

# Effectiveness of Client Centered- ADL Training Program for Improving Upper Extremity Function in Sub-acute Adhesive Capsulitis: A Randomized Controlled Trial

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## ABSTRACT

**CONTEXT:** Adhesive Capsulitis has been described as a self-limiting condition, lasting on an average 2-3 years. It is estimated to affect 2% -5% of the population. Usually affects performance in activities of daily living.

**AIM:** To study the effectiveness of Actual training of ADL's along with Conventional Occupational Therapy in improving Upper Extremity function in Sub-acute stage of Adhesive capsulitis

**METHODS AND MATERIALS:** 10 Patients between the age 40-60 years of both the genders, with unilateral shoulder pain for more than 3 months and had received only analgesic treatment.

**STATISTICAL ANALYSIS:** Statistical analysis-Pain on VAS, UEFI, Muscle Power, ROM And COPM outcomes were done by using descriptive and inferential statistics using chi-square test, Mann Whitney U test and Wilcoxon Signed Rank Test and software used in the analysis were SPSS 24.0 version and GraphPad Prism 7.0 version and  $p < 0.05$  is considered as level of significance.

**CONCLUSION:** On therapeutic basis in Occupational Therapy, the Conventional Occupational therapy and Actual ADL training both were effective in subacute stage of Adhesive Capsulitis.

But, when Client - Centered care perspective considered, then Actual ADL training along with Conventional Occupational therapy is found to be effective than Conventional Occupational therapy alone.

**Keywords:** ADL (Activities of Daily Living), COPM (Canadian Occupational Performance Measure), ROM (Range of Motion), UEFI (Upper Extremity Function Index)

## INTRODUCTION

The American Academy of Orthopaedic Surgeons defines Adhesive Capsulitis as: "a condition of varying severity characterized by the gradual development of global limitation of active and passive shoulder motion where radiographic findings other than osteopenia are absent<sup>[10]</sup>.

It is classified as primary, characterized by idiopathic, progressive, painful loss of

active and passive range of motion in glenohumeral joint. Whereas secondary, characterized as similar to primary but with intrinsic and extrinsic causes or shoulder stiffness following surgical intervention. (Intrinsic-related to trauma; extrinsic-related to rotator cuff tear, trauma, bursitis, tendonitis)<sup>[8]</sup>

Adhesive Capsulitis has been described as a self-limiting condition, lasting on average 2-

3 years. It is estimated to affect 2% -5% of the population. Usually affects patients aged 40-60 years, men tend to be affected less frequently than women, and there is no predilection for race<sup>[8]</sup>.

The primary purpose of the upper limb is to move the hand around the body during the activities of life. The Shoulder has greater mobility than any other articulation in the human body, arising from the combination of gleno - humeral & scapulo- thoracic motions.

Pain associated with Adhesive Capsulitis can cause a limitation or selective immobilization of the painful shoulder. This becomes even more apparent when passive ROM is accompanied by an unusual amount of pain & guarding.

Codman<sup>[34]</sup> discussed this entity describing a slow onset of pain, felt near the insertion of the deltoid, restriction in both active & passive elevation as well as external rotation, yet with normal radiologic appearance. Without degenerative joint disease on radiographs, this clinical picture suggests the diagnosis of Adhesive Capsulitis.

The activities of daily living (ADLs) are a term used to collectively describe fundamental skills that are required to independently care for oneself such as eating, bathing, and mobility. The term activities of daily living were first coined by Sidney Katz in 1950.<sup>[26,27]</sup>

ADL is used as an indicator of a person's functional status<sup>[25]</sup>.

Patients of Adhesive Capsulitis may experience sleep disturbances due to pain or inability to sleep on their affected side. It might prevent them from performing activities of daily living (such as reaching for a wallet in the back pocket, combing the hair, fastening a bra in the back). It also might affect activities at work, particularly, those that require reaching. Furthermore, it might affect recreational activities that feature significant use of the upper extremity such as swimming, throwing a ball, etc.<sup>[17]</sup> Significant correlation between

functional disability related to lack of shoulder ROM & quality of life, as well<sup>[18]</sup>. Client-centered occupational therapy is a kind of partnership between the client/patient and the therapist, which allows empowerment of the patient to engage in functional performance to fulfil his/her occupational roles in a variety of environments.<sup>[20]</sup>

When a client-centered approach is administered completely, the patient makes decisions alone based on his/her targets. In addition, the power is transferred from the therapist to the patient. In such a case, the therapist supports the decision-making power of the patient and accepts his/her decisions.<sup>[21,22]</sup> Expectations and targets are achieved together with the patient.<sup>[23- 24]</sup>

Preparatory method & tasks are part of treatment to prepare clients to engage in occupational performance<sup>[13]</sup>.

In Occupational therapy, for shoulder adhesive capsulitis rehabilitation, is to promote and improve upper extremity ADL functions and reduce disability. It involves early intervention which enhances and helps to return to work by using various levels of interventions.

Adjunctive methods (preparatory method), Enabling activity purposeful/ meaningful activity are used to increase range of motion, strength, coordination, endurance, accuracy, intensity and leads to ultimately improved ADL.

#### **RATIONALE:**

Present Conventional Occupational Therapy management for adhesive capsulitis includes- active/passive ROM, enabling activity, physical agent modalities and simulated activities of daily living. All of these prove to be effective.

