



## TO ANALYSE THE EFFECT OF THERABAND STRENGTHENING WITH CONVENTIONAL EXERCISE ON PAIN, FUNCTION & RANGE OF MOTION IN PATIENTS WITH ADHESIVE CAPSULITIS

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### ABSTRACT

The main aim of this study is to determine effectiveness of Theraband strengthening along with conventional exercise on subjects with Adhesive Capsulitis and to find out the effectiveness of strengthening using Theraband with conventional exercises on subjects with Adhesive Capsulitis and Influence of Theraband training on Pain, Range of Motion and Functional ability. 30 Patients with Adhesive Capsulitis were selected based on the inclusion and exclusion criteria. Group A received Theraband strengthening with Conventional exercise and Group B received Conventional exercise. Range of Motion (ROM) of shoulder is measured using universal goniometer. Pain and Functional ability is quantified with Shoulder Pain And Disability Index as outcome measures. The collected data was tabulated & analyzed using descriptive & inferential statistics. To all parameters mean and standard deviation (SD) were used. Paired t-test was used to analyze significant changes between pre-test and post-test measurements. Unpaired t-test was used to analyze significant changes between two groups. Statistical Analysis of Post test, Pain Index & Disability Index from SPADI scale and Range of Motion from Universal Goniometer revealed that there is high statistically significant difference seen between Group A and Group B. From the result, it is concluded that Theraband strengthening of shoulder along with conventional exercise (GROUP A) is more effective than conventional exercise (GROUP B) in increasing the Range of motion, reduction of Pain and Disability and improve in Functional ability.

**KEYWORDS:** *Periarthritis Shoulder, Second Stage, Muscle Disuse, Strength Training, Theraband, SPADI Scale.*



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## INTRODUCTION

The shoulder is a very complex joint that is crucial for most activities of daily living. Decreasing shoulder mobility is a serious issue. Various conditions can affect shoulder and the most important musculoskeletal condition being frozen shoulder. The term "Frozen shoulder" was first introduced by Codman in 1934. Long before, in 1872, the same condition was labeled as "Peri-arthritis" by Duplay.<sup>1</sup> In 1945, Naviesar coined the same as "Adhesive Capsulitis."<sup>2</sup> Adhesive Capsulitis is a disorder in which the shoulder capsule, the connective tissue surrounding the glenohumeral joint of the shoulder undergoes an inflammatory, vascular proliferation followed by thickening, scarring and retraction of the joint capsule. Adhesive capsulitis is defined as chronic capsular inflammation along with fibrosis of capsule. The inflammation process often starts at the capsule in the interval between the supraspinatus and subscapularis tendon called rotator cuff interval. This inflammation of the capsule and synovial membrane leads to adhesion formation. With time, adhesions tend to expand in breadth while they tighten and bind normal motion. The onset is usually insidious with progressive pain and loss of both active and passive range of motion of the shoulder complex. Incidence of Adhesive Capsulitis is 3% to 5% in general population and as high as 20% in people with diabetes. It is reported to be more in women, especially between ages of 40 to 60 years and females are more prominent than males.<sup>3</sup> The non-dominant shoulder is more commonly involved than dominant shoulder. Adhesive capsulitis a self-limiting disorder that resolves in 1–3 years and is more common in female in 5th to 7th decade of life.<sup>4</sup> The classical clinical features include pain and stiffness. Pain worsens at night and it's provoked on lying on affected shoulder. Activities like dressing, answering call, overhead activities and reaching behind becomes difficult. There is fibrosis of the gleno humeral joint capsule with a chronic inflammatory response and the patients often experience pain, limited range of motion, and disability generally lasting anywhere from 1 to 24 months.<sup>5</sup> Adhesive capsulitis often has 3 stages. The first stage is *freezing or painful stage*. Characterized by worsening of pain and restriction in range of motion. It will last for 3 to 9 months. The second stage is *frozen or transitional stage*. Characterized by reduction in pain and muscular disuse due to limited use of arm. The common pattern of restriction is diminishing motions with external shoulder rotation, followed by shoulder flexion, abduction and internal rotation. It will last for 4 to 12 months. In third stage is *thawing stage*. It last from 12 to 42 months.<sup>6</sup> The most common interventions for Adhesive Capsulitis is Ultrasound therapy, Capsular stretching and Active and Passive Range of Motion<sup>7</sup>. All these intervention aim in reducing pain and improving range of motion. Since shoulder acts as both dynamic and static stabilizer, strengthening muscles around shoulder is more important. Strengthening can be done by various means and one among that is Theraband. Ultrasound therapy (UST) used in frozen shoulder elevated the tissue temperature to depths of more than 5 cm causing increased collagen tissue extensibility, pain threshold, and enzymatic activity.<sup>8</sup> Use of a static progressive

stretch device in combination with traditional therapy appears to have beneficial long-term effects on shoulder range of motion, pain and functional outcomes in patients with Adhesive Capsulitis of the shoulder.<sup>9</sup> Which is common treatments used for peri-arthritis shoulder. Theraband was created in 1978 in Akron, USA. These bands are safe, inexpensive and portable. Its unique properties are that it allows muscles to be stretched and relaxed in a smooth and consistent manner. This also prevents the bounce at the end of a range of motion exercise that can cause muscle spasms. The other major advantage is that it is not dependent on gravity for providing resistance.<sup>10</sup> The bands are available in various thickness and strengths. There were significant differences in the tension force of the elastic bands of different colours when compared in pairs. There were no differences in the slopes for the tan versus yellow and green versus blue bands, as determined via linear regression analysis and one-way analysis of variance<sup>11</sup>. Yellow band offers minimal resistance that offers 2.5 pounds of resistance, Red band offers medium resistance of 4.5 pounds and super heavy band being silver color with 15 pounds. Though these bands are endorsed even by American Physical Therapy Association (APTA), it is not commonly used for Adhesive capsulitis. So, this study intends to analyze the effect of strengthening using Theraband with conventional exercises among subjects with Adhesive Capsulitis of shoulder.

