured exercise.
3. Across both the groups self-reported scores of depression on beck depression inventory decreased from pre- treatment to post treatment ($p<0.005$) which is statistically significant changes.
4. Supplementing an exercise program with a yoga program did not result in significantly greater improvements in self-reported measures of state and trait anxiety in STAI Y1 AND Y2 scale
5. Despite this lack of statistical significance, the data trends still suggest a possible benefit of complementing exercise with yoga for this clinical populations. In term of group results, there was a large change in mean scores for depression and state and trait anxiety in the group participating in both exercise classes and the yoga program compared to just exercise alone.
6. With individual case result, the participants demonstrating larger clinically relevant improvements in mental health scores participated in both exercise and yoga. This was particularly so for improvement in state anxiety.
7. This pilot study was limited by a number of factors. Firstly, this study was most likely. With participants 8 from the YEX group, it was difficult to determine from which activity the benefit of mental health improvements was derived due to the exposure of two new modes of physical activity
8. At this stage, although it is difficult to indicate whether the present clinically relevant improvements in mental health outcomes for the participants in the YEX group were from the exercise program, the yoga program, the combination of both or even a change due to the 15
9. Additional attention and group activity afforded by the combined treatments, there may potentially be a synergist effect of exercise and yoga which needs to be further investigated
10. Both the exercise and yoga programs were substantially shorter than those previously reported to provide mental health benefits. While some participants in both groups responded to the short treatment, it is quite possible that given a Longer treatment period, more participants would have demonstrated clinically relevant mental health benefits and larger improvements in scores would have been observed.
11. The present study also set out to determine the feasibility of conducting subsequent larger-scale studies investigating the mental health efficacy of exercise and yoga programs in individuals with a PTSD. Participation in group exercise and yoga programs appears to be safe as no adverse effects were reported during the trial.
12. In addition, adherence to both treatment modes was high which way indicate that adding yoga to an existing exercise program is easy and enjoyable to participate in.

LIMITATION OF THE STUDY:

Shorter duration of intervention

Highly labile self-reporting of symptoms of depression and anxiety.

The design of this trial meant that we could not isolate the mental health benefits of participation in exercise and yoga from one another

FUTURE SCOPE OF THE STUDY:

Larger sample sizes

Recruitment of participants with clinically relevant levels of mood disorder.

Longer intervention periods

Research designs that allow for mental health assessments at multiple points in time and that provide appropriate comparisons between the intervention and control groups

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A comparative study between effects of kinesiotapping technique and myofascial release in the patients with chronic plantar fascitis.

Manash Kanti Chakraborty*, Sumeeta khaund Grover, Saloni Agrawal*****

INTRODUCTION

Plantar fasciitis is the most frequently reported cause of foot and heel pain. This condition is characterised by localised pain at the calcaneal origin of the plantar fascia; reproduced by weight bearing after prolonged period of rest.1Plantar fasciitis denotes, the inflammation of the plantar fascia. Frequent injuries or loading of the plantar fascia can cause micro tears; which would ultimately lead to inflammation and degeneration of the connective tissues in the fascia.1

The plantar fascia is a thick fibrous connective tissue, which originates at the medial tuberosity of the calcaneus and inserts into the proximal phalanges of each toes. The central portion is the thickest, and attaches to the posterior aspect of the medial tuberosity of the calcaneus posterior to the origin of the flexor digitorum brevis tendon and is 1.5 to 2 cm in width, distally at the label of the metatarsophalangeal joint of the 2nd to 5th toes.

The central portion of the plantar aponeurosis is divided into five fascicles, one for each of the toes.2 The lateral portion of the plantar aponeurosis arises from the lateral aspect of the medial tuberosity of the calcaneus and its distal medial and lateral bands attached to the plantar plates of the fourth toe and to the base of the fifth metatarsal respectively and is 1 cm to 1.5 cm in width. The medial portion of the plantar aponeurosis is thin and continuous medially with the dorsal fascia and laterally with the central portion of the plantar aponeurosis.2 Fibres of the plantar fascia also gives attachment to the dermis, the transverse metatarsal ligament, and the flexor sheath.2

The function of the plantar fascia is to maintain the medial longitudinal arch.3 Hicks (1954) concluded that the plantar fascia plays an important role during the gait cycle; where it lengthens during the stance phase of the gait cycle; locks the mid foot during toe off phase of the gait cycle and assists acceleration during the swing phase of the gait cycle and facilitate shock absorption during activities of daily living.3 Plantar fasciitis is more commonly found in the woman population. It is commonly found in the age group of 40-60 years in the general population and is also common in younger age among military personnel and running athlete. Its prevalence is estimated to be about 10% in the general population. It is usually unilateral, but 30% of the cases are bilateral in nature. 4, 5

It is caused due to a variety of factors. The risk factors associated with the development of plantar fasciitis includes obesity, reduced angle of dorsiflexion of the ankle, occupations that require prolonged standing, pes planus foot or excessive pronated foot , running on an uneven surface or excessive running, cavus foot , shortened Achilles tendon, improper shoes and reduce strength of the intrinsic muscles of the foot.5,6

The association of plantar fasciitis with increasing age and BMI is in co-relation to the histopathological findings of degeneration. The decrease in elasticity of the fascia seen with increasing age and BMI is associated with a decrease in the shock absorbing capacities of the degenerative fascia, which might lead to inability to resist normal tensile loads.7

These constant overloading inhibits the normal repair process; resulting in collagen destruction which causes both structural changes and perifascial oedema. These changing in turn leads to a thicker heel pad which is related to pain in

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individuals with plantar fasciitis. These degenerative findings suggest that plantar fasciitis is secondary to repetitive micro trauma caused by prolonged weight bearing activities.6

Plantar fasciitis also leads to shifting of the body weight on the lateral side supported by the toes during gait cycle because of pain in the medial region of the calcaneus or on the proximal insertion of the plantar fascia; which might leads to chronic shortening of Achilles tendon and pain in the medial region of gastrocnemius.7 The posterior calf musculature has an integral part in the functioning of the plantar fascia. Any disruption in the posterior calf musculature either due to tightness or weakness would lead to an alternation in the normal biomechanics of the foot.8 This leads to increased loading of the plantar fascia at the calcaneus attachment. This resultant abnormal biomechanics of the foot increases the tensile strength on the plantar fascia and would give rise to plantar fasciitis.9

There is some controversy as to whether heel spur or projections of the bone of the calcaneus is related to plantar fasciitis. Cornwall conducted a study and concluded that only 13.2% and 5.2% respectively suffered from heel spur and sub calcaneal pain out of 1000 subjects who were radiological examined for the presence of heel spur.5

The diagnosis of plantar fasciitis is made with a reasonable level of certainty on the basis of clinical assessment only. The diagnosis of plantar fasciitis is usually straightforward; which basically involves pain in the heel especially while taking the first few steps when one wakes up from the bed in the morning or after a period of rest which is highly suggestive of plantar fasciitis, unlike calcaneal heel spurs where pain increases with activity. The pain often improves after walking, but might occur after prolonged weight bearing or stressful activity.1, 4,5

The second characteristics is the localisation of the pain which is usually at the origin of the plantar fascia from the medial tubercle of the calcaneus. The pain may be aggravated by passive dorsiflexion of the toes in subjects with more severe condition. Heel pad swelling may accompany chronic plantar fasciitis. In most cases, the subject would initially complain of sharp localised pain under the plantar surface of the heel with paraesthesia being uncommon. Initially, the pain may be diffused or migratory in nature, but with the gradual passage of time and worsening of the condition the pain is usually localised to the medial calcaneal tuberosity at the point of origin of the plantar fascia.1, 5, 6.

Plantar fasciitis is considered to be a self-limiting condition, because the mechanical factors are found in 90% of the subjects and only 10% of the subjects have a non-functional aetiology.6

Conservative treatment for plantar fasciitis consist of exercises (strengthening and stretching exercises), corticosteroid therapy, use of modalities like cryotherapy, ultrasound with or without the application of phonophoresis, electrical stimulation, contrast bath, Whirlpool bath, NSAIDs(non-steroidal anti-inflammatory drugs), taping like calcaneal taping, kinesio taping, night splints, use of soft sole insoles and the use of orthotics. Davis et al concluded that 89% of the subjects had pain relief after 12 months of conservative treatment.1, 4, 5

Initial treatment should include sufficient foot rest with conservative analgesic use. Over-the-counter NSAIDs have been shown to be an adequate means of pain control when used in combination with other forms of treatment.22,23 Focused stretching of the Achilles tendon, plantar fascia, and intrinsic muscles of the foot has also been demonstrated to improve pain.24,25 The intermittent application of ice seems to provide some benefit to patients with plantar fasciitis when compared with heat application.23

The osteopathic manipulative treatment technique of counter strain may provide immediate improvement of plantar fasciitis symptoms; however, maintenance of these results has not been documented, to the authors' knowledge.26,27 The plantar fascia should be placed in a position of least

resistance with passive flexion of the knee and plantar flexion of the ankle and toes.27 This position should be maintained for approximately 90 seconds while monitoring the tender point, which is most commonly located at the plantar fascial insertion on the medial calcaneus.27 The foot should then be returned to a neutral position and reassesed.27

But no evidence of literature has been found to compare the effectiveness between kinesio taping techniques and myofascial release techniques for plantar fasciitis. Hence the aim of the study is focused to compare the effectiveness between this two conservative treatment namely kinesio taping versus myofascial release as soft tissue mobilisation for plantar fasciitis.

NEED OF THE STUDY

Plantar fasciitis is primarily a clinical diagnosis. Patients classically describe medial plantar heel pain on weight bearing, which is often most intense during their first few steps in the morning but tends to improve with rest.3, 12 This pain may progress over the course of the day, especially after prolonged standing. Acute exacerbations may occur at any time when rising from a seated position.3,12 Physicians should look for other risk factors for plantar fasciitis and assess the appropriateness of the patients' footwear choices for their customary activities.

Classic physical examination findings suggestive of plantar fasciitis include reproducible pain with palpation of the plantar medial aspect of the heel and pain with passive dorsiflexion of the ankle and toes (windlass test).12 A contributing planus or cavus foot deformity may be noted.3,12 Ankle range of motion should also be assessed. Active dorsiflexion less than 10° beyond neutral is indicative of an equinus contracture.13

Approximately 85% to 90% of patients with plantar fasciitis can be successfully treated without surgery.6 Methods include rest, over-the-counter (OTC) nonsteroidal anti-inflammatory drugs (NSAIDs), stretching, counterstrain technique, orthoses, corticosteroid injections, extracorporeal shock wave therapy (ESWT), and ultrasound therapy. Although treatment may be required for 6 months or longer, 80% of patients treated conservatively have no long-term recurrence of pain.1,16

Corticosteroid injections should be considered with caution, owing to a potentially unfavorable risk-to-benefit ratio for patients with plantar fasciitis. In a randomized, prospective clinical trial, corticosteroid injections provided better relief of plantar fasciitis symptoms at 1 month but not at 6 months when compared with control groups.32 The risks associated with corticosteroid injection include skin and fat pad atrophy, infection, and plantar fascia rupture.32,33 In a retrospective study, corticosteroid injections were associated with a 10% incidence of plantar fascia rupture.33 This complication can be serious, possibly leading to problems associated with the loss of the medial longitudinal arch of the foot.34

Dimou, Brantingham and Wood compared chiropractic adjustments/manipulation of the joints of the ankle and foot along with a daily stretching program to custom orthotics alone and was carried out for a one month period with a one month follow-up. The authors noted a significant improvement in both groups in almost all outcome measures. The only significant difference between groups favored the chiropractic care with stretching over orthotics in pain rating at day 15.1

Basford et al. reported on a trial comparing low-intensity laser therapy with an inactive laser control group. The authors concluded that laser therapy was ineffective in treating plantar fasciitis.18

Crawford and Snaith reported on a study comparing therapeutic ultrasound to sham ultrasound. Ultrasound did not significantly outperform sham ultrasound after eight sessions over four weeks. 3

Pfeffer et al. conducted a randomized controlled trial comparing Achilles tendon and plantar fascia stretching alone to stretching along with one of four

different shoe inserts. Three of the inserts were prefabricated (one rubber, one felt, and one silicone) and the last was a custom-made polypropylene orthotic. After eight weeks, the subjects were re-assessed and the authors found that the custom-made orthotics produced the lowest percentage of responders (subjects with at least a slight improvement subjectively) and the least reduction in pain among the different interventions, including the stretching only group.8

Martin et al. used a randomized study design to ascertain whether custom orthoses, over the counter arch supports, or tension night splints were more beneficial in the treatment of plantar fasciitis over a 3 month period. The differences were not statistically significant, nor were the differences noted between the groups in first step pain, which favored the night splint group (with an average change of 6.1 in VAS score over time and 57% of the subjects rating their outcome as good or excellent on first step pain) over the over the counter arch support and custom orthotics (which averaged 5.3 change in VAS over time each, and 57% and 61% rating their first step pain outcome as good or excellent, respectively).7

Turlik et al. compared generic heel pads to functional foot orthotics over a 3 month period Assessments were performed prior to the initial treatment and again at the end of the study (3 months total duration).13 At the conclusion of the study, authors conclude that the functional foot orthotics were more effective than generic heel pads in relieving the symptoms of heel spur syndrome.13

Rome et al. compared the clinical effectiveness and cost-effectiveness of functional and accommodative foot orthoses in the treatment of plantar heel pain, the functional orthosis was more cost effective than the accommodative orthosis.16

But there was no evidence of compare the effectiveness of Konesio tapping and myofascial release in treatment for plantar fascities. As it is important to evaluate the comparison so this study has been designed for.

AIM OF THE STUDY

To compare the effects of Kinesio tapping technique and Myofascial release in the patients with chronic plantar fascitis.

OBJECTIVES OF THE STUDY

The main objectives of the study are:

1. To investigate the effectiveness of Kinesio taping technique for the patients with chronic plantar fasciitis.
2. To investigate the effectiveness of Myofascial release technique in the patients with chronic plantar fasciitis.
3. To compare the effects of Kinesiotapping technique and Myofascial release in the patients with chronic plantar fascitis.

HYPOTHESES

Null hypotheses (H0):

There is no significant difference between the effectiveness of Kinesio taping technique and Myofascial release technique in the patients with chronic plantar fasciitis.

Alternate hypotheses (H1):

There is significant difference between the effectiveness of Kinesio taping technique and Myofascial release technique in the patients with chronic plantar fasciitis.

METHODOLOGY

STUDY DESIGN: Comparative study

SAMPLE SIZE: 40 subjects with chronic plantar fasciitis.

SAMPLE DESIGN: Randomised sampling.

STUDY CENTRE: Various OPDS of Department of Physiotherapy, JRNRV

STUDY DURATION: 12 weeks, 5days in a week and 45 mints sessions per day.

INCLUSION CRITERIA

I. Age: between 30 and 60 years

II. Both genders (males & females).

III. Duration of symptoms at least 6 months or more.

IV. Unilateral and Bilateral cases

V. Plantar heel pain consistent with the following findings:-

- Plantar heel pain that increases in the morning with the first few steps after walking up or prolonged rest.
- Pain decreases with activity such as walking.
- Pain localised to the inferior heel or plantar surface of the foot consistent with the findings of plantar fasciitis.
- Pain score of at least 3 -8 cm on a 10 cm Visual Analog Scale.

EXCLUSION CRITERIA:

I. Increased body temperature.

II. Continuous pain on weight bearing on heel.

III. Infective condition of the skin of the foot.

IV. Recent fracture of the foot and ankle complex.

V. Previous surgery of the foot and ankle complex.

VI.Previous treatment of plantar fasciitis in the previous 4 weeks.

VII. Foot and ankle complex deformity.

VIII. Referred pain due to Sciatica or other neurological condition.

IX. Corticosteroid injection in the heel preceding 3 months.

X. Subjects with Psychosocial problems.

XI. Calcaneal heel spur.

XII. Fibromyalgia.

XIII. Unstable angina and other cardiac problems.

OUTCOME MEASURES:

1. VISUAL ANALOGUE SCALE (VAS)
2. FOOT FUNCTION INDEX(FFI)

STUDY MATERIALS

1. Written consent form
2. General assessment form
3. Treatment couch
4. Paper-pencil
5. Cotton
6. Chair
7. Kinesio tape
8. Non absorbent gel

PROCEDURE

After collecting the written concern form and the patients selected by inclusion and exclusion criteria were divided into two group- group A and group B. All the patients were explained about the procedure separately so that both groups remain unknown about the techniques applied to them. Group A was treated with Kinesio taping techniques while Group B treated with Myofascial release (MFR).Home exercises taught to all the subjects and also asked to perform under supervision so that they could do at home properly. All the pre and post data of outcome measures were taken and kept safely for analysing.

Group A- Kinesiotaping

Towel curl up- For this, subjects sat with foot flat on the end of the surface and small weight was be kept at the end of towel keeping the heel on the floor and the towel was pulled towards the body by curling the towel with toes for 5 minutes.

Fig -Towel curling exercise

FIG : Self-stretching

DATA ANALYSIS

Mean, standard deviation, paired't' test and unpaired't' test has performed for analysis of pre and post data evaluation within and between groups. 'SPSS 18' software has used for statistical analysis. The parametric test results within the group and between the groups were obtained and statistically analysed using Student's paired and unpaired t-tests, respectively.