However, transfer of training in the patient's home environment does not occur; and hence, patients still struggle with the right method of performing activities for total independence.

Horst et al in 2017 concluded in the study of Adhesive capsulitis patients, that therapy based on performing activities seems to be

more effective for pain reduction and the ability to perform daily life activities than conventional treatment method (Physiotherapy).

As this study also recommends future studies on patients who have had history of shoulder pain and limited range of motion for at least 3 months (i.e., Subacute phase) prior to baseline to rule out the assumption of activity-oriented therapy.

Therefore, the aim is to study the effect of actual ADL training along with conventional occupational therapy in subacute stage of adhesive capsulitis.

In 2014 Aishwarya Swaminathan concluded in her study, that for an effective client centered care, it is essential to consider both quantitative and qualitative factor that guide the program. They used COPM as an outcome measure to study the self-perceived changes by the clients/ participants<sup>[4]</sup>.

Therefore, COPM along with the other scales were used as an outcome measure in the study as this is client centered training program.

**AIM:** To study the effectiveness of Actual training of ADL's along with Conventional-Occupational Therapy in improving Upper Extremity function in Subacute stage of Adhesive capsulitis

#### **OBJECTIVE:**

1. Effectiveness of Conventional-Occupational Therapy alone in Subacute stage of Adhesive Capsulitis using COPM and UEFI
2. Effectiveness of Conventional-Occupational Therapy along with actual ADL training in Adhesive Capsulitis using COPM and UEFI
3. To compare effectiveness of Conventional-Occupational Therapy alone, and Conventional Occupational Therapy Along with Actual ADL Training.

#### **MATERIALS & METHODS**

The study program was conducted in Tertiary care Hospital of Mumbai,

Maharashtra. For a period of 18 months, started in the year of 2019 by institutional Ethics approval for 30 sample size, 15 in each group. But, due to COVID-19 Pandemic and lockdown situation, there is inadequacy of the patients. For this an amendment was proposed for 10 sample size to Institutional Ethics Committee, and was approved (EC(II)/OUT/507/2020) also. Hence, this study included total 10 patients, 5 in each group.

Sample allocation was done by using simple random sampling (lottery method) & were randomized serially, into equal size in 2 groups- A (Control group- Conventional Occupational Therapy) & B (Experimental group- Conventional Occupational Therapy + Actual ADL Training).

#### **INCLUSION CRITERIA:**

- 1) Shoulder pain complaint for more than 3 months
- 2) Age: 40 - 60 years
- 3) Gender: Both Male and Female
- 4) Unilateral shoulder involvement
- 5) Previous treatment by analgesics only

#### **EXCLUSION CRITERIA:**

- 1) With any neurological & psychological involvement.
  - 2) Case history of pain and limited range of motion in the cervical spine
  - 3) Any significant history of fractures
- Patients were explained the nature and purpose of the study.

A consent letter was taken from them in the language best understood by them.

And were subjected to an initial baseline evaluation: Pain on Visual Analogue Scale, UEFI, COPM, Range of motion on Goniometer and Manual muscle testing. Re-assessment of all outcome measures were taken at the end of 4<sup>th</sup> and 6<sup>th</sup> week except COPM.

For COPM scale, the checklist of Upper extremity ADL was provided, to select the tasks which they were finding difficult to perform. The COPM was performed 2 times in the study. First time, at the baseline and re-assessment at the end of 4<sup>th</sup> week for 1<sup>st</sup> 5

difficult tasks. And second time, at the beginning of 5<sup>th</sup> week and reassessment at the end of 6<sup>th</sup> week for another 5 new tasks. The selection of activities differs from one patient to another patient. Patients were subjected to follow-up for therapy 3 times in a week, for total of 6 weeks protocol. And who does not report for the therapy, for a continuous period of 1 week, was considered as deviation from protocol.

### TREATMENT PROTOCOL

An initial assessment was done and the eligible patients, were randomly placed in Group A and Group B.

Group A (30min): Conventional occupational therapy intervention

Group B (30min): Conventional occupational therapy intervention with Actual training of ADL.

Table 1. Treatment Protocol

Weeks (0-6 weeks)	Group A –Conventional OT [30min]	Group B- Conventional OT with Actual ADL training [30min]
0-2 weeks	-Preparatory method[15min] (Hot/Cold fomentation/Contrast bath) -Any 2 Enabling activity [15min] 1 Set of 10 repetition/ as per patients tolerance	-Preparatory method[15min] (Hot/Cold fomentation/Contrast bath) -Any 2 Enabling activity [15min] 1 Set of 10 repetition/ as per patients tolerance
3-4 weeks	-Preparatory method[10min] -Any 3 Enabling activity [5min] 1 Set of 10 repetition/ as per patients tolerance -Any 3 Purposeful simulated activity [5min] 1 Set of 2 repetition/ as per patients tolerance -Cooling down exercise(placebo) [10min] 1 set of any 2 enabling activities with breathing in and out.	-Preparatory method[10min] -Any 3 Enabling activity [5min] 1 Set of 10 repetition/ as per patients tolerance -Any 3 Purposeful simulated activity [5min] 1 Set of 2 repetition/ as per patients tolerance -Actual ADL training (for 1 <sup>st</sup> 5 selected challenging ADL) [10 min] (-3 sets of 5/more repetition as per patients tolerance OR-1 set - with increased in number of repetition)
5-6 weeks	-Preparatory method [10min] (Hot/Cold fomentation/Contrast bath) -Any 3 Enabling activity [5min] 1 Set of 10 repetition/ as per patients tolerance -Any 3 Purposeful simulated activity [5min] 1 Set of 2 repetition/ as per patients tolerance -Cooling down exercise(placebo) [10min- same protocol but with progressive increase in repetitions with weights]	-Preparatory method [10min] (Hot/Cold fomentation/Contrast bath) -Any 3 Enabling activity [5min] 1 Set of 10 repetition/ as per patients tolerance -Any 3 Purposeful simulated activity [5min] 1 Set of 2 repetition/ as per patients tolerance -Actual ADL training (for 2 <sup>nd</sup> 5 selected challenging ADL) [10min- same protocol but with progressive increase in repetitions]