### Objective

To find out the, Effectiveness of strengthening using Theraband with conventional exercises among subjects with Adhesive capsulitis. Influence of Theraband training on Pain, Range of Motion and Functional ability.

### Methodology

Study design: Experimental study design  
Reference & Source population: Samples were selected from Physiotherapy outpatient department, Saveetha Medical College and Hospital, Saveetha University, Thandalam, Chennai-602105, according to the inclusion & exclusion criteria.  
Sampling Technique: Simple Randomized sampling  
Sample size: 30 (15+15)

### Inclusion criteria

Age group - 40 to 60 years.  
Both genders  
Unilateral & Bilateral adhesive capsulitis  
2<sup>nd</sup> stage of adhesive capsulitis 4 weeks to 12 months.  
Restriction in all planes

### Exclusion criteria

History of recent dislocation at the shoulder.  
Osteoarthritis of shoulder.  
Symptoms for less than 6 weeks.  
Wound over shoulder region  
Recent fracture over shoulder region  
Neurological condition

### Materials

Therapeutic ultrasound machine and gel.  
Universal Goniometer

Thera band –Yellow and Red  
SPADI Scale

### **Procedure**

30 subjects with Adhesive Capsulitis were selected based on inclusion and exclusion criteria. They were counselled and explained about the purpose and their role in the study. They were asked to sign the informed consent. This study has been approved by ethics committee for student's proposal at No. 006/04/2016/IEC/SU. All the subjects were assessed for Pain, Function and Range of motion using SPADI (Shoulder Pain and Disability Index) and Universal Goniometer. The subject's Pain was assessed using SPADI pain component. Pain component scale consists of 5 components and maximum score is 50, scores obtained from each individual were documented. The subject's Function was assessed using SPADI disability component. Disability component scale consists of 8 components and the maximum score is 80, scores obtained from each individual were documented. The subject's both Active & Passive Range of Motion for Shoulder External Rotation, Flexion and Abduction was assessed using Universal Goniometer. For assessing shoulder Abduction, the patient was asked to be in supine lying position with the fulcrum of goniometer placed one inch below the acromion process to assess, movable arm is placed over the midline of anterior aspect of arm and stable arm is placed perpendicular to the movable arm. The passive range of motion and the active range of motion of shoulder are measured by the therapist and the patient himself performing the movement. For assessing shoulder Flexion the patient was asked to be in supine lying position comfortably with fulcrum of goniometer is placed on greater tuberosity of the humerus. Movable arm is placed over the midline of the arm and the stable arm is placed straight line to the movable arm and is kept in the air without the patient's body contact. The passive range of motion and the active range of motion of shoulder are measured by the therapist and the patient himself performing the movement. For assessing shoulder External Rotation, the patient was asked to be in supine lying position with shoulder abducted to 90° and elbow flexed to 90° position comfortably with fulcrum is placed on olecranon process. Movable arm is placed over the midline of the posterior aspect of forearm and the stable arm is placed straight line to the movable arm and is kept in the air without the patient's body contact. The passive range of motion and the active range of motion of shoulder are measured by the therapist and the patient himself performing the movement. After the initial evaluation, the participants were randomly assigned into 2 groups, 15 in each. Group A was given Theraband strengthening with conventional exercises and group B was given conventional exercise. Level of significance was set as  $p < 0.0001$ .

Group A (n=15)

### **Theraband strengthening with conventional treatment**

Conventional therapy and Theraband is given for strengthening of shoulder for a period of 3 weeks/alternative days.

### **Theraband exercises**

Patient will be standing in a comfortable position on floor where both feet firmly placed on the Thera band. Patient is asked to hold the end of the Theraband and asked them to gradually abducting, external rotation; flexion of shoulder will be encouraged from the starting position, followed by hold and back to the position without any bouncing movement. Initially for 1½ weeks all the subjects were given strengthening using yellow band followed by red Theraband for another 1½ weeks.

### **Treatment protocol**

Yellow colour band and red colour band  
Theraband exercises - Repetitions: 5 reps  
Hold time: 25 seconds  
Frequency: 3times/week  
Duration: 3 weeks/alternative days

### **Conventional exercise**

Consisted of Ultrasound therapy, range of motion and shoulder girdle exercises stretching exercises for 3 weeks /alternative days.

Group B (n=15)

### **Conventional treatment**

#### **Ultrasound therapy**

The patient was positioned in sitting position with the affected shoulder is supported on a pillow. Pulsed ultrasound was given by placing the transducer head over the shoulder joint and its surroundings. It was given in contact, using ultrasonic coupling medium. Treatment was given for 3weeks/alternative days.

### **Treatment protocol**

Intensity: 1 W/cm<sup>2</sup>  
Frequency: 1MHz  
Duration: 10 minutes  
Sessions: 3 weeks/alternative days

### **Shoulder girdle exercises**

Scapular-  
protraction  
retraction  
elevation and  
depression

Patient will be sitting, with the arm supported. Assist elevation, depression, protraction or retraction with pressure directly on the scapula in the direction opposite the motion.