RESULTS & DATA INTERPRETATION

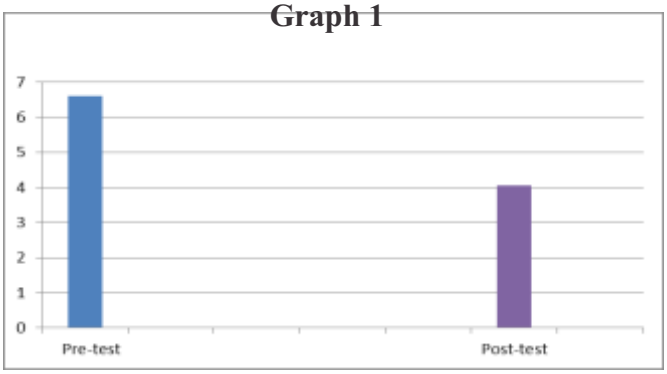
Analysis pre test and post test score within and between the values of groups are tubulised with intervention of the result of the study.

A. WITHIN GROUPS:

TABLE 1

FFI	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre-test	15	78.13	4.2739	1.1035	6.66	14	10	<0.0001**
Post-test	15	71.47	2.5597	0.6609				

Graph 1



INTERPRETATION:

The above table and graph shows the comparison of score for the Foot function index within group A.

TABLE 2

GROUP A

FFI	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre-test	15	78.13	4.2739	1.1035	6.66	14	10	<0.0001**
Post-test	15	71.47	2.5597	0.6609				

**Significant

Graph 2

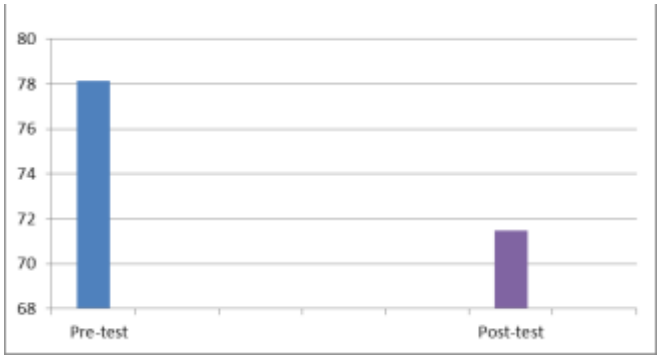


TABLE 3

GROUP B

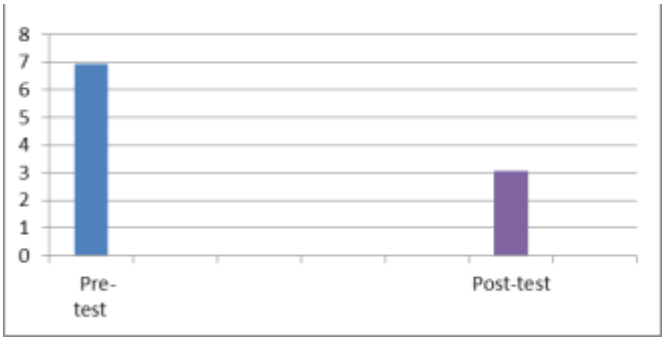
INTERPRETATION:

The above table and graph shows the comparison of score for the Foot function index within group A.

VAS	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre-test	15	6.933	0.7988	0.2062	3.867	14	10.8685	<0.0001**
Post-test	15	3.066	0.7037	0.1817				

**Significant

Graph 3



INTERPRETATION:

The above table and graph shows the comparison of score for the VAS within group B.

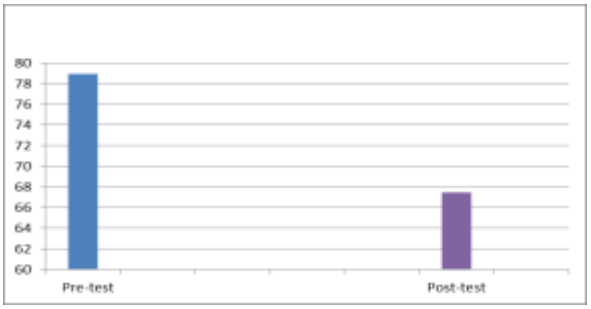
TABLE 4

GROUP B

FFI	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre-test	15	78.93	3.954	1.021	11.47	14	12.3262	<0.0001**
Post-test	15	67.46	2.134	0.551				

**Significant

Graph 4



INTERPRETATION:

The above table and graph shows the comparison of score for the Foot function index within group B.

B. BETWEEN THE GROUPS:

TABLE 5

VAS

Post test value	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Group A	15	4.067	0.7037	0.1817	0.134	14	0.485	<0.0001**
Group B	15	3.933	0.7988	0.2062				

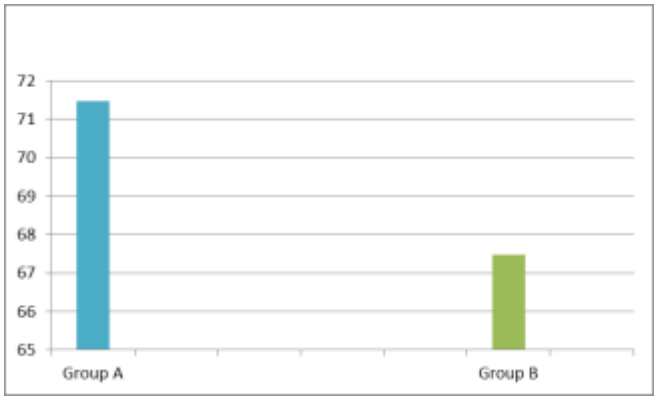
Graph 5

TABLE 6

FFI

Post test value	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Group A	15	71.47	2.56	0.66	4.00	28	4.6489	<0.0001**
Group B	15	67.47	2.134	0.551				

Graph 6



INTERPRETATION:

The above table and graph shows the comparison of post test score for the Foot function index between group A and group B.

DISCUSSIONS

The results of the present study showed that both Group A and Group B were effective in the treatment of Plantar fasciitis but after comparing the two groups Group B showed better results than Group A.

The statistical analysis of the VAS showed that there was a significant time effect for both groups ($p < 0.001$) which means that both treatment groups were effective at reducing the mean VAS over the course of the study period.

There was a statistically significant treatment effect showing that the MFR group improved better than the Kinesio tape group. It showed a faster rate of decrease of pain than the Kinesio group.

There was a significant time effect ($p < 0.001$) indicating that both groups decreased the total FFI score over time within groups. These findings suggest that both treatments may be effective in reducing the total FFI score because MFR are

claimed to cause vasomotor response, increase blood flow to the affected areas, increase lymphatic drainage of the toxic metabolites, the reduction in oedema and inflammation.

Kuhar et al showed significant results by stating that the MFR is an effective therapeutic option in the treatment of plantar fasciitis which also supports the findings of the present study (Suman Kuhar, 2007).

The Kinesio tape group decreased morning pain overall .This may be as a result of the tape being worn for up to three days over which time the tape could act on correcting intrinsic muscle imbalances in the foot, aiding the correct functioning of the fascia itself, reducing oedema and inflammation by stimulating blood circulation and neurologically stimulating the proprioceptive nerve fibres and reducing pain.

The Kinesio group may have been able to effectively reduce the VAS of participants due to its stimulating effect on proprioceptive A-beta fibres which decrease the effect of nociceptive C fibres, proven by studies done by Illes in 2009. The tape may have also aided the correct functioning of the plantar fascia and intrinsic foot muscles and neurologically suppressed the pain of the PF.

This may have been accomplished by shortening the distance between origin and insertion of the plantar musculature and fascia which relieved the strain and tensile forces on weight bearing. In this way the strapping allowed healing to occur naturally with the healing of the plantar fascia also being less painful.

MFR stimulates fibroblasts proliferation, which lead to collagen synthesis that may promote healing of plantar fascia by replacing degenerative tissue with a stronger and more functional tissue (Joahua Dubin, 2007).

Thus myofascial release is thought to hydrate dehydrated ground substance of the injured tissue and restore functional ROM to the areas of painful restriction, perhaps optimal ROM effects can only be expected in pathological tissue (William, 1994).

On the other hand stretching regardless of how it is performed causes a lengthening of the muscle, even if methods utilising contraction- relaxation or reciprocal inhibition appears to yield better results (Anders Henricson, 1983). Stretching relaxes the neuromuscular system in general.

The major goal of stretching is to recreate the windlass mechanism and to minimise repetitive microtrauma associated with chronic inflammation, by doing the exercises prior to the first step in the morning or after prolonged sitting or inactivity. This protocol provides a conservative treatment option that resulted in a rate of improvement of symptoms (Benedict, 2003).

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CONCLUSIONS

This study concludes that MFR group having more significant effects while comparing with Kinesio tape group to reduce pain and decrease the score of FFI in chronic plantar fascitis.

LIMITATIONS AND RECOMMENDATIONS

- Limitations
- Small sample size
- Short duration of study
- Recommendations

Further study could be perform with

- Large number of sample
- Duration of study for long period
- Different condition may be selected

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A Comparative Study Between Effects of Manual Therapy Exercises Versus Comprehensive Impairement Based Exercises For The Adhesive Capsulitis

Satya Bhushan Nagar*, Manash Kanti Chakraborty, Srishti Gosain*****

INTRODUCTION

Adhesive capsulitis the medically referred term also known as “Frozen shoulder”, is a disorder in which the shoulder capsule, the connective tissue surrounding the glenohumeral joint of the shoulder, becomes inflamed and stiff, and grows together with abnormal bands of tissue, called adhesions, greatly restricting motion and causing chronic pain. Dr Robert Codman the reknown shoulder specialist first described 'Frozen Shoulder' in 1934, although this painful shoulder condition had frustrated patients and doctors for centuries before this. In 1945, Nevasier used the term Adhesive Capsulitis and described the pathology as being characterized by adhesions and contractures of the fibrous capsule that surrounds the shoulder joint. While other conditions can produce a stiff shoulder and shoulder pain, frozen shoulder is characterized by adhesions of the capsule.

Adhesive capsulitis syndrome is characterized by a progressive loss of both active and passive shoulder motion includes pain, limited range of motion and muscle weakness from disuse. Abnormal bands of tissue grow between the joint surfaces, restricting motion. There is also lack of synovial fluid, which helps the shoulder joint to move by lubricating the gap between the head of humerus and the socket in the scapula. These bands reduce the space between the capsule and ball of the humerus resulting from fibrosis and contracture of the joint capsule characterized by painful, stiff shoulder, gradual loss of active and passive shoulder motion.

The condition is of unknown etiology occurs in 2-5% of the general adult population and up to 20% of the patients with diabetes, mainly affects individuals of 40-60 years of age with female predominance and stroke, lung disease, arthritis, cervical disk disease or heart disease patients are also at a higher risk. Patients complain that the stiffness and pain worsen at night and usually dull or aching in nature which being worsened with attempted motion or if bumped.

The adhesive capsulitis has been described as having three stages.

First stage: The Freezing Stage

In this stage there is severe pain in the shoulder even at rest. There is also a decrease in shoulder external rotation and abduction ROM. These symptoms appear 2-3 weeks after onset of pain and can last from 10 to 36 weeks. Symptoms of loss ROM are secondary to the pain and are not true capsular contractures.

Second stage: The Frozen Stage

In this stage, pain is no longer present at rest but only with movement. There is decrease of capsular volume in the shoulder, which is reflective of loss of motion in all planes and pain in throughout the range. There may be evidence of atrophy of the rotator cuff, biceps, deltoids, and triceps brachii. Typically, this stage can last for 4 to 12 months.

Third stage: The Thawing Stage

In this stage there is a slow but progressive recovery of ROM. The recovery of ROM is due to capsular remodelling.

Treatments for adhesive capsulitis include physiotherapy interventions such as heat application, ultrasound, interferential treatment, stretching exercises, and manipulative treatment options that includes high velocity, low amplitude manipulation, end range mobilization, midrange mobilization etc.

Irvin Korr, J. S. Denslow and colleagues did the original body of research on manual therapy.[4] Korr described it as the "Application of an

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accurately determined and specifically

directed manual force to the body, in order to improve mobility in areas that are restricted; in joints, in connective tissues or in skeletal muscles."[5]

According to the Orthopaedic Manual Physical Therapy Description of Advanced Specialty Practice manual therapy is defined as a clinical approach utilizing specific hands-on techniques, including but not limited to manipulation/mobilization, used by the physical therapist to diagnose and treat soft tissues and joint structures for the purpose of modulating pain; increasing range of motion (ROM); reducing or eliminating soft tissue inflammation; inducing relaxation; improving contractile and non-contractile tissue repair, extensibility, and/or stability; facilitating movement; and improving function.[6]

A consensus study of US chiropractors[7] defined manual therapy (generally known as the "chiropractic adjustment" in the profession) as "Procedures by which the hands directly contact the body to treat the articulations and/or soft tissues."

The Spencer technique is a standardized series of shoulder treatments with broad application in diagnosis, treatment and prognosis developed by Spencer, D.O. in 1916. This approach is a well-known osteopathic manipulative technique that focuses on mobilization of the glenohumeral and scapulothoracic joints used to treat shoulder restriction caused by adhesive capsulitis.

The Mobilizations with movement (MWM) has been developed by Mulligan can be used in isolation or integrated with other manual approaches to improve the quality of joint intra articular gliding, neurodynamics and the facilitation of correct muscle recruitment.

Additional studies and systematic reviews clearly support the use of exercise to treat pain and disability in persons with adhesive capsulitis. The exercise program was divided into 3 phases, with each phase consisting of strengthening/muscle re-education exercises for the scapula stabilizers and the rotator cuff in addition to flexibility exercises.

A slouched posture is associated with reduced arm elevation strength37 and a reduction in the dimension of the subacromial space.79

Strengthening exercises were performed with 2 to 3 sets of 10 repetitions, using a 120-cm-long precut section of latex-free Thera Band. Patients began exercising using the non-latex yellow band at mild tension and were progressed to the next color resistive band in the sequence: yellow, red, green, and blue. Stretching exercises were designed to increase the flexibility of the glenohumeral capsule and other soft tissues.

However no studies have found in the literature to compare the effectiveness of manual therapy versus comprehensive impairment based exercises for adhesive capsulitis which become the main purpose of this study.

NEED OF THE STUDY

Adhesive capsulitis syndrome is characterized by a progressive loss of both active and passive shoulder motion includes pain, limited range of motion and muscle weakness from disuse. Abnormal bands of tissue grow between the joint surfaces, restricting motion. There is also lack of synovial fluid, which helps the shoulder joint to move by lubricating the gap between the head of humerus and the socket in the scapula. These bands reduce the space between the capsule and ball of the humerus resulting from fibrosis and contracture of the joint capsule characterized by painful, stiff shoulder, gradual loss of active and passive shoulder motion.

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Treatments for adhesive capsulitis include physiotherapy interventions such as heat application, ultrasound, interferential treatment, stretching exercises, and manipulative treatment options that includes high velocity, low amplitude manipulation, end range mobilization, midrange mobilization etc. Irvin Korr, J. S. Denslow and colleagues did the original body of research on manual therapy.

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Manual and manipulative treatment options for this condition include high-velocity, low amplitude manipulation, end-range mobilization, mid-range mobilization and mobilization with movement of the shoulder only and/or of the shoulder girdle.

The Spencer technique is a standardized series of shoulder treatments with broad application in diagnosis, treatment and prognosis developed by Spencer, D.O. in 1916. This approach is a well-known osteopathic manipulative technique that focuses on mobilization of the glenohumeral and scapulothoracic joints used to treat shoulder restriction caused by adhesive capsulitis.

AIM OF THE STUDY

The aim of the study is to compare the effectiveness between manual therapy and comprehensive impairment based exercises for adhesive capsulitis on improvement of pain and functional ability.

OBJECTIVE OF THE STUDY

The main objectives of the study are:

1. To study the effects of manual therapy and comprehensive impairment based exercises for adhesive capsulitis.
2. To find out the improvement of pain, mobility and functional abilities for adhesive capsulitis.
3. To compare the effects of manual therapy and comprehensive impairment based exercises for adhesive capsulitis.

HYPOTHESIS

Alternative Hypothesis

There would be significant difference between the effects of manual therapy and comprehensive impairment based exercises for adhesive capsulitis.

Null Hypothesis

There would be no significant difference between the effects of manual therapy and comprehensive impairment based exercises for adhesive capsulitis.