Number of repetitions varies from patient to patient, but a baseline number of repetitions was obtained for each patient and thereby increasing the repetition every week as per patient tolerance (enabling, purposeful activities & actual ADL training).

#### Enabling activity includes

- Horizontal sanding
- Incline sanding
- Finger ladder (forward flexion/abduction)
- Peg-board activity (table-top/wall-mounted)
- Moving cones (different level)
- Stacking Blocks etc.

- clothing fastener board (buttoning and unbutton [placing front /back])
- House-hold hardware board (at chest level/above Chest Level)
- Shifting/placing boxes at different level in sitting /Standing etc.

#### Purposeful Simulated activity includes:

**Home program** for both groups to perform each set of exercises twice a day as per tolerance.



**0-2 weeks:**

- (A) 1 Set (10 counts) of shoulder isotonic exercise up to chest level
- (B) 2 Sets (10 counts) of isotonic exercises of other joints of upper extremity
- (C) Neck isotonic exercise

(C) Neck isotonic exercise with minimal resistance.

(D) Practice simulated as well as actual ADL at home, as shown during therapy session.

**3-4 weeks:**

- (A) 1 Set (10 counts) of Shoulder isotonic exercise beyond chest level
- (B) 2 Sets (10 counts each) of isotonic exercise with minimal resistance (up to 1kg) for other joints of upper extremity.

**5-6 week:**

- (A) Continue first 4 weeks of protocol
  - (B) 1Set (10 counts) of shoulder isotonic exercises with minimal resistance (up to 1kg) beyond chest level
- Practice simulated as well as actual ADL activities at home.



Fig 1.



Fig. 2

Fig1 and 2: Vertical sanding



Fig.3



Fig. 4

Fig 3 and 4: Actual ADL training (donning and doffing of Shirt)

**STATISTICAL ANALYSIS**

Statistical analysis was done by using descriptive and inferential statistics using chi-square test, Mann Whitney U test and

Wilcoxon Signed Rank Test and software used in the analysis were SPSS 24.0 version and Graph Pad Prism 7.0 version and

p<0.05 is considered as level of significance.

## RESULT

The study was conducted between the year 2019 and 2021. Total 10 patients were statistically analyzed. Both groups had equal distribution.