### **Treatment protocol**

Duration of each session : 15min  
Duration between each repetition: 3sec  
Sessions : 1 session/day  
Repetitions : 10 reps  
Hold time : 5 seconds  
Frequency : 3 times a day  
Duration : 3 weeks in alternative days

### **Active exercises**

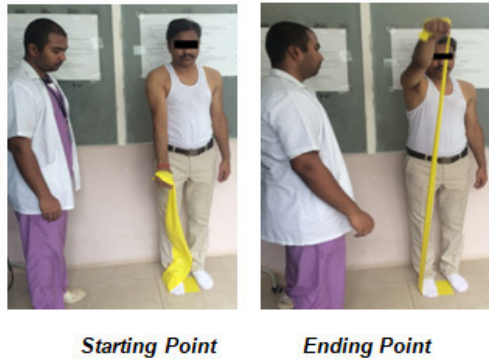
Codman's Pendulum: Progress to 3-5 minutes. Repeat 5 times each day.  
Stick Exercises: Repeat 5 times per day, 10 repetitions.  
Wall Climb: At the peak, hold for 15-30 seconds. 10-15 repetitions, repeat 5 times per day.

Capsular stretches: Hold for 15-30 seconds, 5 repetitions, 5 times per day. Posterior, anterior and inferior capsule stretches will be given.

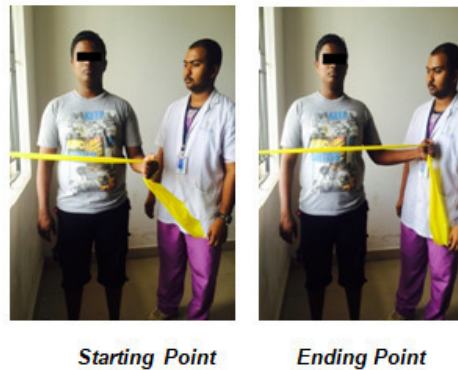


**Figure 1**  
**Ultrasound therapy**

**Flexion**



**External Rotation**



**Abduction**



**Figure 2**  
**Shoulder Strengthening Exercise with Theraband Exercises (Yellow)**

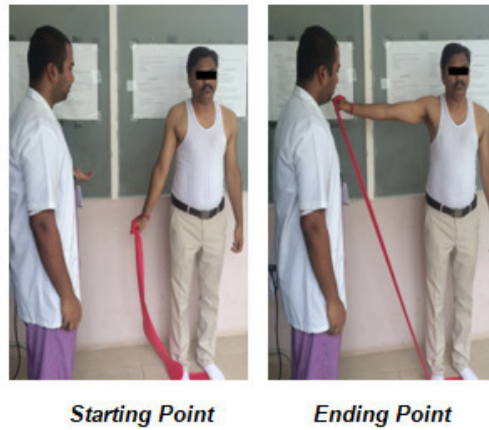
**Flexion**



**External Rotation**

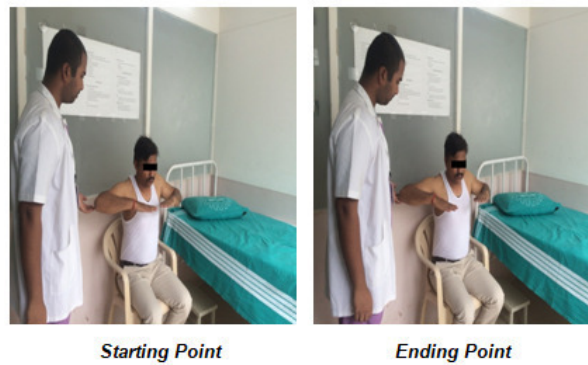


**Abduction**



**Figure 3**  
**Shoulder Strengthening Exercise with Theraband Exercises (Red)**

**Shoulder Protraction & Retraction Exercises**





**Shoulder Shrugging & Bracing Exercises**



*Starting Point*

*Ending Point*

**Shoulder Pendular Exercises**



**Shoulder Wall Climbing Stretching**



**Shoulder Capsular Stretching**



**Figure 4**  
**Conventional exercises**

**RESULT**

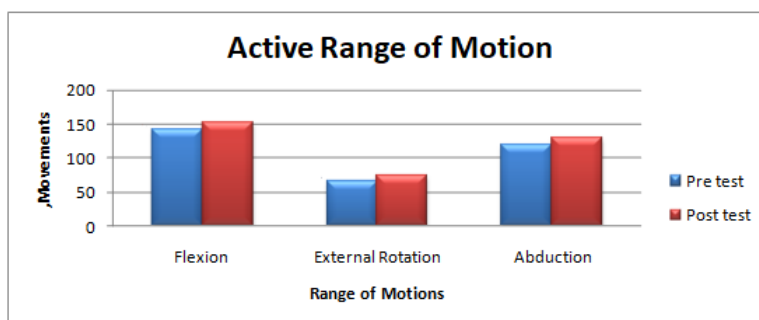
The collected data was tabulated and analyzed using descriptive and inferential statistics. To all parameters mean and standard deviation (SD) was used. Paired t-

test was used to analyze significant changes between pre-test and post-test measurements. Unpaired t-test was used to analyze the significant changes between two groups:

**Within group analysis: Group: A**

**Table 1**  
**Comparison between Pre-and Post-values of Flexion, External Rotation and Abduction of Active Range of Motion of shoulder score of Group A.**