METHODOLOGY

Study design:Comparative study

Sample selection: Randomised

Sample size: 60 participants with diagnosed adhesive capsulitis

Study centre: Various Physiotherapy out patients department of JRNRV University

Study duration: 45 minutes per session, 4 days per week, 24 weeks

Inclusion criteria:

1. Diagnosed Adhesive capsulitis
2. Age between 40-55 years
3. Both males and females

4. Well oriented

Exclusion criteria:

1. Presence of recent fracture in shoulder region
2. Presence of skin infections around shoulder region
3. Mentally retarded persons
4. Presence of other Red flags
5. Patients previously treated with corticosteroid injection

STUDY MATERIALS:

1. Written consent form
2. Assessment form
3. Treatment couch
4. Paper-pencil
5. Ultrasound Therapy machine
6. Ultrasonic gel
7. Cotton
8. Chair
9. Thera Bands

OUTCOME MEASURES

1. VAS (VISUAL ANALOGUE SCALES)
2. SPADI (SHOULDER PAIN AND DISABILITY INDEX)

PROCEDURE

Group A:

30 patients were randomly selected after meet all the inclusion and criteria. They were being thoroughly explained about the procedure and individual written consent form had collected. Then ultrasound therapy given with 3 MHz frequency in continuous mode for 8 minutes followed by manual therapy which consisted of 3- phase progressive exercise programme includes: -

Posterior shoulder:

1. GH posterior glide
2. GH posterior glide with active elevation (MWM)
3. Cross-body posterior shoulder stretch
4. Internal rotation passive stretching

Inferior shoulder:

1. GH inferior glide

Scapula:

1. Antero-posterior gliding
2. Scapular mobilisation (protraction and retraction)

Stretching

Performed at all phases, 30s, 3 repetitions

1. Towel stretch supine
2. Doorway pectoral stretch
3. Cross-body stretch
4. Shoulder external rotation cane stretch
5. Shoulder internal rotation towel stretch
6. Shoulder flexion stretch; in all phases (1-3)

Group B:

30 patients were randomly selected after meet all the inclusion and criteria. They were being thoroughly explained about the procedure and individual written consent form had collected. Then ultrasound therapy given with 3 MHz frequency in continuous mode for 8 minutes followed by comprehensive impairment exercises –

Strengthening

2-3 sets of 10 repetitions, progressing from the yellow to red to green to the blue band

Phase 1:

1. Resisted shoulder external rotation
2. Resisted shoulder internal rotation
3. Resisted scapular retraction
4. Resisted shoulder extension
5. Resisted scapular protraction in supine

Phase 2:

1. Resisted shoulder abduction in scapular plane
2. Resisted shoulder external rotation with abduction
3. Resisted shoulder internal rotation with abduction
4. Prone scapular retraction and shoulder elevation "Y"

5. Prone shoulder elevation in ER with scapular retraction "T"

Phase 3:

Continue phase 2 and add:

1. Body blade below 60°
2. Body blade above 60°
3. Lawn mower pull

Home exercises taught for both the groups -

1. Codman's pendular exercises,
2. Finger ladder,
3. Shoulder pulley
4. Towel exercises,
5. Stick exercises,

Phase 1:

1. Resisted shoulder external rotation
2. Resisted shoulder internal rotation
3. Resisted scapular retraction
4. Cross-body stretch

Phase 2:

1. Resisted shoulder abduction in scapular plane
2. Resisted shoulder external rotation with abduction
3. Prone scapular retraction and shoulder elevation "Y"
4. Cross-body stretch

Phase 3:

1. Shoulder abduction in scapular plane
2. Prone scapular retraction and shoulder elevation "Y"
3. Prone shoulder elevation in ER with scapular retraction "T"

Subjects of both the group advised to do the exercise at home and repeat on the next session.

Each phase of home exercise programmes were supervised for making them familiar so that the patients could easily perform at home.

The pre-test and post-test value of VAS and SPADI score taken on baseline (day 1) and 24wks for both the groups and recorded safely for statistical analysis.

DATA ANALYSIS

Mean, standard deviation, paired't' test and unpaired't' test has performed for analysis of pre and post data evaluation within and between groups. 'SPSS 20' software has used for statistical analysis. The parametric test results within the group and between the groups were obtained and statistically analysed using Student's paired and unpaired t-tests, respectively.

RESULTS & DATA INTERPRETATION

Analysis pretest and post test score within and between the values of groups are tabulated with intervention of the result of the study.

A.WITHIN GROUPS:

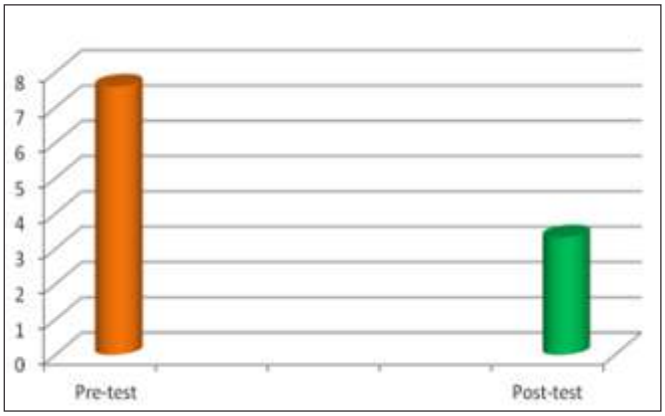
TABLE 1

GROUP A

VAS	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
P re-test	30	7.6	0.4982	0.09	4.24	29	40.06	<0.001**
P ost-test	30	3.33	0.4794	0.0875				

** significant

Graph 1

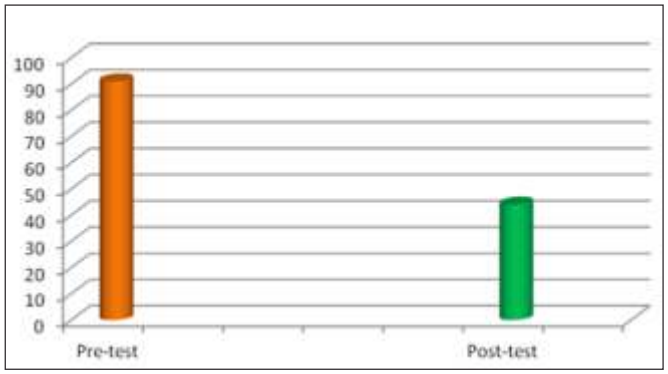


Graph 1

VAS	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre-test	30	7.067	0.868	0.158	3.5	29	16.85	<0.001**
Post-test	30	3.567	0.727	0.132				

**** significant**

Graph 2



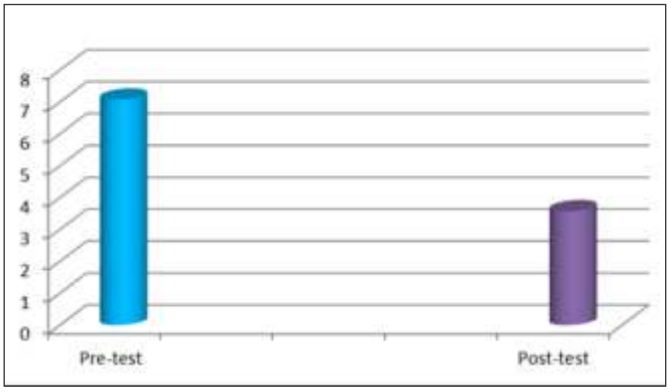
INTERPRETATION:

The above table and graph shows the comparison of score for the SPADI score within Group A.

VAS	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre-test	30	7.067	0.868	0.158	3.5	29	16.85	<0.001**
Post-test	30	3.567	0.727	0.132				

**** significant**

Graph 3



INTERPRETATION:

The above table and graph shows the comparison of score for the VAS score within Group B.

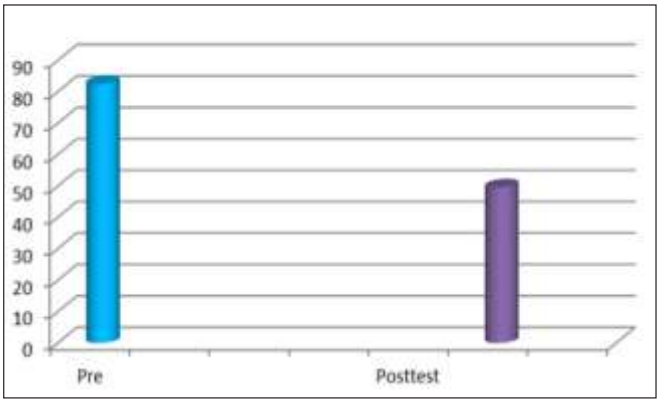
TABLE 1

GROUP A

SPADI	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Pre	30	82.40	2.253	0.645	32.43	29	60.028	<0.0001**
Posttest	30	49.47	2.161	1.059				

**** significant**

Graph 4



INTERPRETATION:

The above table and graph shows the comparison of score for the SPADI score within Group B.

B.BETWEEN GROUPS:

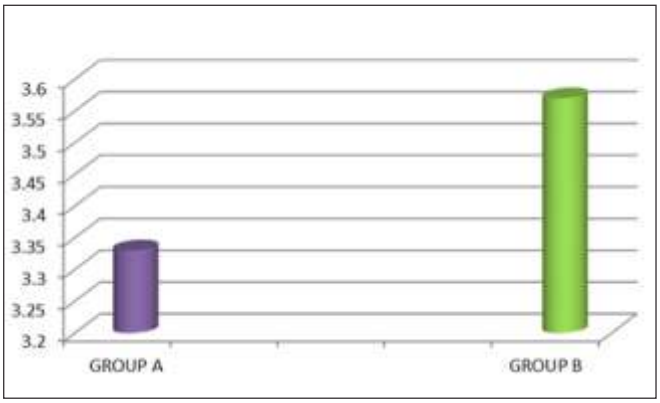
TABLE 5

VAS

Post-test	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
GROUP A	30	3.33	0.4794	0.09	0.24	29	24.21	<0.001**
GROUP B	30	3.57	0.727	0.132				

VAS

Graph 5



INTERPRETATION:

The above table and graph shows the comparison of mean value of post score for the VAS between Group A & Group B.

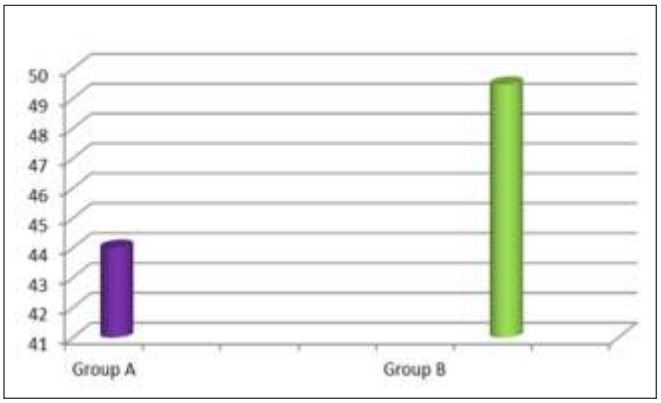
TABLE 6

SPADI

Post-test	N	Mean	SD	Std. Error Mean	Mean Diff	df	t	p
Group A	30	44.0	5.801	1.059	5.47	29	24.861	<0.0001**
Group B	30	49.47	2.161	1.059				

** significant

Graph 6



INTERPRETATION:

The above table and graph shows the comparison of mean value of post score for the SPADI between Group A & Group B.

The intent of this study was to compare effects of manual therapy exercises versus comprehensive impairement based exercises for the adhesive capsulitis conditions in improving pain, and shoulder functional activity. A secondary purpose was to explore the individual value of specific manual therapy techniques. In terms of improving shoulder mobility, the evidence suggests that patients receiving manual therapy interventions for shoulder pain will demonstrate improvements in range of motion (ROM).

In this study both the group shows significant effects on reducing pain and improving functional activity ($p<0.0001$), but group A showed statistically high significant while comparing with group B.

Increasing posterior capsule flexibility supported normal scapula-humeral rhythm and increased range of shoulder motion especially internal rotation [7,25] This tightness could be solved by the application of manual therapy techniques for the posterior capsule. Vermeulen et al[10] concluded that in subjects with adhesive capsulitis of the shoulder, high-grade mobilization techniques (HGMT) appear to be effective in improving glenohumeral joint mobility and reducing disability.

According to Giovanni Maria D'Orsi Adhesive Capsulitis (AC) is a shoulder condition characterized by a gradual and painful loss of both active and passive range-of-motion (ROM) in all planes of glenohumeral joint, especially external rotation1, resulting from progressive fibrosis

and contracture of the glenohumeral joint capsule.According to C.G Bise PT Manual therapy is used to treat motion impairments that cause pain and decreased range of motion. Joint-specific techniques are indicated when the motion impairment is caused by loss of the normal joint motion as a result of a reversible joint hypomobility. Once pain has been reduced and joint mobility improved with the application of manual therapy, it is easier for a patient to regain normal movement patterns and restore maximal function.

According to Angela R. Tate Strengthening rotator cuff and scapular muscles, with stretching and manual therapy aimed at thoracic spine and the posterior and inferior soft-tissue structures of the glenohumeral joint appeared to be successful in the majority of patients. It describes a comprehensive impairment-based treatment which resulted in symptomatic and functional improvement in 8 of 10 patients in 6 to 12 week.

Group B showed significant effects on comprehensive exercise. But while comparing then it should less significant then manual therapy.

Ultrasound therapy helped to break the adhesion and improve the blood circulation all those together helped to improve the functional performance by reducing pain and increase joint mobility.

CONCLUSION

This study concludes that manual therapy and comprehensive impairment based exercises both is statistically significant for adhesive capsulitis on improvement of pain and functional ability. But while comparing the group treated with manual therapy showed statistically more effective than the group treated with comprehensive exercise on reducing pain and improving functional performance for adheshive capsulitis.

LIMITATION AND RECOMMENDATION

Limitation

- Small sample size
- Short duration of study
- Only two types of intervention is used

Recommendation

Further study could be performing with

- Large number of sample
- Duration of study for long period
- Different condition may be selected
- Compare with more interventions

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Effects Of MRP Vs Task Specific Training On Chronic Hemiplegic Stroke

Logeshwari Selvaraj*, M.S. Sundaram,**
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ABSTRACT:

Functional independence is one of the most important component in post stroke patients to enhance better functional performance their postural stability has to be improved and maintained. Hence this study aimed to know the Effect of MRP Vs Task Specific Training in Chronic Hemiplegic Stroke patients.

Methods: A comparative study was done for 40 chronic stroke patients and divided into 2 groups based on inclusion criteria using simple lot method. Group A (MRP) and Group B (Task specific training) & both groups were given aerobic exercises and followed up for 12 weeks. The pretest and post test values were assessed using the outcome measures such as POMA, TUG, IQ-CODE, SSQOL.

Result: There was significant difference in the POMA, TUG, IQ-CODE, SSQOL between 2 groups with $p<0.05$. The group A had more significance than group B in POMA & IQ-CODE. Group B had more significance in SSQOL & TUG in improving cognition, balance, gait and functional performance in chronic hemiplegic stroke patients.

Conclusion: Group A had better prognosis when compared to Group B and hence we concluded that motor relearning along with aerobic exercises can improve the functional performance of stroke patients.

Keywords: Aerobic exercise, IQ-CODE, POMA, stroke & TUG

INTRODUCTION:

Dynamic imbalance affects the walking and hence the functional performance after stroke which eventually reduces the quality of life in chronic hemiplegic stroke. Balance deficit leads to an insufficient co-ordination , insecurity and reduced postural stability during standing and less coordinated response to both self induced and external balance perturbations [1].

The lack of cardiovascular fitness after stroke is considered to be an typical cause, which has an pessimistic inference in the rehabilitation of stroke. WHO definition for stroke is Rapidly developing clinical signs of focal disturbances of cerebral functions with symptoms lasting more than 24 hours or longer leading to death, with no or apparent cause other than a vascular origin [1].

The American heart association (AHA) commend that the aerobic exercises should be a basic component of stroke rehabilitation, which is found to be effective in improving the cardiovascular fitness, cognition, gait and mobility by breaking the physical inactivity and functional decline [2,3].

Cognitive impairment is considerably a big problem that affects 70% of people after stroke which makes it difficult to recall the motor skills which notably impairs the functional performance and the quality of life [4]. Interference in cognitive tasks and motor activity is important for functional improvement in patients with neurological deficits[5] . Therefore, it is necessary to consider both cognitive and motor training in rehabilitation therapy[6]. Physical activities such as walking and jogging resulted in a reduced risk of cognitive impairment in stroke survivors[7]. Learning the motor skills are disrupted by the cognitive impairment [8], restricting the

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capacity of patient to perceive, repeat & examine the recovering movement [9].

Many researchers have started the inquiry about how the aerobic exercises can bring advancements in other outcomes like cognition and relearning the complex skills by increasing neurotrophins and blood supply to the brain apart from improving the fitness and gait[10]

Another major perspective that has been proposed to improve the cognitive function is aerobic exercise. It has been recommended that the aerobic exercises enhances the arousal level and reduces depressive symptoms which in turn gives the better cognitive function [4].

Barbara M in his study on "Aerobic Exercise Improves Cognition and Motor Function Poststroke" have stated that , Recently.. aerobic exercise (AEX) are shown to be beneficial for improving executive function for healthy adults, in addition it also helps in improving cardiac function, balance, and coordination. Yet no studies have examined the effects of AEX on cognition after hemiparetic stroke, or considered if lower extremity AEX promotes generalized sensorimotor learning for motor performance across limbs, such as the nonaffected upper extremity[11].

Subjects with hemiplegia due to stroke attack flourish unequal posture of the paretic lower limb bearing only 25-43% or less of their weight in standing which brings on disability to maintain their balance that leads to an abnormal gait pattern[12].

Co-ordination of movement pattern and balance both involve the complex pyramidal and extra pyramidal systems that are disrupted by stroke. There is impairment in muscle force generation particularly with sustaining force and delay in anticipatory and postural activities on the hemiplegic's side. Stroke disturbs the autonomic postural response that contributes to sitting and standing balance. Gait is the most important pursuit for permitting community participation. The primary aim of most of the individuals affected with stroke is the functional ambulation[13]. Walking pattern of stroke includes slow gait cycle, shorter stance phase on the affected side and longer swing phase [14].

Patients affected with stroke mostly spend their time on bed with physical inactive lifestyle which may influence the cardiovascular fitness, deterioration of physical functioning and eventually reduced quality of life [3].

Motor relearning program believes in brain ability to recuperate, since it is dynamic and is capable of reorganisation and adaptation[15]. Motor relearning program can be initiated as soon as the patient becomes medically stable. Motor training results in performance improvements that are associated with re-organisation [16].

Previous study showed that the improvement in motor function is greater in motor relearning program comparing to bobath [15].Dora et al carried out an randomized controlled trail study to find the effectiveness of the motor relearning programme approach in enhancing the physical functional activity and task performance for stroke patients. The motor relearning program is hence found to be potent for improving the functional recovery of stroke subjects[16].