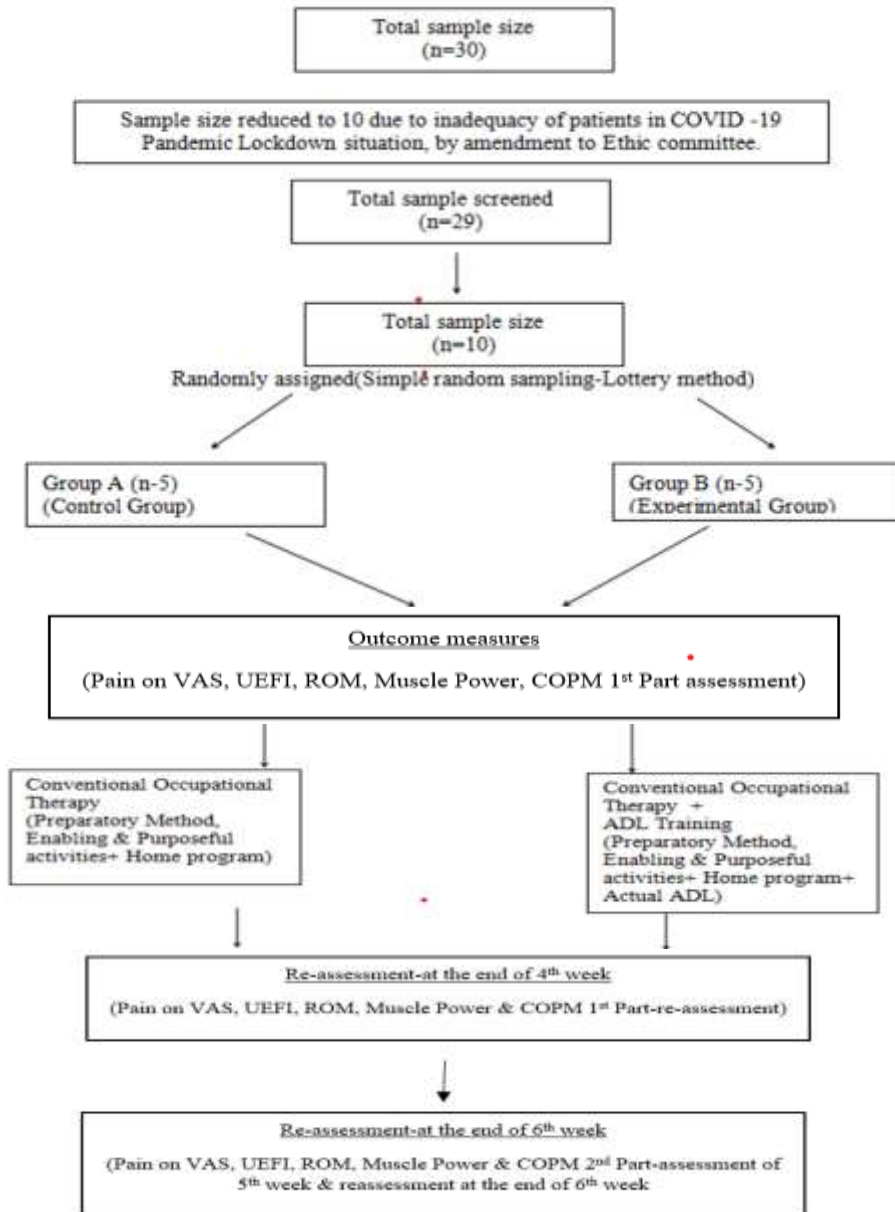


Fig.5. Participants flowchart

Table 1: Distribution of patients according to demographic characteristics

Gender	Control Group	Experimental Group	p-value
	51.20±8.10	49.40±5.59	0.40 p=0.69, NS
Male	3(60%)	2(40%)	1.00, NS
Female	2(40%)	3(60%)	

For the significant difference p value <0.05.

As the sample size was low, between the group's comparison was not significant ( $p < 0.05$ ) hence, between the group's comparison was done on the basis of mean value and its difference. At baseline

subjects were comparable concerning age and gender.

### PAIN ON VISUAL ANALOGUE SCALE

**Table 2. Comparison of Pain on VAS in two groups at the end of 4<sup>th</sup> and 6<sup>th</sup> week when compared with baseline (Wilcoxon Signed Rank Test)**

GROUPS	INTERVALS	Mean	N	Std. Deviation	Std. Error Mean	Mean Difference	z-value
Control Group	Baseline	8.80	5	1.64	0.73		
	At the end of 4 <sup>th</sup> week	6.60	5	1.94	0.87	2.20±1.09	4.49 p=0.011, S
	At the end of 6 <sup>th</sup> week	5.20	5	1.92	0.86	3.60±0.54	14.69 p=0.0001, S
Experimental Group	Baseline	8.40	5	0.82	0.36		
	At the end of 4 <sup>th</sup> week	6.40	5	1.14	0.50	2±0.61	7.30 p=0.002, S
	At the end of 6 <sup>th</sup> week	4.80	5	1.78	0.80	3.60±1.47	5.45 p=0.005, S

**Table 3. Comparison of mean difference at 4<sup>th</sup> and 6<sup>th</sup> week in Pain on VAS in two groups (Mann Whitney U Test)**

	Group	N	Mean difference	Std. Deviation	Std. Error Mean	z-value
At the end of 4 <sup>th</sup> week	Control Group	5	2.20	1.09	0.48	0.35
	Experimental Group	5	2.00	0.61	0.27	p=0.73, NS
At the end of 6 <sup>th</sup> week	Control Group	5	3.60	0.54	0.24	0.00
	Experimental Group	5	3.60	1.47	0.65	p=1.00, NS

Concerning the Pain on VAS, there was significant reduction in pain scores in both the groups from baseline, at the end of 4<sup>th</sup> week and 6<sup>th</sup> week ( $p < 0.05$ ).

But the control group ( $p = 0.0001$ ) showed faster reduction in Pain on VAS scores post therapy from baseline.

On the basis of mean difference, both the groups showed equal reduction in Pain post therapy (3.60).

### UPPER EXTREMITY FUNCTION INDEX

**Table 4. Comparison of UEFS in two groups at pre and post therapy (Wilcoxon Signed Rank Test)**

		Mean	N	Std. Deviation	Std. Error Mean	Mean Difference	z-value
Control Group	Pre t/t	27.40	5	10.45	4.67	20.20±7.52	5.99 p=0.004, S
	Post t/t	47.60	5	8.59	3.84		
Experimental Group	Pre t/t	20.80	5	9.88	4.42	13.60±10.76	2.82 p=0.048, S
	Post t/t	34.40	5	8.50	3.80		

**Table 5. Comparison of mean difference in pre and post therapy UEFS in two groups (Mann Whitney U Test)**

Group	N	Mean Difference	Std. Deviation	Std. Error Mean	z-value
Control Group	5	20.20	7.52	3.36	1.12
Experimental Group	5	13.60	10.76	4.81	p=0.29, NS

Both the groups showed significant results i.e  $p < 0.05$  Post therapy when compared with the baseline.