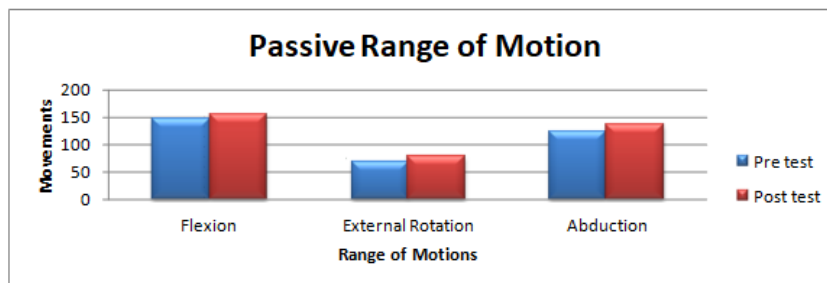
Active Range of Motion	Standard		t-Test	Sig. (2- Tailed)	
	Mean	Deviation			
Flexion	Pre-test	143.33	8.36	8.5533	0.0001
	Post test	152.07	7.67		
External Rotation	Pre-test	65.67	4.22	9.1327	0.0001
	Post test	74.60	4.94		
Abduction	Pre-test	119.33	26.71	7.1359	0.0001
	Post test	131.00	25.10		



**Figure 5a**  
**Showing Pre-and Post-values of Flexion, External Rotation and Abduction of Active Range of Motion of shoulder score of Group A.**

**Table 2**  
**Comparison between Pre-and Post-values of Flexion, External Rotation and Abduction of Passive Range of Motion of shoulder score of Group A. Paired t-Test was used to analyze pre and the post values of Flexion, External Rotation and Abduction of Active Range of Motion of shoulder, the data obtained were statistically significant for group A.**

Passive Range of Motion	Standard		t-Test	Sig. (2- Tailed)	
	Mean	Deviation			
Flexion	Pre-test	147.00	7.88	9.0213	0.0001
	Post test	156.20	6.41		
External Rotation	Pre-test	69.60	3.62	8.3517	0.0001
	Post test	79.27	5.43		
Abduction	Pre-test	125.40	25.94	4.8697	0.0002
	Post test	137.00	22.75		

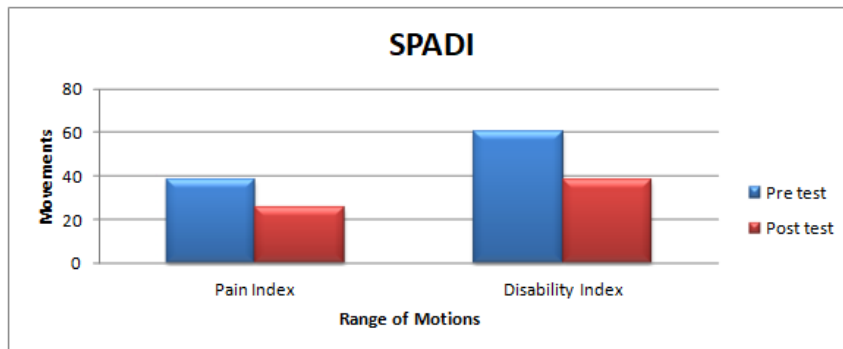


**Figure 5b**  
**Showing Pre-and Post-values of Flexion, External Rotation and Abduction of Passive Range of Motion of shoulder score of Group A.**

**Table 3**

**Comparison between Pre-and Post-values of Pain Index and Disability Index of shoulder score of Group A. Paired t-Test was used to analyze pre and the post values of Flexion, External Rotation and Abduction of Passive Range of Motion of shoulder, the data obtained were statistically significant for group A.**

Scales		Mean	Standard Deviation	t-Test	Sig. (2- Tailed)
Pain Index	Pre-test	38.80	4.00	14.9412	0.0001
	Post test	25.93	3.10		
Disability Index	Pre-test	60.87	3.31	13.4754	0.0001
	Post test	38.40	5.07		



**Figure 5c**

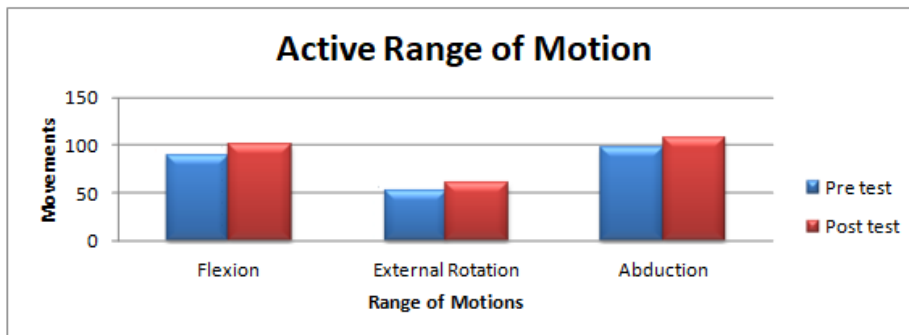
**Showing Pre-and Post values of Pain Index, Disability Index of shoulder score of Group A.**

**Group B**

**Table 4**

**Comparison between Pre-and Post-values of Flexion, External Rotation and Abduction of Active Range of Motion of shoulder score of Group B. Paired t-Test was used to analyze pre and the post values of Flexion, External Rotation and Abduction of Active Range of Motion of shoulder, the data obtained were statistically significant for group B.**

Active Range of Motion		Mean	Standard Deviation	t-Test	Sig. (2- Tailed)
Flexion	Pre-test	89.07	11.90	9.4211	0.0001
	Post test	101.00	10.58		
External Rotation	Pre-test	52.80	4.86	10.3059	0.0001
	Post test	61.27	4.85		
Abduction	Pre-test	98.07	8.53	9.4081	0.0001
	Post test	108.40	5.78		