Motor relearning program focuses on improving motor control and relearning of daily activities. Four steps involved in motor relearning are :-

1) Analysis of the task 2) Practice of missing component 3) Practice of task

4) Transference of training [17].

Now focusing on the task specific training involves practicing normal living tasks/activities. It is found to be demanding and involving active participation. Task specific training demands for a lot of practice to lend the patient gain control for solving the motor problems[18] . Fernandez in his study have said that resistance training led to enhancement in cognitive performance and maximized cognitive recovery

after a stroke[19]. Sae Hoon Chung have stated that Tai Chi training, a kind of task-specific training that combines aspects of aerobic, strength, flexibility or balance training, has positive effects in both cognitively impaired adults and healthy older adults[6].

Task-specific lower extremity training (TSLET) is a complex lower extremity exercise during which subjects learns about lower extremity movement while solving a problem using visual feedback.

The task-specific lower extremity training is a relatively safe and easy training method, which can be applied for stroke patients with low functional level[6]. The client's desire to resume roles, habits, and routines following a stroke, and the environmental demands on the client when he or she returns home, makes the home an ideal place to engage in TOT using real world activities[19] . It is also found to limit the compensatory movements and enhance the adaptive movements in them.

By training of motor skills, rehabilitation focuses to increase the patients functional performance and quality of life [20]. It is the method in which we focus on particular functional tasks connected to musculoskeletal and neuromuscular system[21].

Many evidence have proved that the task specific training for the people with stroke will result in greater improvements in walking and functional performances[22] . Many of the previous studies have also shown that the task specific training focusing on lower limb have a greater impact in enhancing the functional mobility and physical activity in individuals with stroke[23].

Ranjeet Singha, in his study with the stroke population have shown that the task specific training and motor relearning program for paretic muscles leads to an improvement in lower limb weight bearing in sitting, standing up and walking[16].

Ting-Ting Yeh (2017) have reported that the post stroke cognitive deficits are strongly associated with functional disability and risk of developing dementia. According to Zheng G, Aerobic exercises are considered to be effective in improving cognitive function and has the advantage of being simple, convenient, efficient, inexpensive, and without any severe adverse effects . Motor relearning program is found to improve basic mobility in sit to stand, stand to sit and walking in chronic stroke patients. On the other hand task specific training has been shown to be effective in improving mobility and physical activity in individuals with chronic stroke. Hence the study was done to check the effect of motor relearning program and task specific training in addition with aerobic exercise in improving cognition, balance, gait and functional performance in chronic hemiplegic stroke patients.

Methodology : A comparative study was done for 40 chronic stroke patients from vadallur using simple random sample method. The inclusion criteria : Chronic hemiplegic subjects (after 6-12 months of duration), Age : 25 – 65 years, Gender : both male and female, Brunnstrom stage for Paretic lower limb grading : stage 4 /or stage 5, Subjects who are able to walk with or without support, MMSE Score >24. The exclusion criteria : Uncooperative patients, any recent fracture in lower limb, any other neurological (dementia, parkinsonism, epilepsy, tumours etc..), orthopaedic or cardiovascular conditions, recent surgeries in lower limb. They were divided into two groups. Group A (MRP) and Group B (Task specific training) & both groups were given aerobic exercises and followed up for 12 weeks. The pretest and post test values were assessed using the outcome measures such as POMA, TUG, IQ-CODE, SSQOL.

PROCEDURE:

The participants for the study were selected based on the inclusion and exclusion criteria. The subjects included for the study were asked to fill the informed consent form , stating that they had no objection in participating in this intervention and the assessment was taken based on the outcome measures (POMA, TUG, IQ-CODE, SSQOL).

Total of 40 chronic hemiplegic subjects were taken

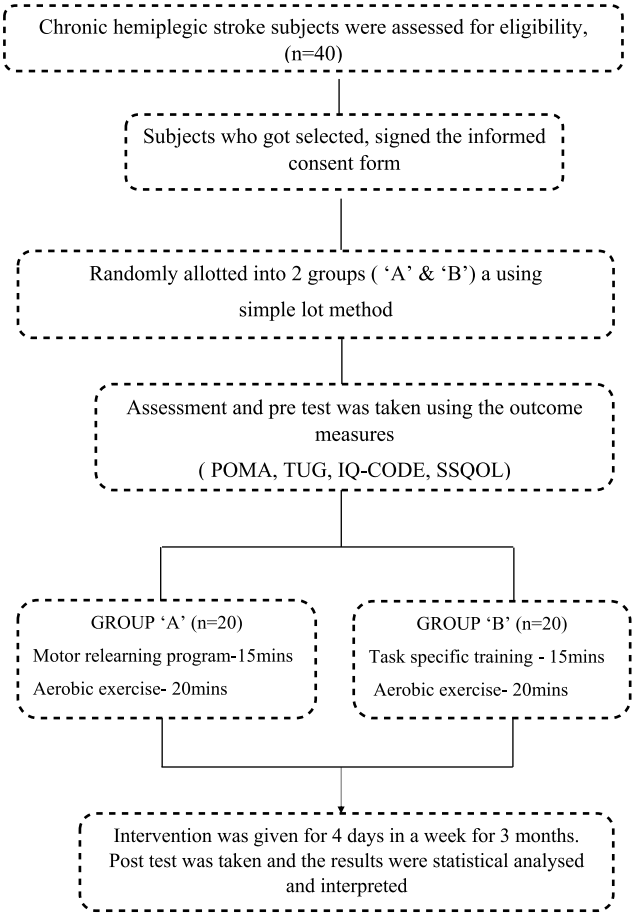
and were randomly divided into 2 groups using a simple Lot method. The duration of the study was 3 months with the intervention program given for 4 sessions per week, each 45 minutes.

- Group 'A'- 20 (male 11 and female 4) : Motor relearning program - 15 mins

  Aerobic exercise – 20 mins
- Group 'B'- 20 (male 10 and female 5) :Task specific training – 15 mins

  Aerobic exercise – 20 mins

Warm up and cool down exercise was given for 10 minutes in each group. The pre test was taken and the exercise were demonstrated to the subjects and was informed to do the exercise regularly. Subjects were allowed to withdraw this study if they had any discomfort. During the intervention session the subjects were advised to wear comfortable cloths . Post test was taken after the 12 weeks of exercise program. Finally the pre and post test values were recorded and analysed statistically.



WARM UP EXERCISES (5 mins)

- Hip flexion and extension – 10 times
- Ankle rolls - 20
- Seated kicks – 10 times
- Marching on the spot - 30 times

(standing by holding the chair support in front).

COOL DOWN EXERCISE (5 mins)

- Calf and hip stretch– 5 times
- Trunk rotation stretch– 5 times
- Hamstring stretch – 5 times

MOTOR RELEAERNING PROGRAM [GROUPA]

1] GAIT TRAINING (5 MINS)

a) TO TRAIN HIP EXTENSION THROUGH OUT STANCE PHASE (1 MINS)

- Stand with correct hip alignment
- Practice stepping forward and backward with intact legs
- Affected hip should extend when stepped forward

b) TO TRAIN KNEE CONTROL FOR STANCE PHASE (1 MINS)

- Subject sitting with knee straight on a chair
- Therapist – gives firm pressure through heel towards knee
- Subject will practice controlling eccentric and concentric of quadriceps through 15 degree range. Attempts to keep the knee straight
- Subjects will be instructed to bend knee little and straighten the knee.
- Followed by Stepping forward and backward with intact legs in front of affected leg , then move his weight forward over intact foot and back while maintaining knee extension of affected leg

c) TO TRAIN LATERAL HORIZONTAL PELVIC SHIFT (1 MINS)

- Subject standing

- Hip in front of the ankle
- Practice shifting weight from one foot to the other

d) TO TRAIN FLEXION OF KNEE AT START OF SWING PHASE (1 MINS)

- Subject prone on bed
- Therapist flex the knee below 90 degree
- Subjects practice controlling knee flexors both eccentrically and concentrically through the small range of movement and holds the knee in different parts of range
- Subjects were instructed to bend the knee and hold it for 5-10 sec and then straighten the knee.

e) TO TRAIN KNEE EXTENSION AND FOOT DORSIFLEXION AT HEEL STRIKE : (1 MINS)

- Subject stand on intact leg
- Holds the affected foot in dorsiflexion with knee in extension
- Subject move weight onto heel
- Therapist instructs to shift weight forward so to put his heel down

2] PRACTICE OF TRAINING (5 MINS)

This is done by practicing the walking itself & stepping forward with the intact leg first.

3] TRANFERENCE OF TRAINING INTO DAILY LIFE (5 MINS)

Subjects were told to walk in different places or rooms in their home environment everyday depending on subject's tolerance along with their family members to prevent fall.

TASK SPECIFIC TRAINING : (GROUP B) – (15 MINS)

- Stand with paretic limb behind and kick the ball using intact leg.
- Step up onto a stepper , starting with the Paretic limb, and step down, starting with the non paretic limb.
- Standing position : heel raise while putting an object on a higher shelf.

AEROBIC EXERCISE (given commonly for both the groups 'A' & 'B') – for (20 MINS)

- walking
- Stair climbing and descending

DATA ANALYSIS & INTERPRETATION :

All statistical analysis were performed on IBM compactible micro computer using statistical package for the social sciences (SPSS 20.0).

The significance was set at alpha = 0.005 level paired t Test was used to compare the pre and post values POMA (Tinetti performance oriented mobility assessment), TUG (Time up and go test) cognitive questionnaire and Stroke specific quality of life questionnaire in chronic hemiplegic subjects.

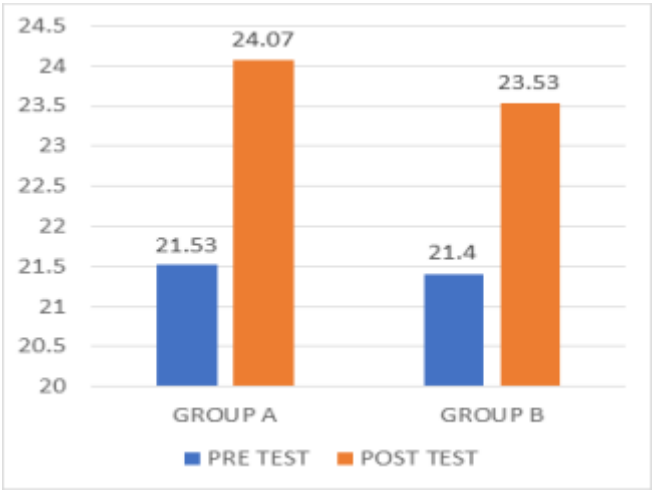
TABLE – 1: Effect of Motor Relearning Program In Improving Cognition, Gait And Functional Performance In Chronic Hemiplegic Stroke of **GROUP A**

OUTCOME MEASURE	MEAN	STANDARD DEVIATION	t - VALUE	p - VALUE
POMA PRE	21.53	1.60	-10.72	0.000
POST	24.07	1.44		
TUG PRE	38.00	4.36	14.47	0.000
POST	31.87	4.72		
IQCODE PRE	1.57	0.13	9.83	0.000
POST	1.38	0.15		
SSQOL PRE	184.60	3.31	-14.74	0.000
POST	191.00	4.47		

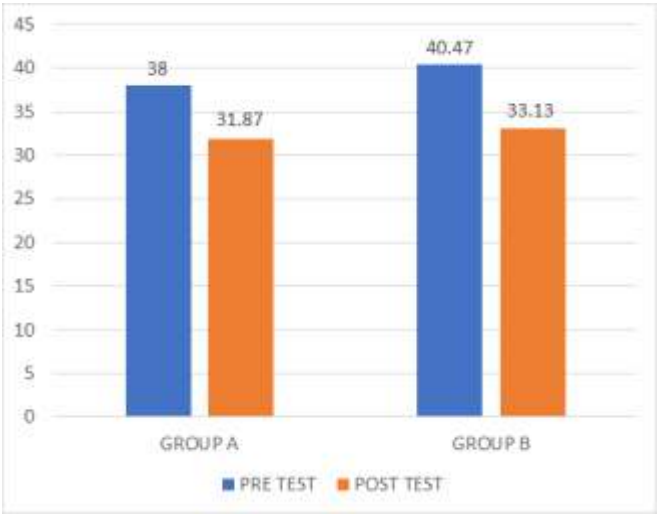
TABLE – 2: Effect of Task Specific Training In Improving Cognition , Gait and Functional Performance In Chronic Hemiplegic Stroke of GROUP B

OUTCOME MEASURE	MEAN	STANDARD DEVIATION	t - VALUE	p - VALUE
POMA PRE	21.40	1.50	7.34	0.000
POST	23.23	1.6.0		
TUG PRE	40.47	5.08	16.14	0.000
POST	33.13	4.81		
IQCODE PRE	1.47	0.17	5.44	0.000
POST	1.35	0.15		
SSQOL PRE	184.93	4.20	17.97	0.000
POST	192.33	50.7		

Graph 1: Comparison of POMA score between Group A & Group B

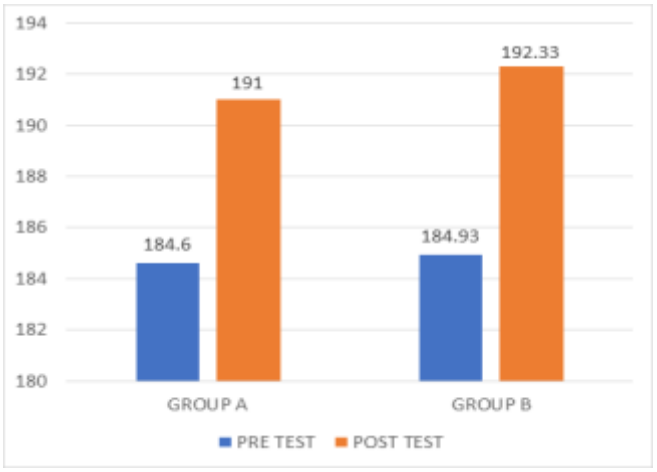


Graph 2: Comparison of TUG score between Group A & Group B



Graph 3: Comparison of IQ-CODE score between Group A & Group B

Graph 4: Comparison of SSQOL score between motor relearning program and task specific training



RESULT : -

TABLE 1 :- Shows that the mean and standard deviation values of GROUP 'A' (MOTOR RELEARNING PROGRMME AND AEROBIC EXERCISE) is IQ-CODE questionnaire : 1.38± 0.15 , SSQOL questionnaire : 191.00 ± 4.47 , POMA : 24.07±1.44 , TUG : 31.87±4.72 .

TABLE 2 :- Shows that the mean and standard deviation values of GROUP 'B' (TASK SPECIFIC TRAINING AND AEROBIC EXERCISE) is IQ-CODE questionnaire : 1.35±0.15 , SSQOL questionnaire : 192.33±50.07 , POMA : 23.23±1.60 , TUG : 33.13± 4.81 .

DISCUSSION

This study was designed to compare the effect of motor relearning program and task specific training

combined with aerobic exercise among chronic stroke subjects. Many of the previous evidence have proved that the task specific training , motor relearning program and aerobic exercises have their individual effects on improving the functional performance in chronic stroke subjects.

Rosenbaum has pointed out that movement or task becomes more skilled with learning, and this is probably due to improvements in timing, tuning, and coordinating muscle activations[16].

Focussing on the subjects who faced major problems in moving their limb and performing daily activities after getting affected have undergone unusual amount of stress and depression which eventually made them mentally feeble experiencing cognitive impairment.

As a first step the motor relearning program was utilized in order to find their own problems in performance[16]. The task given to them in this study were used to target those missing component[16].The participants were supported by both the physiotherapist and their family members[16].

Though the management of neurological deficits and declined function after stroke became the critical issue in competition with the pharmaceutical management of risk factors and motor dysfunction and also the intervention for cognition still remained under developed[4].

Cognitive debt in chronic stroke subjects are strongly related with the functional disability , lack of independency and sometimes dementia, which increase the risk rate in those affected subjects[4]. As already been discussed in previous article of tin-ting yeh that the aerobic exercises has a very good advantage in enhancing the functions of brain and hence cognition[4].

Motor relearning emphasis on giving practice of particular motor task, training the controlled muscle action and controlling the movement component of the tasks performed and hence this method provides relearning of the day to day activities and not just practicing facilitation and non specific exercise[18].This study has been done to know the difference in effectiveness of motor relearning program combined with aerobic exercise and task specific training combined with aerobic exercise in chronic stroke subjects.

Previous article of Ranjeeta Singha have stated that three week of motor relearning program done for at least half an hour , 3 time a week is found to be effective for improving basic mobility of sit to stand , stand to sit and walking in chronic stroke subject in their home setting and she had also concluded that MRP should be recommended for improving the basic mobility in chronic stroke subjects [16]. In this study, one group of chronic stroke patients were given with motor relearning program for 15 min which was then followed by the aerobic exercises for 20 min , initially before starting the session the MRP was planned in such a way that the participant were allowed to identify their own problems and then the particular task were alotted to them While performing MRP, family support and physiotherapy assistance was given to them for a more safer side. Task specific training was given to them while they were doing their normal daily activities which made this session more fun filling. Aerobic exercises on the other hand was involved for both the therapy group 'A' and 'B' for 20 min each.