Control group ( $p = 0.004$ ) showed significantly faster increase in scores from the baseline when compared with experimental group post therapy

Considering the mean difference for between the group comparison, in which Control group (20.20) showed better improvement in UEFI scores than experimental group (13.60)

### MUSCLE POWER

**Table 6. Comparison of Muscle Power within the groups at the end of 4<sup>th</sup> & 6<sup>th</sup> week from baseline**

Movement	Intervals	Mean		N		Std. Dev		Std. Error Mean		Mean Difference		z-value	
		Ctrl grp	Exp. Grp	Ctrl grp	Exp. grp	Ctrl grp	Exp. Grp	Ctrl grp	Exp. grp	Ctrl grp	Exp. Grp	Ctrl grp	Exp. Grp
Flexors	Baseline	2.00	2.00	5	5	0.00	0.00	0.00	0.00				
	At the end of 4 <sup>th</sup> week	2.60	2.80	5	5	0.54	0.44	0.24	0.20	0.60±0.54	0.80±0.44	2.44 P=0.076, NS	4.00 P=0.016, S
	At the end of 6 <sup>th</sup> week	3.20	3.20	5	5	0.44	0.44	0.20	0.20	1.20±0.44	1.20±0.44	6.00 P=0.004, S	6.00 P=0.004, S
Extensors	Baseline	2.40	2.40	5	5	0.54	0.54	0.24	0.24				
	At the end of 4 <sup>th</sup> week	2.80	3.00	5	5	0.44	0.00	0.20	0.00	0.40±0.54	0.60±0.54	1.63 P=0.17, NS	2.44 P=0.070, NS
	At the end of 6 <sup>th</sup> week	3.20	3.40	5	5	0.44	0.54	0.20	0.24	0.80±0.83	1.00±0.70	2.13 P=0.099, NS	3.16 P=0.034, S
Abductors	Baseline	2.00	2.20	5	5	0.00	0.44	0.00	0.20				
	At the end of 4 <sup>th</sup> week	2.20	3.00	5	5	0.44	0.00	0.20	0.00	0.20±0.44	0.80±0.44	1.00 P=0.37, NS	4.00 P=0.016, S
	At the end of 6 <sup>th</sup> week	3.00	3.20	5	5	0.70	0.44	0.31	0.20	1.00±0.70	1.00±0.70	3.16 P=0.034, S	3.16 P=0.034, S
Adductors	Baseline	2.20	2.20	5	5	0.44	0.44	0.20	0.20				
	At the end of 4 <sup>th</sup> week	2.60	3.00	5	5	0.54	0.00	0.24	0.00	0.40±0.54	0.80±0.44	1.63 P=0.17, NS	4.00 P=0.016, S
	At the end of 6 <sup>th</sup> week	3.20	3.20	5	5	0.44	0.44	0.20	0.20	1.00±0.70	1.00±0.70	3.16 P=0.034, S	3.16 P=0.034, S
Internal Rotators	Baseline	2.20	2.40	5	5	0.44	0.54	0.20	0.24				
	At the end of 4 <sup>th</sup> week	3.00	3.00	5	5	0.00	0.00	0.00	0.00	0.80±0.44	0.60±0.54	4.00 P=0.016, S	2.44s P=0.070, NS
	At the end of 6 <sup>th</sup> week	3.00	3.20	5	5	0.00	0.44	0.00	0.20	0.80±0.44	0.80±0.83	4.00 P=0.016, S	2.13 P=0.099, NS
External Rotators	Baseline	2.20	2.20	5	5	0.44	0.44	0.20	0.20				
	At the end of 4 <sup>th</sup> week	2.60	3.00	5	5	0.54	0.00	0.24	0.00	0.40±0.54	0.80±0.44	1.63 P=0.17, NS	4.00 P=0.016, S
	At the end of 6 <sup>th</sup> week	3.00	3.20	5	5	0.00	0.44	0.00	0.20	0.80±0.44	1.00±0.70	4.00 P=0.016, S	3.16 P=0.016, S

**Table 7. Comparison of Muscle Power Between the Groups from end of the 4<sup>th</sup> week to 6<sup>th</sup> week**

Movement	Interval	N		Mean		Std. Dev.		Std. Error Mean		z-value
		Ctrl	Exp	Ctrl	Exp	Ctrl	Exp	Ctrl	Exp	
Flexors	At the end of 4 <sup>th</sup> week	5	5	0.60	0.80	0.54	0.44	0.24	0.20	0.63 P=0.54, NS
	At the end of 6 <sup>th</sup> week	5	5	1.20	1.20	0.44	0.44	0.20	0.20	0.00 P=1.00, NS
Extensors	At the end of 4 <sup>th</sup> week	5	5	0.40	0.60	0.54	0.54	0.24	0.24	0.57 P=0.58, NS
	At the end of 6 <sup>th</sup> week	5	5	0.80	1.00	0.83	0.70	0.37	0.31	0.40 P=0.69, NS
Abductors	At the end of 4 <sup>th</sup> week	5	5	0.20	0.80	0.44	0.44	0.20	0.20	2.12 P=0.067, NS
	At the end of 6 <sup>th</sup> week	5	5	1.00	1.00	0.70	0.70	0.31	0.31	0.00 P=1.00, NS
Adductors	At the end of 4 <sup>th</sup> week	5	5	0.40	0.80	0.54	0.44	0.24	0.20	1.26 P=0.24, NS
	At the end of 6 <sup>th</sup> week	5	5	1.00	1.00	0.70	0.70	0.31	0.31	0.00 P=1.00, NS
Internal Rotators	At the end of 4 <sup>th</sup> week	5	5	0.80	0.60	0.44	0.54	0.20	0.24	0.63 P=0.54, NS
	At the end of 6 <sup>th</sup> week	5	5	0.80	0.80	0.44	0.83	0.20	0.37	0.00 P=1.00, NS
External Rotators	At the end of 4 <sup>th</sup> week	5	5	0.40	0.80	0.54	0.44	0.24	0.20	1.26



											P=0.24, NS
	At the end of 6 <sup>th</sup> week	5	5	0.80	1.00	0.44	0.70	0.20	0.31	0.53	P=0.60, NS

On comparison with the baseline within the groups, there was significant(p<0.05) improvement in both the groups.