**Figure 6a**

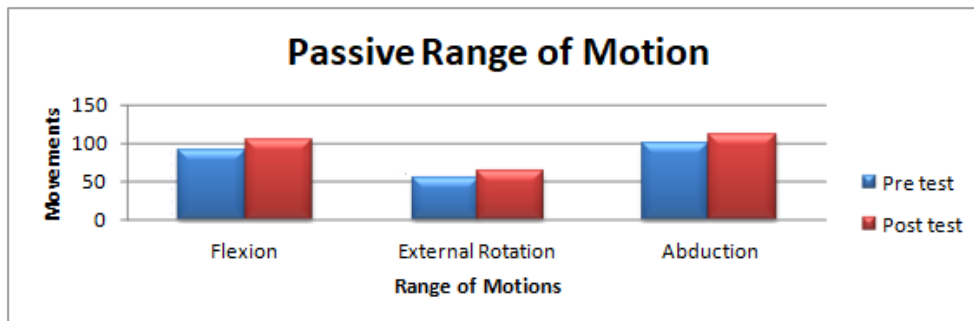
**Showing Pre-and Post-values of Flexion, External Rotation and Abduction of Active Range of Motion of shoulder score of Group B.**



**Table 5**

**Comparison between Pre-and Post values of Flexion, External Rotation and Abduction of Passive Range of Motion of shoulder score of Group B. Paired t-Test was used to analyze pre and the post values of Flexion, External Rotation and Abduction of Passive Range of Motion of shoulder, the data obtained were statistically significant for group B.**

Passive Range of Motion		Mean	Standard Deviation	t-Test	Sig. (2- Tailed)
Flexion	Pre-test	92.13	11.27	9.5773	0.0001
	Post test	104.80	9.99		
External Rotation	Pre-test	55.47	4.24	13.2665	0.0001
	Post test	64.27	4.15		
Abduction	Pre-test	101.13	7.94	11.3088	0.0001
	Post test	111.47	5.74		



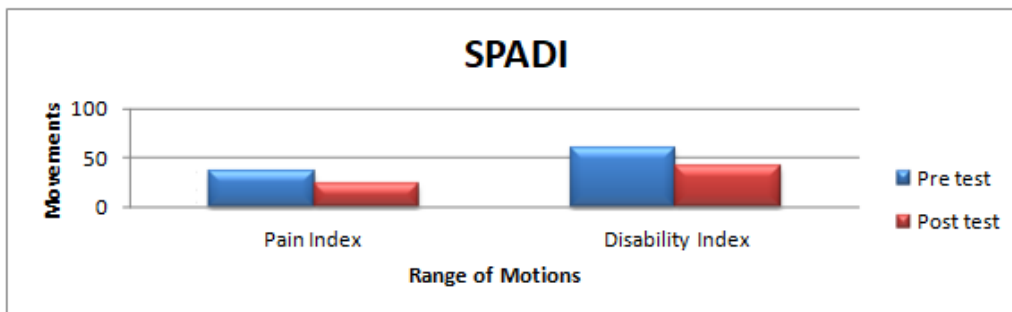
**Figure 6b**

**Showing Pre-and Post values of Flexion, External Rotation and Abduction of Passive Range of Motion of shoulder score of Group B.**

**Table 6**

**Comparison between Pre-and Post-values of Pain Index and Disability Index of shoulder score of Group B. Paired t-Test was used to analyze pre and the post values of Pain Index and Disability Index of shoulder, the data obtained were statistically significant for group B.**

Pain Index/ Disability Index		Mean	Standard Deviation	t-Test	Sig. (2- Tailed)
Pain Index	Pre-test	37.13	5.93	8.9368	0.0001
	Post test	24.07	3.63		
Disability Index	Pre-test	59.53	8.78	5.4183	0.0001
	Post test	41.73	6.66		



**Figure 6c**

**Showing Pre-and Post values of Pain Index, Disability Index of shoulder score of Group B.**

**Between group analysis  
Active range of motion**

**Table 7**

**Comparisons between Group A and B on Active Range of Motion in Flexion of shoulder score p value (0.0001)**  
**Pre-test values (p-value and 95% confidence interval) show that both groups were not significant before training. Statistically significant values were obtained for both the groups following training on Active Range of Motion in Flexion of shoulder score. Since both groups have same p-value and 95% confidence interval, so considering mean, group A has higher value than group B. This shows Group A was highly significant compared to Group B.**

Flexion	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre test	Group A	143.33	8.364	46.573	61.960	.000
	Group B	89.07	11.901	46.533	62.000	.000
Post test	Group A	162.07	7.667	44.155	57.978	.000
	Group B	101.00	10.583	44.125	58.009	.000

**Table 8**

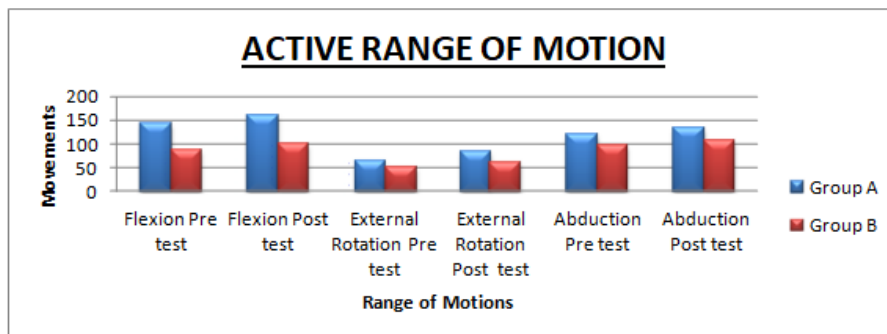
**Comparisons between Group A and B on Active Range of Motion in External Rotation of shoulder score. Pre-test values (p-value and 95% confidence interval) show that both groups were not significant before training. Statistically significant values were obtained for both the groups following training on Active Range of Motion in External Rotation of shoulder score. Since both groups have same p-value and 95% confidence interval, so considering mean, group A has higher value than group B. This shows Group A was highly significant compared to Group B.**