According to this, two groups were statistically significant in POMA (performance oriented mobility assessment) , TUG (time up and go test) , stroke specific quality of life questionnaire and cognitive questionnaire with ($p=0.000$) . Monitoring the POMA scale over post stroke period is also important to know the gait and balance status of the patient. According to this result , balance and gait was more improved in group A – "MOTOR RELEARNING PROGRAM AND AEROBIC EXERCISE", when compared to group B (TASK SPECIFIC TRAINING AND AEROBIC EXERCISE) The time up and go test is commonly

used to measure the balance and walking ability in which the patient rise from the chair then walks 3m and returns back to the chair in the same position.

The outcome measure of time up and go test of three meters were found to be more increased in group B (TASK SPECIFIC TRAINING AND AEROBIC EXERCISE)than group A – ("MOTOR RELEARNING PROGRAM AND AEROBIC EXERCISE"). Stroke specific quality of life questionnaire consists of 49 items covering 12 domains : Mobility , energy , upper extremity function , work and productivity , mood , self care , social roles , vision , language , thinking and personality[33] . Each domain is measured by three to six items using 5-points (1-5) scale.

The outcome measure of stroke specific quality of life questionnaire is found to be more improved in group B (TASK SPECIFIC TRAINING AND AEROBIC EXERCISE) than group A (MOTOR RELEARNING PROGRAM AND AEROBIC Exercise. The questionnaire on cognition decline in elderly (IQCODE) , is a structured interview based on informant response that is used to assess for possible dementia. The outcome measure of IQCODE is found to be more improved in group 'A' (MOTOR RELEARNING PROGRAM AND AEROBIC EXERCISE) than group 'B' (TASK SPECIFIC TRAINING AND AEROBIC EXERCISE) .

Hence the present study concluded that the factors such as Tinetti Performance Oriented Mobility Assessment (POMA), Time up and go test, IQCODE questionnaire , Stroke specific quality of life questionnaire were compared between pre and post exercise training. Based on those factors, it was found that both motor relearning program and task specific training are effective and Treatment A was effective than Treatment B Further recommendations: Including other training principles like (robotics and neuromodulating), large sample selection, Long duration follow would have been done.

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To study the effectiveness of TENS with Neural Mobilization and Neural Mobilization alone to relief pain and improve their functions in patient with cervical radiculopathy

Sadhana Tiwari

ABSTRACT

Background: Neural Mobilization and TENS both have been individually advocated for treatment of Cervical radiculopathy due to their various effects. But the combined effect of these techniques applied simultaneously has been explored in studies. Purpose of study is to know if Transcutaneous Electrical Nerve Stimulation (TENS) is more effective or Neural mobilization or both together is more effective to reduce pain in case of cervical radiculopathy treatment.

Methods: An experimental study design, 30 subjects with acute cervical radiculopathy. Patient were divided into 2 groups by Chit Method. Group A & Group B both the groups were treated for 5 days for 3 weeks.

·Group A(n=15) were treated with Neural mobilization along with TENS.

·Group B(n=15) were treated with only Neural Mobilization.

Outcome measures such as Visual Analogue Scale and Neck Deformity Index were measured before and after treatment.

Result: In comparison of post intervention mean of VAS and NDI there is a statistically significant ($p < 0.05$) difference in improvement in both the groups. Group A shows better results in improvement of cervical radiculopathy. Group A was given TENS along with Neural Mobilization and Neck Isometric. Group B was given only Neural Mobilization. Patients condition was improved faster in Group A.

Conclusion: This study concludes that both TENS and Neural Mobilization is effective in treatment of cervical radiculopathy. But application of TENS along with Neural Mobilization gave better result in improving quality of life , reducing pain, improving disability for cervical pain patients.

Key Words: Cervical Radiculopathy, Neck Deformity Index, Visual Analogue Scale, Neural Mobilization, Pain, Isometric Exercise, TENS.

INTRODUCTION

Radiculopathy of cervical spine is malfunction of nerve root of the cervical spine which is frequently seen in the physical therapy clinic. The seventh (C7; 60%) and sixth (C6; 25%) cervical nerve roots are the most commonly affected. The core muscles of the spine are weakened due to the sedentary life style, lack of daily exercises and continuously increasing physical and mental stress level that altered body mechanics and causes muscular instability. The symptoms of cervical radiculopathy are triggered by additional stress on this weakened structures.1

An epidemiologic survey of a population based study showed the annual aged – adjusted incidence of radiculopathy to be 83 per 100,000 persons.

Radiculopathy can be divided into acute, subacute and chronic. The location and pattern of symptoms will vary depending on nerve root level affected and can include sensory and motor alterations if the dorsal and/or ventral root is involved.5

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Cervical radiculopathy primarily presents with unilateral motor and sensory symptoms into the upper limb with muscle weakness (myotome), sensory alteration (dermatome), reflex hypoactivity and sometimes focal activity being the primary sign. Patients usually present with complaints of pain, numbness, tingling and weakness in the upper extremity which often result in significant functional limitations and disability.6

Neural Mobilization Techniques theorize to examine the neural tension in nerves and mobilize the nerves that exhibit neural tension by passive or active movements by using Tensioning, Sliding and Single Joint Movement techniques and focused on restoring the ability of the nervous system to tolerate the normal compressive, friction, and tensile forces associated with daily and sport activities. With this method, tension was gently applied to the involved nerve root that caused mild pulling but no pain and a low amplitude repetitive movement was introduced in the direction of perceived neural tension.

Transcutaneous electrical nerve stimulation (TENS) has been increasingly used in physical therapy for the relief of acute and chronic pain. TENS is particularly suited for the treatment of pain of neurogenic origin, including peripheral nerve injury, radiculopathies etc. The analgesic effect of TENS may be modulated by the endogenous opiate system through the release of endorphinergic substances

MATERIALS AND METHODS

This study was a comparative study with pre and post intervention. 30 subjects who met the inclusion criteria which includes age 25-45 years of either sex, Unilateral Cervical radiculopathy over a 10 months period as per diagnosed by orthopaedician or neurophysician, presence of three positive examination findings in the subjects like Upper limb tension test, Spurling's test and Cervical distraction test with simple random sampling were taken in to the study. Subjects with presence of any contraindication for TENS and neural mobilization, patients on medications for cervical radiculopathy, upper extremity symptoms due to cord compression and CNS cause, thoracic outlet syndrome were excluded from the study.

PROCEDURE

30 subjects were selected according to inclusion and exclusion criteria and divided into two groups Group A and Group B by chit method and both the groups were treated for 5 days for 3 weeks.

Group A(n=15) : Received Neural Mobilization, TENS and Isometrics Exercises.

Group B(n=15) : Received Neural Mobilization and Isometrics Exercises.

The study was carried out in three stages: a) Pre-intervention measurement b) Intervention c) Post-intervention measurement.

(a) Pre-intervention measurement: Patients in both group I and group II were assessed before starting treatment. Pre-treatment measurement was taken by using Visual Analog Scale (VAS) for pain and Neck Disability Index for functional outcome. VAS and NDI were carried out on the first day of treatment procedure (pre- treatment evaluation).

(b) Intervention: Group I and group II subjects were assessed for nerve affection using upper limb tension tests: ULTT 1 for Median nerve, ULTT 1A for Median nerve, ULTT 2b for Radial nerve, ULTT 3 for Ulnar nerve. Depending on the affected nerve neural mobilization was given to both Group I and Group II. TENS: Frequency of 40-70 Hertz, Intensity as per patient's tolerance, Pulse duration of 10- 50 Micro secs for 20 min. Electrode Placement is at the area of greatest intensity of pain. The treatment consisted of 14 sessions 7 times/week, for 2 weeks. (2) Neural Mobilization[10]: Depending on the affected nerve neural mobilization was given. The treatment consisted of 14 sessions, 5times/week for 3 weeks. The patient was positioned in neurodynamic test position according to the involved nerve and required sliding or gliding techniques were used. Neurodynamic positions. Neck Isometric exercises were given as they are beneficial to maintain the strength of neck muscles. Strengthen the neck and decrease injury risk.

Figure No. 13 ULNM 1 MEDIAL NERVE 1.

Figure No. 14 ULNM1A MEDIAL NERVE 1A

Procedure for upper limb nerve mobilization (Medial Nerve 1A)

Patient should be in supine at the edge of the plinth. Therapist should fix shoulder girdle of patient with help of his waist, shoulder depression, after maintaining the glide patients shoulder is abduction to 100, shoulder should be laterally rotated to slide the median nerve, elbow should me extended, wrist, finger and thumb also in extension (loading the medial nerve). Alteration of elbow flexion with wrist and finger flexion (unloading the medial flexion). Loading and unloading of nerve should be done for 6 sets of repetition. Each set was performed in slow, oscillatory manner with 10 seconds rest between sets.30

Procedure for upper limb nerve mobilization (Radial Nerve)

Patient should be in supine, diagonal on plinth. Therapist should fix shoulder girdle of patient with help of his waist, after maintaining the glide patients should abduct shoulder at few degrees around 15o, elbow should be in extension with shoulder medially rotated to slide the radial nerve, forearm in pronation, flexion of wrist, finger and thumb, and slowly abduction of shoulder (loading of radial nerve). Alteration of elbow flexion with forearm supination, extension of wrist and fingers (unloading the radial nerve). Loading and unloading of nerve should be done for 6 sets of repetition. Each set was performed slow, oscillatory manner with 10 seconds rest between sets.31

FIGURE NO. 15 ULNM RADIAL NERVE.

FIGURE NO. 16 ULNM RADIAL NERVE.

Procedure for upper limb nerve mobilization (Ulnar Nerve)

Patient should be supine at the edge of plinth. The therapist should stabilize patients shoulder with one hand. After maintaining the glide patients should abduct shoulder to 1200. Wrist extension with forearm pronation, elbow flexion, shoulder to be laterally rotated to slide the ulnar nerve and slowly abduction of shoulder to 1200(loading of ulnar nerve). Alteration of elbow extension with shoulder adduction and forearm supination with wrist flexion (unloading of nerve). Loading and unloading of nerve should be done for 6 sets of repetition. Each set was performed slow, oscillatory manner with 10 seconds rest between sets.32

NECK ISOMETRIC EXERCISES

Isometric exercises often are beneficial to maintain the strength of neck muscles. Strengthen the neck and decrease injury risk.

Procedure of neck isometric exercises:-

Ask patient to sit on chair with your feet flat on the floor. His/her weight should be slightly forward so that body is evenly balanced on the buttocks. Ask patient to relax their shoulder and keep head in level with chin tucked. Therapist will press his palm on patients forehead applying backward pressure and ask your patient to resist your movement with neck muscles. Hold for 10 seconds, relax and repeat 5 times.33

Figure no. 17 Isometrics neck exercises for cervical flexors.

Do the exercise again, pressing on sides of your head. Ask your patient to relax on chair, place your one hand on patients side head covering his ears and from your other hand stabilize the shoulder, apply pressure in uniform direction and ask patient to resist your movement with use of neck muscle. Hold for 10 seconds, relax and repeat 5 times, This should be performed on both the sides of head.34

Figure no. 18 Isometric neck exercise for cervical lateral flexors.

Do this exercise again, pressing on the back of your head. Keep your both the hand on patients back head just above the occipital region, apply pressure in forward direction and ask patient to resist your movements with use of neck muscle. Hold for 10 seconds, relax and repeat 5 times.35

Figure no. 19 Isometric neck exercise for cervical extensors.

(c) Post- intervention measurement: VAS and NDI were carried out again on the 14th day of treatment procedure (post-treatment evaluation) for all the patients.

RESULTS

Statistical Data

Comparison of Pre-Intervention VAS Scores In Group A & Group B

Pain Intensity Using VAS Group A	Subject	Mean ± SD	Mean Difference	t-Value	p-Value
Pre Intervention	N=15	7.33 ± 1.54	3.13	13.25	0.001
Post Intervention	N=15	4.21 ± 1.26			

Mean pre-intervention VAS in Group A was 7.33 ± 1.54 whereas 7.46 ± 1.18 post-intervention mean VAS respectively. Test of significance (paired t test) didn't observed statistically highly significant difference between pre-intervention Group A and pre-intervention Group B mean at both levels ($p>0.05$) which proves there is not much significant difference between pre-intervention Group A and post-intervention Group B level of pain parameter.

Comparison of Post-Intervention VAS Scores In Group A & Group B

Pain Intensity Using VAS	Subject	Mean ± SD	Mean Difference	t-Value	p-Value
Post Intervention Group A	N=15	4.20 ± 1.26	1.4	3.2	0.001
Post Intervention Group B	N=15	5.60 ± 1.12			

Mean post-intervention VAS in Group A was 4.20 ± 1.26 whereas 5.60 ± 1.12 post-intervention mean VAS in Group B respectively. Test of significance (paired t test) observed statistically highly significant difference between post-intervention Group A and post-intervention Group B mean at both levels ($p>0.05$) which proves there is significant difference between post-intervention Group A and post-intervention Group B level of pain parameter. There is marked difference in pain reduction in Group A in comparison to Group B.

Comparison of Pre-Intervention NDI Scores In Group A And Group B

Disability Assessment Using NDI For Group A	Subject	Mean ± SD	Mean Difference	t-Value	p-Value
Pre Intervention	N=15	36.56 ± 1.80	9.13	15.01	0.001
Post Intervention	N=15	27.40 ± 2.44			

Mean pre-intervention NDI in Group A was 36.53 ± 1.80 whereas 35.20 ± 4.49 pre-intervention means NDI values respectively. Test of significance (paired t test) didn't observed statistically highly significant difference between pre-intervention Group A and pre-intervention Group B mean at both levels ($p>0.05$) which proves there is not much significant difference between pre-intervention Group A and pre-intervention Group B level of disability associated with neck pain.

Comparison Of Post-Intervention NDI Scores In Group A And Group B

Disability Assessment Using NDI	Subject	Mean ± SD	Mean Difference	t-Value	p-Value
Post Intervention Group A	N=15	27.40 ± 2.44	5.73	4.59	0.001
Post Intervention Group B	N=15	33.13 ± 4.77			

Mean post-intervention NDI in Group A was 27.40 ± 2.44 whereas 33.13 ± 4.77 post-intervention means NDI in Group B respectively. Test of significance (paired t-test) observed statistically highly significant difference between post-intervention Group A and post-intervention Group B mean at both levels ($p>0.05$) which proves there is significant difference between post-intervention Group A and post-intervention Group B level of disability associated with neck pain. There is marked difference in disability reduction in Group A in comparison to Group B.

DISCUSSION

Overall 30 subjects who met with the inclusion criteria were randomly allocated into two groups. By conducting this study our aim was to treat the acute suffering in patient associated with cervical pain as well as to spread the awareness. 15 subjects from group A were treated with TENS along with Neural Mobilization while 15 subjects from group B were given only Neural Mobilization.

In comparison of both the groups Group A shows better results in improvement of cervical radiculopathy. Group A was given TENS along with Neural Mobilization and Neck Isometric. Group B was given only Neural Mobilization. Patients condition was improved faster in Group A. Hence this study proved experimental hypothesis which says "There will be significant effect of TENS along with Neural Mobilization in treating Cervical Radiculopathy".

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CONCLUSION

This study concludes that both TENS and Neural Mobilization is effective in treatment of cervical radiculopathy. But application of TENS along with Neural Mobilization gave better result in improving quality of life , reducing pain, improving disability for cervical pain patients.

TENS along with Neural Mobilization shows significance in reducing the pain level and improving ADL from pre-intervention to post-intervention.

It also showed that subjects from group A and group B both showed improvements in cervical pain from Day 1 of treatment to the 3rd week that was post intervention. Based on data we accept the experimental hypothesis and reject the alternate hypothesis.

RECOMMENDATION FOR FUTURE RESEARCH:

Further study is needed to find the effectiveness of combined techniques on outcome measures such as cervical spine movements, EMG studies, H reflex, muscle strength, and quality of life. Studies are needed on bilateral cervical radiculopathy and also with combination of other conventional treatment techniques, for other nerves involved in radiculopathy. Further randomized controlled trail is needed to find effect by increasing frequency of session in short term duration of study lesser than 3 weeks of treatment. The long-term effect of these techniques needs to be studied by follow-up.

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A Comparative Study Between Effects Of Plyometric Training Versus Resistive Training To Improve Pain And Ankle Instability In Collegiate Volleyball Players

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ABSTRACT

BACKGROUND: Volleyball players require greater speed, strength, explosive power, agility, flexibility and endurance to excel. This game is like other game requires both anaerobic as well as aerobic fitness but greater emphasis is placed on anaerobic fitness. Ankle instability is defined as debilitating condition incorporating recurrent sprains, persistent pain and repeated instances of giving way. Resistive training protocols with weights, thera bands and resistance machines are safe and do not negatively impact growth and maturation of youngsters. Plyometric training is also known as reactive training. It enhances performance during functional activities emphasizes the ability of muscles to exert maximal force output in a minimal amount of time. The present investigation was planned to find out to compare the effect of resistive training and plyometric training on improving the pain and ankle instability in collegiate volleyball players. AIMS AND OBJECTIVES: To compare the effectiveness of resistive training and plyometric training on ankle pain and instability in collegiate volleyball players. METHODOLOGY: Thirty volleyball players with pain and ankle instability were randomly selected according to inclusion and exclusion criteria and were divided into two groups – Group A and Group B. Both the groups were assessed for the pain status using visual analogue scale and ankle instability using the Cumberland ankle instability tool. These parameters were assessed before the start of the program as pre-test values and at the end of 12 weeks as post-test values. Both groups treated with RICE protocol for first two weeks. After two weeks Group A received resistive training and Group B plyometric training for 10 weeks. RESULT: The mean age of group A was 21.40 years and group B was 21.00 years. The statistical analysis correlates the study by proposing that groups taken for study either group A and B showed significant effect in improvement in pain and ankle instability. The group B had higher significance when compared to group A. The mean improvement in pain scores of VAS was 2.93 and 3.54 in group A and B, respectively. The mean improvement in ankle instability measured by CAIT was 5.40 and 9.80 in group A and B, respectively. It was resulted that both techniques were effective but plyometric training was slightly superior on improving pain and ankle instability in collegiate volleyball players. CONCLUSION: This study concluded that plyometric training was effective on improving pain and ankle instability in collegiate volleyball players. KEY WORDS: Volleyball, Pain, Ankle instability, Resistive training, Plyometric training.