But insignificant results were found in the control group -extensors (0.099) and experimental group -internal rotators (p= 0.99) when compared with the baseline. (Table 6)

On between the group's comparison, the results were not significant, due to low sample size. Hence, mean difference was

considered for comparison. So, on this basis the results showed were equal improvement in flexors, abductors, adductors and internal rotators (Table7)

And greater improvement in extensors (1.00) and external rotators (1.00) of experimental group than control group (Table7).

### RANGE OF MOTION

Table8. Comparison of ROM within the groups at the end of 4<sup>th</sup> & 6<sup>th</sup> week from baseline

Movement	Intervals	Mean		N		Std. Dev		Std. Error		Mean Difference		z-value	
		Ctrl grp	Exp. Grp	Ctrl grp	Exp. grp	Ctrl grp	Exp. grp	Ctrl grp	Exp. grp	Ctrl grp	Exp. Grp	Ctrl grp	Exp. Grp
Flexion	Baseline	100.00	113.00	5	5	18.70	21.09	8.36	9.43				
	At the end of 4 <sup>th</sup> week	112.00	121.00	5	5	14.83	20.12	6.63	9.00	12±8.36	8±7.58	3.20 P=0.03 3, S	2.35 P=0.07 8NS
	At the end of 6 <sup>th</sup> week	124.00	130.40	5	5	11.40	23.09	5.09	10.32	24±1.40	17.40±14.79	4.70 P=0.00 9, S	2.63 P=0.05 8, NS
Extension	Baseline	46.00	50.00	5	5	11.40	7.07	5.09	3.16				
	At the end of 4 <sup>th</sup> week	52.00	57.00	5	5	13.03	4.47	5.83	2.00	6.00±5.47	7±4.47	2.44 P=0.07 , NS	3.50 P=0.02 5, S
	At the end of 6 <sup>th</sup> week	56.00	58.00	5	5	8.94	4.47	4.00	2.00	10±7.07	8±4.47	3.16 P=0.03 4, S	4.00 P=0.01 6, S
Abduction	Baseline	84.00	82.00	5	5	30.49	17.88	13.63	8.00				
	At the end of 4 <sup>th</sup> week	104.00	92.00	5	5	20.73	13.03	9.27	5.83	20±2.0	10±7.07	2.23 P=0.08 , NS	3.16 P=0.03 4, S
	At the end of 6 <sup>th</sup> week	119.00	106.00	5	5	8.94	16.73	4.00	7.48	35±2.345	24±2.190	3.33 P=0.02 9, S	2.44 P=0.07 , NS
Adduction	Baseline	34.00	34.00	5	5	10.83	5.47	4.84	2.44				
	At the end of 4 <sup>th</sup> week	39.00	38.00	5	5	8.94	2.73	4.00	1.22	5±3.53	4±4.18	3.16 P=0.03 4, S	2.13 P=0.09 9, NS
	At the end of 6 <sup>th</sup> week	43.00	40.00	5	5	7.58	0.00	3.39	0.00	9±5.47	8±5.47	3.67 P=0.02 1, S	2.44 P=0.07 0, NS
Internal Rotation	Baseline	72.00	56.00	5	5	8.36	11.40	3.74	5.09				
	At the end of 4 <sup>th</sup> week	76.00	63.00	5	5	5.47	9.74	2.44	4.35	4±5.47	7±4.47	1.63 P=0.17 , NS	3.50 P=0.02 5, S
	At the end of 6 <sup>th</sup> week	76.00	70.00	5	5	5.47	7.07	2.44	3.16	4±5.47	14±5.47	1.63 P=0.17 , NS	5.71 P=0.00 5, S
External Rotation	Baseline	46.00	50.00	5	5	20.73	18.70	9.27	8.36				
	At the end of 4 <sup>th</sup> week	54.00	56.00	5	5	18.16	15.57	8.12	6.96	8±8.36	6±4.18	2.13 P=0.09 , NS	3.20 P=0.03 3, S
	At the end of 6 <sup>th</sup> week	68.00	61.00	5	5	7.58	12.44	3.39	5.56	22±1.440	11±7.41	3.41 P=0.02 7, S	3.31 P=0.02 9, S