External Rotation	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre-test	Group A	65.67	4.220	9.463	16.270	.000
	Group B	52.80	4.858	9.460	16.273	.000
Post test	Group A	84.60	4.940	9.673	16.994	.000
	Group B	61.27	4.847	9.673	16.994	.000

**Table 9**

**Comparisons between Group A and B on Active Range of Motion in Abduction of shoulder score. Pre-test values (p-value and 95% confidence interval) show that both groups were not significant before training. Statistically significant values were obtained for both the groups following training on Active Range of Motion in Abduction of shoulder score. Considering post test p-value Group A shows higher significance compared to Group B. This shows Group A was highly significant compared to Group B.**

Abduction	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre-test	Group A	119.87	26.398	7.127	36.473	.005
	Group B	98.07	8.531	6.680	36.920	.007
Post test	Group A	132.00	24.495	10.289	36.911	.001
	Group B	108.40	5.779	9.792	37.408	.002



**Figure 7**  
**Showing pre-& post-test between Group A and Group B for Active Range of Motion**

**Passive range of motion**

**Table 10**

**Comparisons between Group A and B on Passive Range of Motion in Flexion of shoulder score. Pre-test values (p-value and 95% confidence interval) show that both groups were no significant before training. Statistically significant values were obtained for both the groups following training on Passive Range of Motion in Flexion of shoulder score. Since both groups have same p-value and 95% confidence interval, so considering mean, group A has higher value than group B. This shows Group A was highly significant compared to Group B.**

Flexion	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre-test	Group A	147.00	7.883	47.593	62.140	.000
	Group B	92.13	11.269	47.554	62.179	.000
Post test	Group A	166.20	6.405	45.125	57.675	.000
	Group B	104.80	9.987	45.075	57.725	.000

**Table 11**

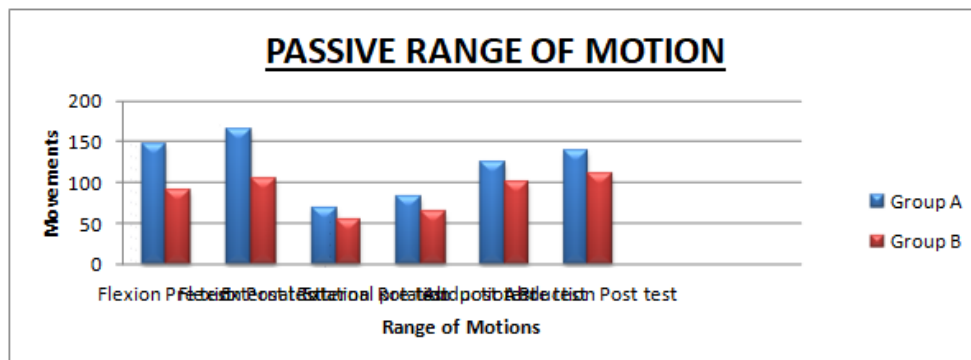
**Comparisons between Group A and B on Passive Range of Motion in External Rotation of shoulder score. Pre-test values (p-value and 95% confidence interval) show that both groups were no significant before training. Statistically significant values were obtained for both the groups following training on Passive Range of Motion in External Rotation of shoulder score. Since both groups have same p-value and 95% confidence interval, so considering mean, group A has higher value than group B. This shows Group A was highly significant compared to Group B.**

External Rotation	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre-test	Group A	69.60	3.621	10.289	36.911	.001
	Group B	55.47	4.240	9.792	37.408	.002
Post test	Group A	84.27	5.431	47.593	62.140	.000
	Group B	64.27	4.148	47.554	62.179	.000

**Table 12**

**Comparisons between Group A and B on Passive Range of Motion in Abduction of shoulder score. Pre test values (p-value and 95% confidence interval) show that both groups were no significant before training. Statistically significant values were obtained for both the groups following training on Passive Range of Motion in Abduction of shoulder score. Considering p-value Group A is highly significant than Group B.**

Abduction	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre-test	Group A	125.40	25.942	9.919	38.615	.002
	Group B	101.13	7.936	9.461	39.072	.003
Post test	Group A	139.00	22.750	13.123	37.943	.000
	Group B	111.47	5.743	12.675	38.391	.001



**Figure 8**  
**Showing pre & post test between Group A and Group B for Passive Range of Motion**

SPADI

Table 13

**Comparisons between Group A and B on Pain Index score. Pre-test values (p-value and 95% confidence interval) show that both groups were not significant before training. Statistically significant values were obtained for both the groups following training on Pain Index score. Considering mean value of both groups, Group A was highly significance compared to Group B.**

Pain Index	Groups	Mean	Standard deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre test	Group A	38.80	4.004	-2.116	5.449	.374
	Group B	37.13	5.927	-2.140	5.473	.376
Post test	Group A	20.93	3.105	-.661	4.395	.142
	Group B	24.07	3.634	-.664	4.398	.142

Table 14

**Comparisons between Group A and B on Disability Index score. Pre-test values (p-value and 95% confidence interval) show that both groups were not significant before training. Statistically significant values were obtained for both the groups following training on Disability Index score. Considering mean value of both groups, Group A was highly significance compared to Group B.**