INTRODUCTION

Volleyball is one of the world popular game, which is played either in indoor or outdoor around the world. The game volleyball was invented by William G. Morgan in the year 1985. He invented this game for players to play during pastime preferably indoor. Since then this game has taken greater modification in rule which accelerated the intensity of the game.1 In order to sustain the present demand in the game player's anthropometric, physical fitness and physiological capacities are highly developed through systematic and scientific methods employed in training.2

Volleyball players require greater speed, strength,

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explosive power, agility, flexibility and endurance to excel. This game is like other game requires both anaerobic as well as aerobic fitness but greater emphasis is placed on anaerobic fitness. Here the players perform jumps to spike, block and serve. This clearly shows that volleyball players require greater explosive power in extremities to perform jump and spike at greater velocity. Earlier it has been showed that power is combination of strength and speed. Therefore, volleyball players require strength in upper and lower extremities.3,4,5 The strength in the limbs of the young players is important along with specific technical skills.6 It is also noted that actions in volleyball possesses eccentric and concentric contraction of muscle while performing all motor actions.7 The stretching and shortening cycles are characteristic of plyometric training. The elastic characteristics of muscles and the reflex function have a significant influence on the stretching of muscles. The muscle stretching reflex is included in the SSC (stretch shortening cycle). For a high quality eccentric-concentric contraction, three important conditions have to be satisfied: the timely activation of the musculature just prior to the eccentric contraction, the short duration of the eccentric contraction and the instant shift from the stretching phase to the shortening phase.8 Earlier studies have proved that plyometric training leads to better adaptations of the CNS and a greater increase in strength and jumping ability.9,10,11

The scenario is to train the players more specific to game. The training which is designed today should possess movements and skills performed during the game. This has greater advantage by improving skill and fitness of the players.[12]

Volleyball players require well-developed muscular strength, power, endurance, speed, agility, and flexibility.13 Versatility and speediness are the trend of development in modern volleyball sport. "Versatility" means that the athletes should not only be well-prepared for their specific position, but also posses high levels of all-round skills in serving, setting, spiking, blocking and defense. "Speediness" requires the athletes to be able to move quickly to the optimal place on the court. Particularly, jumping height is decisive for the execution of techniques and tactics.14 Earlier studies of showed the existence of significant correlation between the vertical jumping index and the competitive ability of the volleyball players.15

An ankle sprain occurs when the strong ligaments that support the ankle stretch beyond their limits and tear. Ankle sprains are common injuries that occur among people of all ages.16 It ranges from mild to severe; depending upon how much damage there is to the ligaments. Although injuries are an aspect of all sports, there are certain injuries while volleyball players are more prone to the ankle sprains.17

The ankle instability is largely divided into mechanical and functional. First, it is defined as structural instability, In other words, ligament relaxation. Second, functional ankle instability is defined as debilitating condition incorporating recurrent sprains, persistent pain and repeated instances of giving way.18 The condition is multifactorial with contributions from static alignment, muscle weakness, poor proprioception, and ligamentous injury.19 This is a clinically important problem because the ankle is one of the most commonly injured joints in the body with more body weight per unit area than the other joints of the body.20

Of all sports, the volleyball players have a relatively high incidence of ankle sprains considering the sudden stops and cutting movements. The ankle instability is very common in novice volley ball players. In athletics, the volleyball event is combination of cyclical running and the technical clearance of movements, however one of the most important elements in the determination of the final athletic result. Studies considered model in the trial of biomechanical measure in Volley ball events, valuing specific movement at event of 110m, the ankle articulation angle in Volley ball approach (take

off) is measured in two different situations: (Previous Support Phase, and Subsequent Support Phase, moment where it takes to higher of the CM), in not being took into account the intermediary moment between these two stages (Balance Phase).21

Take off at the saggital plan of the ankle and knee articulations angles of the leg support, the hip articulation angle in the lead leg, and the Ground Reaction Force (GRF) at the moment from the volleyball players (take off), and at the landing moment after the volleyball players.22

The evaluation criterion for an efficient technique volleyball player is to use the shortest possible time between approach and landing; this moment is defined as air phase and is the moment of greatest propensity to significant loss of speed, the landing phase is one of the most important movements performed on the Volley ball technical when it is the athletic employs a large power level which provides an improvement competitive final result.23

A sprained ankle or twisted ankle is sometimes known as a common cause of ankle pain. A sprain is stretching or tearing of ligaments. The most common is an inversion sprain. Where the ankle turns over so the sole of the foot faces inward, damaging the ligaments on the outside of the ankle.24 Volleyball players who suffer from ankle sprains are more likely to injure the same ankle, which can result in disability and can lead to chronic pain or instability in 20% to 50% of these cases.25

The high incidence of ankle sprains in volleyball players and their negative consequences for future sports participation. The lateral ligament sprain, grade I and grade II injuries can be managed with conservative treatment the ankle should be treated with proper rest, ice, compression and elevation, taping, lace up brace , AROM are started early then additional rehabilitation with plyometric training and Peroneal strengthening is begun.26

The Visual Analogue Scale (VAS) is a measurement instrument that measures a characteristics or attitude that is believed to range across a continuum of values and cannot easily be directly measured. VAS is widely used due to its simplicity and adaptability to a broad range of population. It is often used in epidemiologic and clinical research to measure the intensity or frequency of pain.27

Ankle instability offering a primarily "symptom-based" presentation due to its complexity and multi-factorial nature, patient questionnaires or surveys have become a widely used tool in identifying the pathology. One such questionnaire is the Cumberland Ankle Instability Tool (CAIT) first published by Hiller in 2006. It was proved to be of high content validity and good reliability. The main advantage of the questionnaire is that it consists of only 9 items, minimizing patient burden and increasing reliability. The precision of the instrument is increased as it is a multiple answer option instrument. In contrast to some other ankle instability questionnaires, the CAIT is able to measure the severity of instability using a numeric value. The CAIT is filled out for both the left and right ankle, making it possible to assess both ankles individually.28

In order to recover ankle pain and instability, therapeutic intervention such as RICE protocol, ankle strength training, proprioceptive training, balance training, imagination exercise, isokinetic exercise, taping therapy and plyometric training for supporting ankle structure is being performed.29,30,31

Resistive training broadly refers to a component of physical fitness conditioning by overloading the skeletal muscles through different training modalities, encompassing different types of resistances and muscle actions, which in turn can be used in isolation or in combination.32 Resistive training protocols with weights, therabands and resistance machines are safe and do not negatively impact growth and maturation of youngsters.33,34

Plyometric training is a form of training in which the

individual reacts to the ground surface in such a way that they develop larger than normal ground forces that can then be used to project the body with a greater velocity or speed of movement. Plyometric training is also known as reactive training. It enhances performance during functional activities emphasizes the ability of muscles to exert maximal force output in a minimal amount of time.35 Plyometric training involves exercises that generate quick, powerful movements involving explosive concentric muscle contraction preceded by an eccentric muscle action. In other words, there is a "cocking" or loading phase described as an eccentric muscle action that dampens or slows the downward movement of the body (deceleration) followed immediately by an explosive concentric muscle contraction. The overall height that a player will achieve is determined by their vertical velocity or how fast they leave the ground. This is the essence of a plyometric exercise and uses a characteristic of muscle known as the stretch-shortening cycle. There are three distinct phases involved in plyometric training, including the eccentric or loading phase, the amortization phase or transition phase, and the concentric or unloading phase.36

Plyometric exercises enhance the excitability, sensitivity, and reactivity of the neuromuscular system and increase the rate of force production, motor unit recruitment, firing frequency, and motor unit synchronization. These training exercises are a progression that can be incorporated once a player has achieved an overall strength base, proper core strength, and balance stabilization capabilities. Adequate isometric stabilization strength decreases the time between the eccentric muscle action and concentric contraction, resulting in shorter ground contact times, which result in decreased tissue overload and potential injury when performing plyometric training.37,38,39 Plyometric exercises also use the stimulation of the body's proprioceptive mechanism and elastic properties to generate maximal force output in the minimal amount of time.

All movement patterns that occur during functional activities involve a series of repetitive stretch-shortening cycles (eccentric and concentric contractions). Stretch shortening cycles require the neuromuscular system to react quickly and efficiently after an eccentric muscle action to produce a concentric contraction and impart the necessary force in the appropriate direction. The purpose of this activity is to produce the necessary force to change the direction of an object's center of mass efficiently.40

Plyometric training provides the ability to train specific movement patterns in a biomechanically correct manner at a more functionally appropriate speed. This provides better functional strengthening of the muscles, tendons, and ligaments to meet the demands of everyday activities and sport. The ultimate goal of plyometric training is to decrease the reaction time of the muscle action spectrum that results in increased speed of movement in the individual.41,42

The speed of muscular exertion is limited by neuromuscular coordination. This means that the body will only move within a range of speed that the nervous system has been programmed to allow. Plyometric training improves neuromuscular efficiency and improves the range of speed set by the central nervous system. Optimal reactive performance of any activity depends on the speed at which muscular forces can be generated.43,44

Many researchers used plyometric training, resistive training and stretching and other physiotherapy program to recover ankle instability. However, many studies were done on resistive and plyometric training for improving the joint stability but there is lack of evidence of studies on comparison between resistive and plyometric training for improving pain and ankle instability. Thus, the present investigation was planned to find out to compare the effect of resistive and plyometric training for improving the ankle pain and instability in collegiate volleyball players.

NEED OF THE STUDY

The height over the volleyball net always means the mastery of the game. The height is decided by a combination of a player's stature and the jumping height, and usually it is reflected in blocking height and spiking height. A team will lose its capacity of winning a score if there is a lack of predominance over the net. Similarly, the ability of the players to move in and around the court quickly in multi direction also determines the strength of the team.

Depending on the jump-landing height, at least 10 times body weight is applied to the ankles, which creates excessive shock at the joints. The load applied to an ankle may cause ankle injury and repeated injuries may progress to functional ankle instability, which is a type of chronic ankle instability that leads to loss of proprioception and neuromuscular changes, muscle weakness and lower limb misalignment. These cause dynamic changes in the affected ankle joints, increase risk of injury, and reduce athletic performance.

Ankle pain and instability not only result in numerous visits to emergency care facilities and significant time loss from sports participation, but they can also cause long term disability. Among 5.18million Players 15% (1 million) of athletes sustain ankle pain and instability due to the sudden twisting and cutting movements involved in sport.

Various training modalities were adopted depending upon the necessity that improves sports performance. Ankle rehabilitation exercises are designed to improve flexibility, range of motion, muscle strength, proprioception, and neuromuscular control and prevent functional ankle instability. Traditional ankle rehabilitation exercises consist of range of motion exercises, progressive strength training, proprioceptive exercises and activity-specific training. plyometric exercise training improved the functional performance of an athlete with an ankle sprain. Plyometric exercise improves proprioception, strength and response speed in patients with acute lateral ankle sprain and reduces postural sway during exercise in patients with ankle instability.

Though there are lot of conventional treatment methods available, the part played by resistive training and plyometric training is something commendable and has a renounced effect in treating ankle instability.

Protocol of resistive training and plyometric training program covers all aspect of rehabilitation and makes the patient return to activity without any recurrence or discomfort. Thus, the present study was intended to compare the effectiveness of the resistive training and plyometric training in improving pain and ankle instability amongst the collegiate volleyball players.

AIMS AND OBJECTIVES OF THE STUDY

AIM OF THE STUDY

The aim of the study is to evaluate the effect and compare the twelve weeks plyometric training program and resistive training program on improving pain and ankle instability in collegiate volleyball players.

OBJECTIVES OF THE STUDY

The main objectives of the study are:

1. To study the effect of plyometric training to improve pain and ankle instability in collegiate volleyball players.
2. To study the effect of resistive training to improve pain and ankle instability in collegiate volleyball players.
3. To compare the effect of plyometric training and resistive training to improve pain and ankle instability in collegiate volleyball players.

HYPOTHESIS

NULL HYPOTHESIS:

There is no difference between plyometric training program and resistive training program on improving pain and ankle instability among collegiate volleyball players.

ALTERNATE HYPOTHESIS:

There is difference in plyometric training program than resistive training program on improving pain and ankle instability among collegiate volleyball players.

METHODOLOGY

1. STUDY DESIGN: Comparative study.
2. SAMPLE SIZE: 30 male collegiate volleyball players.
3. SAMPLING DESIGN: Randomized.
4. STUDY CENTER: Wockhardt Hospital, Mumbai
5. DURATION OF THE STUDY:

- 12 weeks.
- Six days per week
- One hour per day

SELECTION CRITERIA:

i.Inclusion criteria:

1. Age group: 18 - 25years.
2. Only male volleyball players.
3. Ankle instability.

ii.Exclusion criteria:

1. Recent fracture and muscular injury to lower extremities.
2. Age above 25 years and below 18 years.
3. Any neurological condition.
4. Any deformity of ankle and foot.

MATERIALS USED

1.Examination table
2.Crepe bandage
3.Ice pack
4.Thera bands
5.Weight cuffs
6.Plyometric box
7.cones
8.Consent form
9.Assessment form
10.Data collection sheet

PROCEDURE

Thirty male volleyball players with pain and ankle instability were selected by randomized sampling method according to inclusion and exclusion criteria and divide into two groups, Group A and Group B. The nature and duration of the study was explained to all participants and written consent was taken from each participant. The demographic and clinical data were collected from each participant. Pre-test level of pain was assessed through Visual Analogue Scale and ankle instability by the Cumberland Ankle Instability Tool on beginning day of the study. Rest, crepe bandage, elevation and cryotherapy were given for affected ankle as a primary treatment to both groups for six sessions per week for two weeks to relieve pain and other inflammatory signs. After two weeks training session started for next ten weeks, in which group A received Plyometric training and group B resistive training. Training program was demonstrated and practiced the same by respective groups for six days per week for next ten weeks. The post- test data was collected on end of 12th week.

9. INTERVENTION

Both groups were treated with RICE protocol for first two week to relieve pain and other inflammatory signs. After two weeks, Group A was treated with resistive training and Group B with plyometric training for 10 weeks. Participants of both the groups were received the selected treatment for 12 weeks.

BOTH GROUPS:

Both groups received RICE protocol for six sessions per week for first two weeks.
1.Rest
2.Cryotherapy
3.Crepe bandage
4.Elevation of ankle

GROUP A: RESISTIVE TRAINING75,76

Treatment parameters:

Duration of treatment: One hour per day Frequency of treatment: Six days per week.

Treatment Protocol:

1st and 2nd week:

1.Rest
2.Cryotherapy
3.Crepe bandage
4.Elevation of ankle

3rd to 5th week:

1.Isometrics of ankle plantar flexors and dorsiflexors:

Position of the patient: Long sitting position.

Procedure: For plantarflexors: Physiotherapist place hand on sole of foot. Ask the patient to move foot towards ground and physiotherapist stop movement by apply counter-pressure.

For dorsiflexors: Physiotherapist place hand on dorsum of foot. Ask the patient to move foot towards leg and physiotherapist stop movement by apply counter- pressure.

2.Isometrics of foot invertors and evertors:

Position of the patient: Long sitting position.

Procedure: For invertors: Physiotherapist place hand on medial side of foot. Ask the patient to move foot inwards and physiotherapist stop movement by apply counter-pressure.

For evertors: Physiotherapist place hand on lateral side of foot. Ask the patient to move foot outwards and physiotherapist stop movement by apply counter- pressure.

3.Active exercises of ankle plantar flexors and dorsiflexors:

Position of the patient: Standing.

Procedure: Ask the patient to move foot upwards and downwards.

4.Active exercises of foot invertors and evertors

Position of the patient: Standing.

Procedure: Ask the patient to move foot inwards and outward**s.**

6th to 8th week:

1.Theraband exercises:

i.Strengthening of ankle plantar flexors and dorsiflexors:

Position of the patient: Long sitting.

Procedure: Ask the patient tomove foot downwards for plantarflexors and upwards for dorsiflexors against resistance applied by theraband..

2.Standing on toes:

Procedure: Ask the patient to standing on toes for 15 Seconds and increase duration progressively.

3.Standing on Heels:

Procedure: Ask the patient to standing on heels for 15 Seconds and increase duration progressively.

9th to 12th week:

1.Toe walking:

Procedure: Ask the patient to standing on toes and walk 100 meters and increase distance progressively.

2.Heel walking:

Procedure: Ask the patient to standing on heels and walk 100 meters and increase distance progressively.

3.Hopping:

Position of patient: Standing

Procedure: Lift up one foot backwards and standing on one leg. Place hands on hips. Move up on to toes on standing leg than flex knee and ankle slightly and hop up and down on standing leg.

4.Jumping:

5.Running:

Procedure: Stand on running stance and run for half kilometer and increase distance and speed gradually.