**Table 9. Comparison of ROM between the groups from end of the 4<sup>th</sup> week to 6<sup>th</sup> week**

Movement	Interval	N		Mean		Std. Dev.		Std. Error Mean		z-value
		Ctrl	Exp	Ctrl	Exp	Ctrl	Exp	Ctrl	Exp	
Flexion	At the end of 4 <sup>th</sup> week	5	5	12.00	8.00	8.36	7.58	3.74	3.39	0.79 P=0.45, NS
	At the end of 6 <sup>th</sup> week	5	5	24.00	17.40	11.40	14.79	5.09	6.61	0.79 P=0.45, NS
Extension	At the end of 4 <sup>th</sup> week	5	5	6.00	7.00	5.47	4.47	2.44	2.00	0.31 P=0.76, NS
	At the end of 6 <sup>th</sup> week	5	5	10.00	8.00	7.07	4.47	3.16	2.00	0.53 P=0.60, NS
Abduction	At the end of 4 <sup>th</sup> week	5	5	20.00	10.00	20.00	7.07	8.94	3.16	1.05 P=0.32, NS
	At the end of 6 <sup>th</sup> week	5	5	35.00	24.00	23.45	21.90	10.48	9.79	0.76 P=0.46, NS
Adduction	At the end of 4 <sup>th</sup> week	5	5	5.00	4.00	3.53	4.18	1.58	1.87	0.40 P=0.69, NS
	At the end of 6 <sup>th</sup> week	5	5	9.00	6.00	5.47	5.47	2.44	2.44	0.86 P=0.41, NS
Internal Rotation	At the end of 4 <sup>th</sup> week	5	5	4.00	7.00	5.47	4.47	2.44	2.00	0.94 P=0.37, NS
	At the end of 6 <sup>th</sup> week	5	5	4.00	14.00	5.47	5.47	2.44	2.44	2.88 P=0.020, S
External Rotation	At the end of 4 <sup>th</sup> week	5	5	8.00	6.00	8.36	4.18	3.74	1.87	0.47 P=0.64, NS
	At the end of 6 <sup>th</sup> week	5	5	22.00	11.00	14.40	7.41	6.44	3.31	1.51 P=0.16, NS

When compared with the baseline, there is significant ( $p < 0.05$ ) increase in ranges of flexion (0.009), extension (0.034), abduction (0.029), adduction (0.021) and external rotation (0.027) control group. And also, in experimental groups- extension (0.016), internal (0.005) and external rotation (0.029) (Table 8)

On between the group's comparison the results were not significant, due to low sample size.

Hence, mean difference was considered for comparison. So, on this basis the results showed were greater increase in shoulder

ROM particularly in flexion (24.00), extension (10.00), abduction (35.00), adduction (9.00) and external rotation (22.00) of control group when compared with experimental group. (Table 9)

And greater increase in internal rotation (14.00) of experimental group when compared with the control group. (Table 9)

**Regarding COPM - Performance and Satisfaction** component considered into 2 Parts

**1<sup>st</sup> part** (1<sup>st</sup> 5 selected difficult ADLs)

**Table 10: Comparison of Performance and Satisfaction score at the start of 3<sup>rd</sup> week and at the end of 4<sup>th</sup> week in two groups (Mann Whitney U Test)**

	Group	N	Mean	Std. Deviation	Std. Error Mean	z-value
Performance	Control Group	5	3.08	1.35	0.60	0.99 p=0.34, NS
	Experimental Group	5	4.24	2.22	0.99	
Satisfaction	Control Group	5	3.92	1.40	0.62	0.48 p=0.64, NS
	Experimental Group	5	4.34	1.32	0.59	

**For 1<sup>st</sup> Part:**

Post therapy, the mean value of Performance component of experimental group (4.24) was greater than control group (3.08), which indicates improvement in Performance of the patients in 5 tasks, which they had selected according to their problem areas of ADLs.

Similarly, the mean value of Satisfaction component of experimental group (4.34) is greater than control group (3.92), indicating greater Satisfaction post therapy. (Table 10)

**2<sup>nd</sup> part** (2<sup>nd</sup> 5 selected difficult ADLs)

**Table 11: Comparison of Performance and Satisfaction score at the start of 5<sup>th</sup> week and at the end of 6<sup>th</sup> week in two groups (Mann Whitney U Test)**

	Group	N	Mean	Std. Deviation	Std. Error Mean	z-value
Performance	Control Group	5	2.54	1.13	0.50	1.17 p=0.27, NS
	Experimental Group	5	4.12	2.78	1.24	
Satisfaction	Control Group	5	4.54	3.19	1.42	0.55 p=0.59, NS
	Experimental Group	5	5.52	2.30	1.03	

### For 2<sup>nd</sup> Part:

Post therapy, the mean value of Performance component of experimental group (4.12) was greater than control group (2.54), which indicates improvement in Performance of the patients in another 5 tasks, which they had selected according to their problem areas of ADLs.

Similarly, the mean value of Satisfaction component of experimental group (5.52) was greater than control group (4.54), indicating greater Satisfaction post therapy. (Table 11)

## DISCUSSION

The present study's finding indicates following results:

First- the Pain on VAS showed reduction in shoulder pain in both the groups.

Second- in Muscle power- in more than half of the muscle (flexors, abductors, adductors and internal rotators) has shown equal results in both the groups and the remaining muscles (extensors, external rotators) power were improved in experimental group when compared with the control group post therapy.

Third- the control group has shown better results than Experimental group in UEFI and ROM post therapy between the group.

Fourth- COPM results showed improvement in both the groups, but on comparison between the groups experimental group has shown better improvement than Control group.

Explanation in detail of each Outcome are as follows:

### Pain on VAS

Both the group showed effective results in gradual reduction of shoulder pain through the use of Preparatory methods (hot

fomentation/cold fomentation/contrast bath).

Table 3 explains about comparison between the groups, in which control group showed better results in reducing pain than experimental group.

The reason may be that, the experimental group was given actual ADL training within normal movement pattern, by inhibiting the awkward substitution of movement for attempting to complete the tasks, which could have aggravated the pain factor. However, such inhibition of movement pattern was not given in control group, this could be the reason that the control group has showed faster reduction in pain than experimental group.

The preparatory method was given throughout the therapy sessions and was advised to take for 10-15 mins for 3 times a day particularly pre- and post-exercise.