Disability Index	Groups	Mean	Standard Deviation	95% confidence interval		Sig (2-tailed)
				Lower	Upper	
Pre test	Group A	60.87	3.314	-3.631	6.298	.587
	Group B	59.53	8.782	-3.760	6.427	.589
Post test	Group A	38.40	5.068	-7.760	1.093	.134
	Group B	41.73	6.660	-7.774	1.107	.135

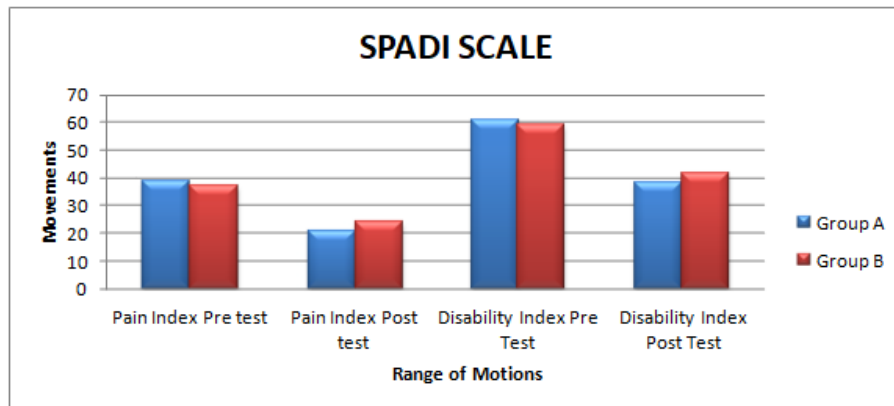


Figure 9

**Showing pre-& post test between group analyses of SPADI Scale**

**DISCUSSION**

Movements of the human shoulder complex represent a dynamic relationship of many muscle forces, ligament constraints, and bony articulations. Static and Dynamic stabilizers allow the shoulder the greatest range of motion of any joint in the body and position the hand and elbow in space. Shoulder pain is a commonly encountered problem, with prevalence studies indicating a frequency of 7–20% among the adult general population. Altered dynamic control appears to be a significant contributing factor to shoulder dysfunction. The shoulder relies primarily on the rotator cuff for dynamic stability through mid-range. Hence, any impairment in the dynamic stabilizing system is likely to have profound effects on the shoulder complex.<sup>12</sup> Frozen shoulder, also called adhesive capsulitis, is one of the diseases that cause shoulder pain. There is often a delay of patient presentation, and sometimes delay in

diagnosis as it can share symptoms with many other shoulder conditions. Typical history is that of minor or no trauma with the gradual progression of pain and loss of Range Of Motion. The hallmark of physical examination is loss of both passive and active ROM without degenerative changes on X-ray. The Adhesive capsulitis of shoulder syndrome affects the glenohumeral joint; the physiologic movement most restricted by the syndrome is external rotation. The major complaint is joint stiffness. As this problem gradually worsens, the patient avoids using the shoulder, creating a vicious circle in which movement restriction increases pain and causes atrophy & reduce in muscle strength, resulting in further increased stiffness. Thus, it is of critical importance for both the patient’s quality of life and the reversibility of the condition to recognize the disease and promptly provide treatment before it reaches an advanced stage. Frozen shoulder can be of primary or secondary type. The term “primary” indicates an idiopathic condition.

Secondary Disease may be linked to trauma, cardiovascular disease, hemiparesis, surgical procedures or diabetes. Although numerous studies are on the published effectiveness of treatment for frozen shoulder, the topic remains somewhat controversial. Many treatment methods have been applied; the most widespread and effective treatments suggested are Heat application, ultrasound, neuromuscular electro stimulation, continuous passive movement exercises, joint mobilization, Proprioceptive neuromuscular facilitation (PNF) techniques, and ROM exercises. These are commonly provided independently or as a part of standard physical therapy. Resistance training using elastic band seems to fall into a distinct category. Unlike traditional resistance exercise methods, use of elastic band relies on the tensile properties of latex or other elastic polymers as a form of resistance. The level of resistance varies according to rate and elongation of stretch of the material. Theraband Hughes & McBride, in his study proved that Theraband strengthening program is effective method for treating Adhesive capsulitis of shoulder. Theraband for Adhesive Capsulitis shoulder in deceleration pattern is effective in increasing the eccentric strength at slow speeds, but not at fast speeds around shoulder.<sup>14</sup> Whereas, therapeutic Ultrasound restored Range of Motion, Functions and reduced Pain compared to a placebo sham ultrasound group for the treatment of adhesive capsulitis.<sup>15</sup> Thus the combination of physical therapy, exercise, and manual techniques was found to be effective in treating frozen shoulder. The aim of this study was to determine the effectiveness of effect of Theraband strengthening with conventional exercise on pain, function & range of motion in patients with Adhesive capsulitis of shoulder. 30 subjects fulfilling the inclusion criteria were assigned to this study by randomized technique. The subjects were divided 15 subjects each. Informed consent was taken from the subjects and the procedure was explained. Group A (n=15) were receiving Theraband exercises with conventional therapy over a period of 3times/week, 3 weeks/alternative days. Group B (n=15) were receiving conventional therapy over a period of 3times/week, 3 weeks/alternative days. Universal Goniometer and SPADI scale was used to as the tools for analysis. The Outcome measures were taken at the end of 3<sup>rd</sup> week. When analyzed male subjects showed greater improvement when compared to women which could be attributed to normal activities of daily living. Age played a critical role in outcome measures that is lesser the age greater was the improvement. This could be due to physiological changes in muscle structure and function with an increase in age. The 4 outcome measures Active Range of Motion, Passive Range of Motion & Function. Passive Range of Motion & Function showed greater improvement compared to other 2 outcome measures.