GROUP B: PLYOMETRIC TRAINING77,78

Treatment parameters:

Duration of treatment: One hour per day. Frequency of treatment: Six days per week. Treatment Protocol:

1st and 2nd week:

1.Rest
2.Cryotherapy
3.Crepe bandage
4.Elevation of ankle

3rd to 5th week:

1.Two-Foot Ankle Hop:

Direction of Jump: Verticle

Starting Position: Get into a comfortable, upright stance with feet shoulder width apart.

Arm Action: None or double arm

Preparatory Movement: Begin with a Slight Countermovement Upward Movement: Hop up, with primary motion at the ankle joint

Downward Movement: Land in the starting Position and immediately repeat hop.

Note: This drill should be performed with little horizontal (forward or backward) or lateral movement.

2.Double-Leg Hop:

Direction of Jump: Horizontal and Vertical

Starting Position: Get into a comfortable, upright stance with feet shoulder- width apart.

Arm Action: Double Arm

Upward Movement: Jump as far forward as possible.

Downward Movement: Land in the starting position and immediately repeat the hop.

3.Squat Jump:

Direction of Jump: Vertical

Starting Position: Get into a squat position (thighs slightly above parallel with the ground) with feet shoulder-width apart. Interlock fingers and place hands behind head.

Arm Action: None Preparatory Movement: None

Upward Movement: Explosively jump to maximum height.

Downward Movement: Land in the squat position and immediately repeat the jump.

4.Double-Leg Zigzag Hop:

Direction of Jump: Diagonal

Equipment: Place about 10 Hurdles about 18-24 inches apart in a zigzag pattern.

Starting Position: Get into a comfortable, upright stance with feet shoulder- width apart. Stand on the outside of the first hurdle. Elbows should be flexed 90 degrees and held at the sides of the body.

Arm Action: Double Arm

Upward Movement: Jump from the outside of the first hurdle to the outside of the second, keeping the shoulders perpendicular.

5.Single-Leg Push-Off :

Direction of Jump: Vertical

Equipment: Plyometric box, 6-18 inches high

Starting Position: Stand facing the plyometric box with one foot on the ground and one foot on the box. The heel of the foot on the box should be near the box's closest edge.

Arm Action: Double arm

Preparatory Movement: None

Upward Movement: Jump up using the foot on the box to push off. Downward Movement: Land with the same foot on the box; this foot should land just before the ground foot. Immediately repeat the movement.

Note: Intensity can be increased by increasing the height of the box.

6th to 8th week:

1.Double Leg Vertical Jump:

Direction of Jump: Vertical

Starting Position: Get into a comfortable, upright stance with feet shoulder- width apart.

Arm Action: Double Arm

Upward Movement: Explosively jump up, using both arms to assist, and reach for a target.

Downward Movement: Land in the starting position and repeat the jump. Allow recovery time between jumps.

2.Jump and reach:

Direction of Jump: Vertical

Starting Position: Get into a comfortable, upright

stance with feet shoulder- width apart.

Arm Action: Double arm with reach at top of jump Preparatory Movement: Begin with a countermovement

Upward Movement: Explosively jump up and reach for an object or target Downward Movement: Land in starting position and immediately repeat jump. Note: Emphasis is on verticle height with minimal delay between jumps.

3.Double-Leg Tuck Jump:

Direction of Jump: Vertical

Starting Position: Get into a comfortable, upright stance with feet shoulder- width apart.

Arm Action: Double arm

Preparatory Movement: Begin with a countermovement

Upward Movement: Explosively jump up. Pull the knees to the chest, quickly grasp the knees with both hands and release before landing.

Downward Movement: Land in the starting position and immediately repeat the jump.

4.Lateral Push-Off: Direction of Jump: Vertical Equipment: Plyometric Box

Starting Position: Stand to one side of the plyometric box with one foot on the ground and one foot on the box. The inside of the foot on the box should be near the box's closest edge.

Arm Action: Double Arm

Upward Movement: Jump up using the foot on the box to push off. Downward Movement: Land with the same foot on the box; this foot should land just before the ground foot. Immediately repeat the movement

Note: Intensity can be increased by increasing the height of the box.

5.Side to side Push-Off:

Direction of Jump: Vertical Equipment: Plyometric box

Starting Position: Stand to one side of the box with on foot on the ground and one foot on the box. The inside of the foot on the box should be near the box's

closest edge

Arm Action: Double Arm

Upward Movement: Jump up and over the box to push off.

Downward Movement: Land with the opposite foot on the opposite side of the top of the box; this foot should land just before the ground foot. Immediately repeat the movement to the opposite side.

Note: Intensity can be increased by increasing the height of the box.

9th to 12th week:

1.Single Leg Tuck Jump:

Direction of Jump: Vertical

Starting Position: Get into a comfortable, upright stance on one foot. The no jumping leg is held in a stationary position with the knee flexed during the exercise

Arm Action: Double Arm

Preparatory Movement: Begin with a countermovement.

Upward Movement: Explosively jump up. Pull the knee of the jumping leg to the chest, grasp the knee with both hands, and release before landing.

Downward Movement: Land in the starting position and immediately repeat the jump using the same leg. -Repeat with the opposite leg after a brief rest.

2.Pike Jump:

Direction of Jump: Vertical

Starting Position: Get into a comfortable, upright stance with feet shoulder- width apart.

Arm Action: Double Arm

Upward Movement: Explosively jump up. Keeping the legs straight and together, try and lift them to the front and try and touch the toes with the hands. Downward Movement: Land in the Starting Position

and immediately repeat the jump.

3.Jump over Barrier:

Direction of Jump: Horizontal and Vertical Equipment: a barrier such as a cone or hurdle

Starting position: Get into a comfortable, upright stance with feet shoulder- width apart.

Arm Action: Double Arm

Upward Movement: Jump over a barrier with both legs, using primarily hip and knee flexion to clear the barrier. Keep knees and feet together without lateral deviation.

Downward Movement: Land in the starting position and repeat the jump

4.Lateral Barrier Hop:

Direction of Jump: Lateral and Vertical Equipment: Barriers (cones or hurdles) Arm Action: Double Arm

Upward Movement: Jump over the barrier with both legs, using primarily hip and knee flexion to clear the barrier. Keep knees and feet together.

Downward Movement: Land on the opposite of the barrier and immediately repeat jump to the starting side.

Note: intensity level of the lateral barrier hop can be increased by increasing the height of the barrier (i.e. from a cone to a hurdle) or by performing the hops with one leg only.

5.Jump to Box:

Direction of Jump: Vertical and slightly horizontal Equipment: Plyometric box

Starting Position: Facing the plyometric box get into a comfortable, upright stance with feet shoulder-width apart.

Arm Action: Double arm

Preparatory Movement: Begin with a counter movement. Upward Movement: Jump onto the top of the box using both legs

Downward Movement: Land on both feet in a half squat position, step down and repeat.

Note: Intensity can be increased by increasing the height of the box.

6.Squat Box Jump:

Direction of Jump: Verical and slightly horizontal Equipment: Plyometric box

Starting Position: Facing the plyometric box with hands clasped behind head, get into a comfortable, upright stance with feet shoulder-width apart.

Preparatory Movement: Begin with a counter movement. Upward Movement: Jump onto the top of the box using both legs.

Downward movement: Land on both feet in a half squat position, step down from box and repeat.

Note: Intensity can be increased by increasing the height of the box.

7.Lateral Box Jump:

Direction of Jump: Vertical and slightly horizontal Equipment: Plyometric box

Starting Position: Stand to one side of the box, get into a comfortable, upright stance with feet shoulder-width apart.

Arm Action: Double Arm

Upward Movement: Jump onto the top of the box using both legs. Downward Movement: Land on both feet in a half squat position, step down from the box and repeat in the opposite direction.

Note: Intensity can be increased by increasing the height of the box.

10.OUTCOME MEASURES

The outcome measures of pre and post treatment will be subject to statistical analysis for significance.

i. Visual Analogue Scale (VAS) for end feel pain:

The VAS is most commonly known and used for the measurement of pain. The scale consists of a straight line of a specific length (100 mm) with verbal descriptors at each end. The line may be horizontal or vertical, NO PAIN is on one end of the line and WORST PAIN is on the other end of the line. The subjects were instructed to place a mark on the line to

report the intensity of pain experienced at that moment. Scoring is done by measuring the millimeters from the lower end of the scale to subject's mark.

ii. Cumberland Ankle Instability Tool (CAIT) for ankle instability:

This tool is a self-assessed and perception based survey of an individual's ankle instability consisting of 9 questions. Respondents may score between 0 and 30 with lower scores indicating decreased ankle stability and higher scores indicating increased stability.

DATA ANALYSIS

Pre-test and Post-test data within the group and between groups will be analysed by using Paired and unpaired 't' test. 33,3 The differences between pre - test and post - test values were found. It was done for the values taken before and at the end of sixth week respectively. The mean difference of VAS and Ankle CAIT of group A were compared with group B and the actual pattern of variation were observed. With the 't' value from the pre-test and post-test, the accurate level of significance was analyzed and interpreted. An alpha level of $p<0.05$ was the level of significance for the test. Paired 't' test was performed to analyze the efficacy of treatment within the groups and unpaired 't' test was performed to analyze the efficacy of treatment between both groups.

The differences in the means was compared by Least Significant Differences (LSD) at 5 per cent level ($P<0.05$).

RESULT AND DATA INTERPRETATION

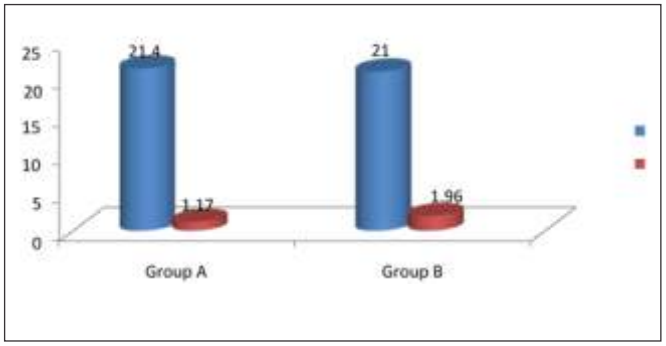
The present study was carried out to compare the effects of plyometric training and resistive training to improve pain and ankle instability in collegiate volleyball players. The improvement in pain was assessed by VAS and ankle instability by CAIT.

D1.DEMOGRAPHIC PRESENTATION OF DATA IN GROUPS:

TABLE: 1

Group	Number	Age (in years)	
		Mean	SD
Group A	15	21.40	1.17
Group B	15	21.00	1.96
Total	30	21.20	2.04

GRAPH: 1



INTERPRETATION:

Table 1 show that the average age of all the participants was 21.20 years. Group A had a mean age of 21.40 years and Group B had a mean age of 21.00 years.

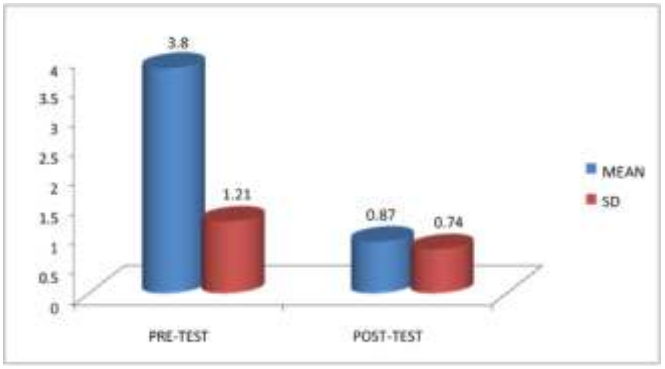
1.ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF VISUAL ANALOGUE SCALE (VAS) WITHIN GROUP A:

TABLE: 2

	Mean	N	SD	Std. Error Mean	R	Mean Diff	T	P
Pre-test	3.80	15	1.21	0.31	0.6847	2.93	12.85	0.0024*
Post-test	0.87	15	0.74	0.19				

* Significant difference ($P<0.05$)

GRAPH: 2



INTERPRETATION:

The above table shows the mean of pre-test and post – test values were 3.80 and 0.87, respectively. The mean improvement in VAS of Group A was 2.93. The 't' value 12.85 and 'P' value 0.0024 for pain scores using VAS within Group A analysis. When compared to table value, the above 'P' value is lesser at P<0.05, which is significant. It indicates that Group A treated with resistive training had significant improvement in pain within Group A.

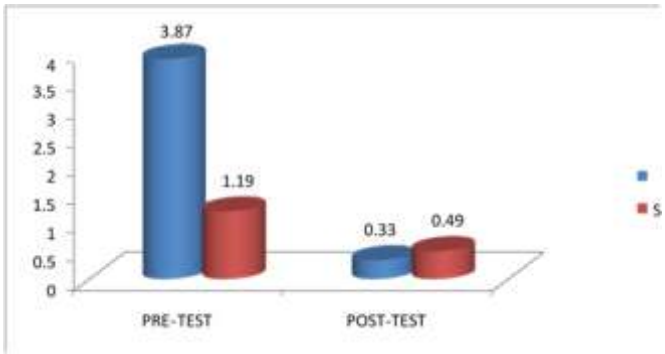
1.Analysis Of Pre-test And Post-test Values Of Visual Analogue Scale (vas) Within Group B:

TABLE: 3

	Mean	N	SD	Std. Error Mean	R	Mean Diff	T	P
Pre-test	3.87	15	1.19	0.30	0.5754	3.54	13.817	0.0124*
Post-test	0.33	15	0.49	0.13				

* Significant difference (P<0.05)

GRAPH: 3



INTERPRETATION:

The above table shows the mean of pre-test and post – test values were 3.87 and 0.33, respectively. The mean improvement in pain score of Group B was 3.54. The 't' value 13.817 and 'P' value 0.0124 for pain scores using VAS within Group B analysis. When compared to table value, the above 'P' value is lesser at P<0.05, which is significant. It indicates that Group B treated with plyometric training had significant improvement in pain within Group B.

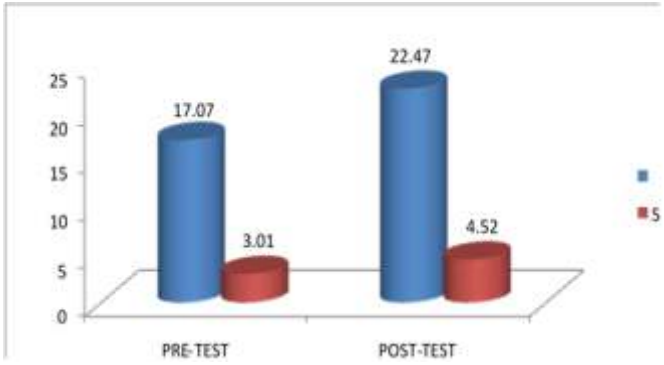
1.Analysis Of Pre-test And Post-test Values Of The Cumberland Ankle Instability Tool (cait) For Significance Within Group A:

TABLE: 4

	Mean	N	SD	Std. Error Mean	R	Mean Diff	T	P
Pre-test	17.07	15	3.01	0.78	0.9165	5.40	9.812	0.0011*
Post-test	22.47	15	4.52	1.17				

* Significant difference (P<0.05)

GRAPH: 4



INTERPRETATION:

The above table shows the mean of pre-test and post – test values of CAIT were

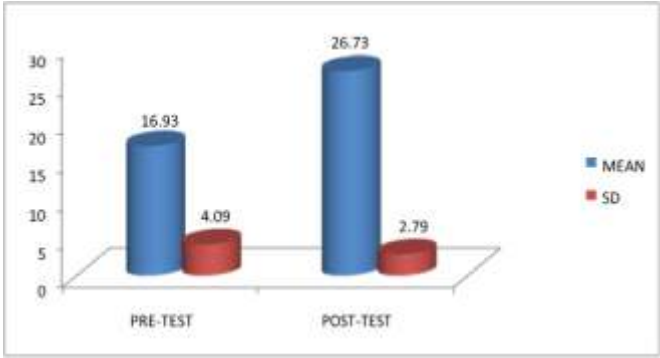
17.07 and 22.47, respectively. The mean improvement in CAIT score of Group A was 5.40. The 't' value 9.812 and 'P' value 0.0011 for ankle instability scores using CAIT within Group A analysis. When compared to table value, the above 'P' value is lesser at P<0.05, which is significant. It indicates that Group A treated with resistive training had significant improvement in ankle instability score within Group A.

1.Analysis Of Pre-test And Post-test Values Of The Cumberland Ankle Instability Tool (cait) For Significance Within Group B:

TABLE:5

	Mean	N	SD	Std. Error Mean	R	Mean Diff	T	P
Pre-test	16.93	15	4.09	1.06	0.7047	9.80	13.051	0.0017*
Post-test	26.73	15	2.79	0.72				

* Significant difference (P<0.05)



INTERPRETATION:

The above table shows the mean of pre-test and post – test values of CAIT were 16.93 and 26.73, respectively. The mean improvement in CAIT of Group B was 9.80. The 't' value 13.051 and 'P' value 0.0017 for ankle instability scores using CAIT within Group B analysis. When compared to table value, the above 'P' value is lesser at P<0.05, which is significant. It indicates that Group B treated with plyometric training had significant improvement in ankle instability within Group B.