## REFERENCES

1. Dias R, Cutts S, Massoud S. Frozen shoulder. *BMJ: British Medical Journal*. 2005 Dec 17;331(7530):1453.
2. Noel E, Thomas T, Schaeferbeke T, Thomas P, Bonjean M, Revel M. Frozen shoulder. *Joint,*

The SPADI is short, easy to understand and takes less than five minutes to complete the score. It also has reasonably good clinometric properties. If the measurement of pain and disability are of primary interest, the SPADI is a useful tool for a wide range of patients with most shoulder problems.<sup>16</sup>

On comparison between Group A and B on SPADI scale both the groups showed significant improvement but Group A had a greater improvement compared to Group B. In SPADI scale component like reaching for something on a high shelf (pain component), removing something from your back pocket (Disability component) were more difficult while compared to other components. On comparison between Group A and Group B on Active range of motion both the groups showed significant improvement but Group A had a greater improvement compared to Group B. In Active range of motion External Rotation were more difficult due to pain while compared to other components. On comparison between Group A and Group B on Passive range of motion both the groups showed significant improvement but Group A had a greater improvement compared to Group B. In Passive range of motion External Rotation were more difficult due to pain while compared to other components. The present study reveals that patient who received Theraband strengthening exercise along with conventional exercise showed marked improvement in Range of Motion Active and Passively, Pain Index, Functional Index than those who received only conventional exercise. This novel exercise using inexpensive Theraband provides a practical means of adding strengthening of shoulder training to the treatment of Adhesive Capsulitis.

## CONCLUSION

From the result, it has been concluded that Theraband strengthening along with conventional treatment (Group A) is more effective than conventional treatment in increase in Range of motion, decrease in pain, and decrease in disability and thereby improving the functional ability.

### *Future recommendations*

A study with large sample size is recommended. Further investigation in this area may include a follow up study which could examine for how long did the gain in the strength of shoulder lasted after three weeks of intervention. Strengthening muscles around shoulder should be considered.

## CONFLICT OF INTEREST

Conflict of interest declared none.

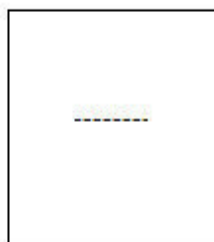
bone, spine: *revue du rhumatisme*. 1999 Dec;67(5):393-400.

3. Kelley MJ, Shaffer MA, Kuhn JE, Michener LA, Seitz AL, Uhl TL, Godges JJ, McClure PW, Altman RD, Davenport T, Davies GJ. Shoulder pain and mobility deficits: adhesive capsulitis: clinical practice guidelines linked to the international classification of functioning, disability, and health from the Orthopaedic



- Section of the American Physical Therapy Association. *J Orthop Sports Phys Ther.* 2013 May;43(5):A1-31.
4. Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. *Current reviews in musculoskeletal medicine.* 2008 Dec 1;1(3-4):180-9.
  5. Page P, Labbe A. Adhesive capsulitis: use the evidence to integrate your interventions. *NN Am J Sports Phys Ther.* 2010 Dec;5(4):266.
  6. Hsu WC, Wang TL, Lin YJ, Hsieh LF, Tsai CM, Huang KH. Addition of Lidocaine Injection Immediately before Physiotherapy for Frozen Shoulder: A Randomized Controlled Trial. *PLoS one.* 2015 Feb 25;10(2):e0118217.
  7. Surgery A. Bernard F. Hearon, M.D. [Internet]. *Shoulder, Elbow, Wrist and Hand Surgery, Joint Replacement,* 1994 <http://www.aoaortho.com/bernard-f-hearon-md/#tab-01>
  8. Ansari SN, Lourdhuraj I, Shah S, Patel N. Effect of ultrasound therapy with end range mobilization over cryotherapy with capsular stretching on pain in frozen shoulder-a comparative study. *Int J Curr Res Rev.* 2012 Dec 15;4(24):68.
  9. Ibrahim M, Donatelli R, Hellman M, Echternach J. Efficacy of a static progressive stretch device as an adjunct to physical therapy in treating adhesive capsulitis of the shoulder: a prospective, randomised study. *Physiotherapy.* 2014 Sep 30;100(3):228-34.
  10. Alptekin HK, Aydın T, İflazoğlu ES, Alkan M. Evaluating the effectiveness of frozen shoulder treatment on the right and left sides. *J Phys Ther Sci.* 2016;28(1):207-12.
  11. Uchida MC, Nishida MM, Sampaio RA, Moritani T, Arai H. Thera-band® elastic band tension: reference values for physical activity. *J Phys Ther Sci.* 2016;28(4):1266-71.
  12. Magarey ME, Jones MA. Dynamic evaluation and early management of altered motor control around the shoulder complex. *Manual therapy.* 2003 Nov 30;8(4):195-206.
  13. Hughes CJ, McBride A. The use of surface electromyography to determine muscle activation during isotonic and elastic resistance exercises for shoulder rehabilitation. *ORTHOPAEDIC PHYSICAL THERAPY PRACTICE.* 2005;17(2):18.
  14. Page PA, Lamberth J, Abadie B, Boling R, Collins R, Linton R. Posterior rotator cuff strengthening using Theraband® in a functional diagonal pattern in collegiate baseball pitchers. *J Athl Train.* 1993;28(4):346.
  15. Soediono B., Effectiveness of therapeutic ultrasound in adhesive capsulitis. *J Chem Inf Model.* 1989;53:160.
  16. Breckenridge JD, Mc Auley JH. Shoulder pain and disability index (SPADI). *J Physiother.* 2011 Dec 31;57(3):197.

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