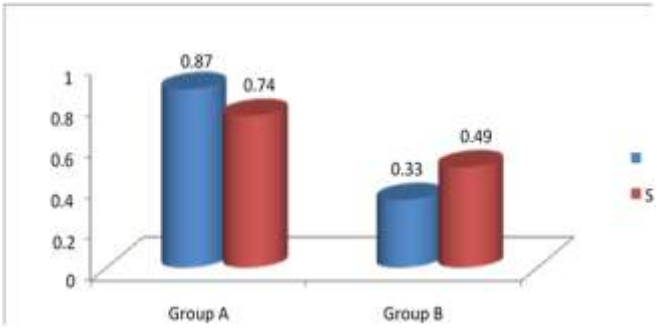
1.Analysis Of Pre-test Values Of Visual Analogue Scale (vas) Between Groups:

TABLE: 6

Group	Mean	N	SD	Std. Error Mean	Mean Diff	T	P
A	3.80	15	1.21	0.31	0.07	0.1525	0.4757[NS]
B	3.87	15	1.19	0.30			

[NS] Non-significant difference (P<0.05)

GRAPH: 7



INTERPRETATION:

The above table shows the mean of post-test values of pain scores were 0.87 and 0.33 in Group A and Group B, respectively. The mean difference in pain scores between groups were 0.54. The 't' value 2.323 and 'P' value 0.0276 for pain scores using VAS between Group A and Group B analysis. When compared the table value, the above 'P' value is lesser at P<0.05, which is significant. It indicates that both the techniques were effective in ankle pain relieve but Group B treated with plyometric training was more effective over group A treated with resistive training.

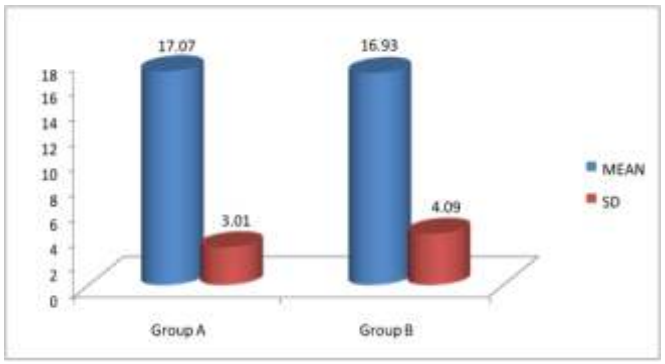
1.Analysis Of Pre Test Values Of The Cumberland Ankle Instability Tool (cait) Between Groups:

TABLE: 8

Group	Mean	N	SD	Std. Error Mean	Mean Diff	T	P
A	17.07	15	3.01	0.78	0.14	0.1016	0.9198[NS]
B	16.93	15	4.09	1.06			

[NS]Non-significant difference (P<0.05)

GRAPH: 8



Interpretation:

The Above Table Shows The Mean Of Pre-test Values Of Ankle Instability Scores Were 17.07 And 16.93 In Group A And Group B, Respectively. The Mean Differences In Ankle Instability Scores Between Groups Were 0.14. The 't' Value 0.1016 And 'p' Value 0.9198 For Ankle Instability Scores Using Cait Between Group A And Group B Analysis. When Compared The Table Value, The Above 'p' Value Is Greater At P<0.05, Which Is Non-significant. It Indicates The Homogeneity In Pre Test Values Of Both The Groups.

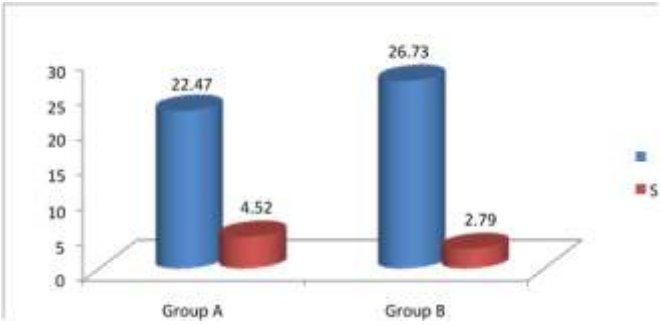
1.Analysis Of Post - Test Values Of The Cumberland Ankle Instability Tool (cait) Between Groups:

TABLE: 9

Group	Mean	N	SD	Std. Error Mean	Mean Diff	T	P
A	22.47	15	4.52	1.17	4.26	3.112	0.0042*
B	26.73	15	2.79	0.72			

* Significant difference (P<0.05)

GRAPH: 9



INTERPRETATION:

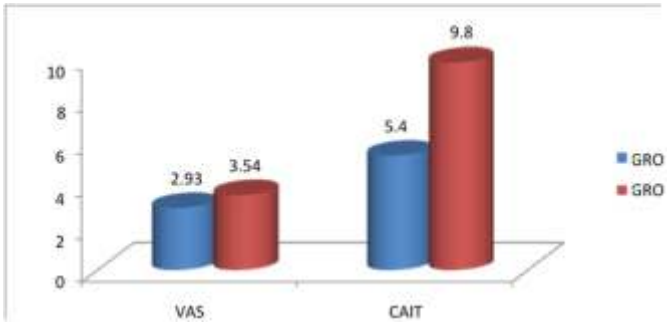
The above table shows the mean of post-test values of ankle instability scores were 22.47 and 26.73 in Group A and Group B, respectively. The mean difference in ankle instability scores between groups were 4.26. The 't' value 3.112 and 'P' value 0.0042 for ankle instability scores using CAIT between Group A and Group B analysis. When compared the table value, the above 'P' value is lesser at P<0.05, which is significant. It indicates that both the techniques were effective in improving ankle instability but Group B treated with plyometric training had superior effect than Group A treated with resistive training.

3.Mean Improvement In All The Parameters Between Group A And Group B:

TABLE: 10

	Group	N	Mean		Group	N	Mean
VAS	A	15	2.93	CAIT	A	15	5.40
	B	15	3.54		B	15	9.80

GRAPH: 10



INTERPRETATION:

The above table shows the mean improvement in pain scores of VAS was 2.93 in Group A and 3.54 in Group B. It was resulted that Group B treated with plyometric training was more effective in pain relieve over Group A treated with resistive training.

The above table shows the mean improvement in ankle instability scores of CAIT was 5.40 in Group A and 9.80 in Group B. It was resulted that Group B treated with plyometric training was more effective in improvement of ankle instability over Group A treated with resistive training.

DISCUSSION

Volleyball is an intense anaerobic sport that combines explosive movements with short periods of recovery. JF Baumhauer (1995)81 reported that ankle sprains were associated with higher ratios between ankle inversion and eversion peak torques, higher peak torques produced by plantar flexion, and a lower ratio between dorsiflexion and plantar-flexion peak torques in in soccer, lacrosse, volleyball and field hockey. Majority of the injuries in volleyball occurs in the conflict area around the net during blocking or spiking. Both activities demand coupling between eccentric and concentric calf muscle activities. Those players that score better on the isokinetic tests and have greater concentric strength of plantar flexors can jump higher. Landing from a jump is a complex task and requires good coordination, dynamic muscle control, flexibility

and height of the jump only increases those demands. Landing badly from a jump is also a common injury mechanism in volleyball players which may cause ankle instability. Rehabilitation of athletic injuries requires the prescription of sport-specific exercise and activities that challenge the recovering tendons, ligaments, bones and muscle fibers without overstressing them. The goal of rehabilitation is to return an athlete to the same or higher level of competition as before the injury. Rehabilitation must take into consideration normal tissue size, flexibility, muscular strength, power, and endurance.

The purpose of the present study was to compare the effects of plyometric training and resistive training to improve pain and ankle instability in collegiate volleyball players.

In present study, total 30 volleyball players with pain and ankle instability were selected randomly and divided into two groups - Group A and Group B (15 participants in each group). First two weeks, both groups treated with RICE protocol to relieve inflammatory signs. After that, group A received resistive training and group B received plyometric training for next 10 weeks.

The improvement in pain was assessed by using VAS and ankle instability by CAIT. Pre-test data were collected at the beginning of the study and post-test data were collected at the end of 12th week. The data were statistically analysed and comparing Group A and Group B. In present study, Group A had a mean age of 21.40 years and Group B had a mean age of 21.00 years.

Group A received resistive training showed improvement in pain and ankle instability in collegiate volleyball players when comparing the pre and post test values proved by VAS and CAIT. The mean improvement in VAS and CAIT score was 2.93 and 5.40, respectively. This analysis found significant difference between pre and post test score within group A. The above data have shown that resistive training may be effective on improving pain and ankle instability in volleyball players. This statement is strongly supported by the earlier findings of Emily A. Hall et al. (2018)82 who found that strength training protocols were effective in improving strength and perceived ankle instability. Szymanski DJ (2007)83 concluded that 12-week resistance training program can significantly increase upper and lower maximal strength in boys aged 13 to 17 years. Shaibi et al. (2006)84 reported that resistance training program 2 times per week for 16 weeks can significantly increase both upper, lower body strength in overweight Latino adolescent male without any injuries. Tsolakis et al. (2004)85 also concluded that 2-months resistance training program resulted in significant increases in isometric strength of preadolescent boys. Significant changes in muscular strength, stability in joint and performances changes are most related to neural factors. Neural adaptation such as increased motor unit recruitment and coordination as well as improved coordination of involved muscle groups was the main factors that could explain the positive training response. Neural adaptation factors following strength training also have been related to anaerobic performance enhancement.86 The mechanisms responsible for peak anaerobic power enhancement following strength training may relate to increased force generation and neural adaptation such as increased motor neuron firing rate and improved muscular coordination.87,88

Group B received plyometric training showed improvement in pain and ankle instability in collegiate volleyball players when comparing the pre and post test values proved by VAS and CAIT. The mean improvement in VAS and CAIT score was 3.54 and 9.80, respectively. This analysis found significant difference between pre and post test score within group B. The above data have shown that plyometric training was also effective in improving pain and ankle instability. This statement is strongly supported by the earlier findings of George Davies et al. (2015)89 stated that plyometrics assist in the development of power, joint sense, joint stability, relieve pain and a foundation from which the athlete

can refine the skills of their sport. Kotzamanidis (2006)90 revealed that training program in prepubertal boys has a positive effect on running speed and ankle instability as well as vertical jump performance. Diallo et al. (2001)91 reported that 10 weeks of specific plyometric training revealed a significant increase in joint stability, jump, running and sprint-cycling performance in trained boys 12-13 years of age. Matavulj et al. (2001)92 found that plyometric training could improve pain, ankle instability and jump performance in elite junior basketball players and this improvement could be partly related within increase in force of hip extensor. The effectiveness of plyometric exercises in improving power and performance in the lower extremities. Kraemer WJ and Newton RU (2000)93 and Komi PV (1979)94 have described increased jump height, sprint time reduction, improved running economy and improved joint position sense and postural control as a result of lower extremity plyometric training.

The study was compared the plyometric training and resistive training on improving pain in ankle of collegiate volleyball players. The pain score of each player was assessed by using VAS before the start of the treatment as pre-test values and at the end of 12th week as post-test values. The mean of pre-test and post - test values were 3.80 and 0.87, respectively in group A and 3.87 and 0.33, respectively in group B. The mean improvement in VAS score of group A and group B was 2.93 and 3.54, respectively. The statistical analysis correlates the study by proposing that groups taken for study either Group A treated by resistive training or Group B treated by plyometric training showed significant effect in improvement on pain.

The Group B treated with plyometric training had liitle bit superior effect in improvement on pain in collegiate volleyball players when compared to Group A treated with resistive training.

The study also compared the plyometric training and resistive training on improving ankle instability of collegiate volleyball players. The ankle instability score of each player was assessed by using CAIT before the start of the treatment as pre-test values and at the end of 12th week as post-test values. The mean of pre- test and post – test values were 17.07 and 22.47, respectively in group A and

16.93 and 26.73, respectively in group B. The mean improvement in CAIT score of group A and group B was 5.40 and 9.80, respectively. The statistical analysis correlates the study by proposing that groups taken for study either Group A treated by resistive training or Group B treated by plyometric training showed significant effect in improvement in ankle instability. The Group B treated with plyometric training had superior effect in improving ankle instability when compared to Group A treated with resistive training.

Thus, the above study resulted that plyometric training had a superior effect over resistive training in pain and ankle instability of collegiate volleyball players. The results of the Vescovi JD et al. (2008)95, Vissing K (2008)96 and Myer GD et al. (2006)97 indicate that plyometric training was more effective in increasing functional performance in athletes following acute ankle sprain than basic resistance exercises. The contractile component of the actin and myosin cross bridges with the sarcomere plays an important role in motor control and force development during plyometrics. The plyometric movement uses the pre-stretch of the muscle-tendon unit physiological length-tension curve in order to enhance the ability of the muscle fibers to generate more tension and resultant force production. The Elftman (1966)98 states that eccentric muscle contractions create the most force, followed by isometric contractions and then concentric contractions. Concentric muscle contractions therefore, are actually the weakest of the three modes of muscle actions. However, plyometrics create the greatest forces during the concentric power production phase. It is for this reason that the eccentric pre-stretch and the short

amortization phases are so critical for the optimum power development in a muscle.

Muscles function in various sporting activities as force production generators, and eccentric decelerators/ shock absorbers primarily due to the active and elastic properties within the muscles.99 These elastic properties form the mechanical basis of muscle mechanics and are due to the three structural components within the muscles: contractile components (CC), SEC and PEC. All three of these components interact with one another to produce force output. The mechanical behavior of the SEC is a major contributor in the plyometric action. Increased force generation during the concentric phase of the plyometric movement occurs from the mechanical elastic issue loading. During the pre-stretch motion, potential kinetic energy is stored in the SEC. This stored energy then contributes to the concentric force production as the muscle returns to its normal length. This is referred to the rebound force response. The SEC acts like a spring, where the energy release will be greater with higher forces. This effect of plyometric exercises is attributed to the elastic recoil of the elastic (PEC, SEC) tissues. The SEC accounts for 70-75 percent of the concentric force increases of muscle thereby making the plyometric training very efficient by decreasing load on joints, ligaments thus prevent injuries and reduce pain.100,101

The proprioceptors of the body include the muscle spindle, the Golgi tendon organ (GTO) and the mechanoreceptors located in joint capsules and ligaments. Stimulation of these receptors can cause facilitation, inhibition, and modulation of both agonist and antagonistic muscles. When the muscle spindle is stretched, there is an increase in afferent nerve firing. The strength of the signal that is sent to the spinal cord from the muscle spindle is dependent on the rate of the applied stretch. The faster the rate of the stretch, the stronger the neurological signal sent from the muscle spindle and as a result, the greater the efferent muscle contraction (the shortening cycle of the plyometric movement).102

The other mechanoreceptor that plays a significant role in the plyometric stretch-shorten cycle is the GTO. The function of the GTO is to act as a protective reflex preventing over-contraction or too much tension in the muscle. Thus, the GTO assists with modulating forces during plyometric exercises. Consequently, the purpose of plyometric training is to increase the excitability of the neurologic receptors for improved reactivity of the neuromuscular system while desensitizing the GTO.103

Explosive plyometric exercises may improve the neural efficiency through enhancement of neuromuscular coordination Therefore, plyometric training increases neuromuscular performance by increasing the set speed in which the muscles may act. Ultimately this mechanism results in the enhancement of the neurologic system to allow neuromuscular coordination to become more automatic and enhance coordination and stability.104

CONCLUSION

Based on the results, the present study states that both resistive training and plyometric training are effective to improve ankle pain and instability but plyometric training has better results than resistive training on improvement in pain and ankle instability of collegiate volleyball players.

Thus, it can be concluded that plyometric training is useful and an effective technique to treat ankle pain and instability in collegiate volleyball players.

LIMITATIONS OF THE STUDY

1. The study was limited to volleyball players.
2. The study was limited due to shorter duration of training.
3. The study was limited due to less number of participants.
4. The study was limited to the age group between 17 – 25 years.
5. The study was limited to upper ankle pain and instability.

RECOMMENDATIONS

1. It may be recommended that study could be done on other sports also.
2. It may be recommended that training course could be more than 12 weeks, so that more results could be evaluated.
3. It may be recommended that study could be done on more than 30 volleyball players.
4. It may be recommended that study could be done on different age groups.
5. It may be recommended that more studies are needed to be done in various techniques to ankle pain and instability in collegiate volleyball players.
6. It may be recommended that study could be done on other joints of lower and upper limbs.

SUMMARY

The present study aimed to compare the effect of resistive training and plyometric training on improvement in ankle pain and instability of collegiate volleyball players, where pain was assessed by VAS and ankle instability was assessed by CAIT.

In present study total thirty volleyball players were selected on the basis of inclusion and exclusion criteria and assigned randomly into two groups; Group A and Group B (Fifteen participants in each group). Both groups treated with RICE protocol for first 2 weeks after that group A received resistive training and group B plyometric training for next 10 weeks and to compare both the training, data were collected at the beginning of treatment (Pre-test) and at the end of treatment (Post-test).

The mean age of Group A and group B was 21.40 and 21.00 years, respectively. Data were analyzed using Paired and Unpaired 't' test which showed that resistive training and plyometric training have got beneficial effect on ankle pain and instability but when compared mean difference between two procedures for effectiveness, the result were significant for plyometric training. Thus, present study accepts the alternate hypothesis.

The pre-test and post-test values of VAS were 3.80 and 0.87 for group A and 3.87 and 0.33 for group B. The mean improvement in pain scores of VAS was 2.93 in Group A and 3.54 in Group B. It was resulted that Group B treated with plyometric training had a superior effect in pain status over Group A treated with resistive therapy in collegiate volleyball players.

The pre-test and post-test values of CAIT were 17.07 and 22.47, respectively for group A and 16.93 and 26.73, respectively for group B. The mean improvement in CAIT was 5.40 in Group A and 9.80 in Group B.

The result of our study shows Group B treated with plyometric training had a superior effect in ankle instability over Group A treated with resistive training in collegiate volleyball players.

Hence, plyometric training is more effective technique than resistive training on improvement in ankle pain and instability of collegiate volleyball players.

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