Preparatory method was given to the patient to relieve pain and stiffness.

Therefore, both the groups showed significant reduction in pain on VAS when compared from baseline within the groups.

In support of this observation, Tandra L. Marik et al in a systematic review mentioned about the use of preparatory methods- to affect body structures with the ultimate goal of promoting performance in occupation. As there is a cyclic relationship among preparatory methods and tasks, activities, and Occupations that affects Clients factors. [13]

(Hot fomentation: improves blood flow and helps to alleviate muscle stiffness and pain.

Cold fomentation: promotes vasoconstrictions which slows down the blood circulation, in turn reduces redness, swelling, spasms and pain.

Contrast bath: alternating pattern between hot and cold fomentation, creating a

“pumping” action in circulatory system by restricting circulation to reduce swelling and then increasing circulation to a particular area. This alteration results in improved ROM and expedited pain recovery. This type of fomentation is given when an injury is at a week or longer maturity and heat and cold alone has not worked.<sup>[36]</sup>

### **ROM & Muscle Power**

Both the groups showed better improvement post therapy in range of motion and muscle power indicating that the control group as well as experimental group was effective [9,13]

For between the group’s comparison in ROM- on the basis of mean difference, indicating that the control group has shown greater increase in ROM particularly in flexion, extension, abduction, adduction and external rotation when compared with experimental group from the baseline. (table8)

The experimental group has shown greater improvement in internal rotation when compared with the control group. And equal improvement in abduction range. (table9)

The reason behind the improvement in ROM was the therapeutic activities covered in enabling and purposeful simulated activity forms, and isotonic exercises, the study by Tamba et al.

With respect to muscle power of shoulder, there was significant( $p < 0.05$ ) increase in powers of both the groups when compared with the baseline, except extensors (0.099) of control group and internal rotators ( $p = 0.099$ ) of experimental group. (table6)

The mean difference on between the group’s comparison indicating that the experimental group had shown increase in muscle power of shoulder extensors and external rotators when compared with control group. (table7)

Improvement in external rotators in experimental group could be because of actual ADL training (donning and doffing of shirt/T-shirt, banyan, top, combing and oiling hair etc). Similarly, in the study of Horst et al 2017 mentioned about improvement in activity-oriented group in

which combing hair, putting on a jacket, rolling from side lying to supine were included as activity part to train external rotators.

Whereas, the remaining shoulder muscles (flexors, abductors, adductors, and internal rotators) have shown equal improvement post intervention. (table7)

In the present study, both the groups were given enabling and purposeful simulated activities. In addition to this, those patients who followed up for 2 times in a week were given home program. Home program includes gradual increasing isotonic exercises and the end of the weeks with resistance for strengthening.

Improvement in shoulder muscle power (table6) and range of motion (table 8-9) through therapeutic activities proven in the study done by Manish Samnani (2004) as well as in a systematic review by Tamba et al -mentioning about the strong evidence of showing improvement in function and decrease in pain by performing ROM exercises, strengthening exercises, and joint mobilizations.

### **Upper Extremity Functional Scale**

The Control group( $p = 0.004$ ) showed significant faster increase in scores of UEFI from the baseline when compared with experimental group post therapy. (table4)

In the present study, both the groups were given enabling, purposeful simulated activities and home program. Home program includes, gradual increasing isotonic exercises and the end weeks with resistance exercise for strengthening. The improvement in ROM in control group may be because of routine day to day activities too.

Considering mean difference for comparison, in which control group (20.20) showed better improvement in UEFI scores than experimental group (13.60). (table5)

This improvement in Upper Extremity functional index scores in both the groups post therapy, which is due to improvement in muscle power, range of motion and

reduction in level of pain which improved the mobility of the shoulder joint.

### **COPM**

Patients' performance and satisfaction was measured on COPM scale. The patient assessment was done in 2 parts for the Performance and Satisfaction components.

1<sup>st</sup> part- beginning of 1<sup>st</sup> week (baseline) and at the end of 4<sup>th</sup> week (post therapy for selected 5 difficult ADL tasks from the checklist);

2<sup>nd</sup> part -beginning of 5<sup>th</sup> week (baseline) and at the end of 6<sup>th</sup> week (post therapy for selected another 5 difficult ADL tasks from the checklist).

On observation in Table 10 & 11 in both the parts (1<sup>st</sup> & 2<sup>nd</sup>) of COPM, it showed increase in the scores which means improvement in Change in Performance and Satisfaction scores post therapy (at end of 4<sup>th</sup> and 6<sup>th</sup> week) when compared to the baseline (at start of 1<sup>st</sup> and 5<sup>th</sup> week).

The improvement in Change in Performance scores in both the groups indicating improvement in Performance of the selected problem areas by the patients. And the improvement in Satisfaction scores in both the groups indicating that the patients were Satisfied with the therapy for the selected problem areas.

In the present study, the experimental group was given actual ADL training. Patients were trained to perform the tasks correctly without any alteration in performance of the particular tasks. The patients were made to repeat the tasks, and each time the patients were corrected for the awkward compensation/adaptation for newly formed pattern by them which inhibits normal movement pattern for task completion. The awkward compensation is due to the result of pain, because of which occurrence of learn disuse of the joint took place, that lead to restriction in normal ROM. Therefore, it was important to inhibit the adapted pattern in the cortex and to promote the normal pattern of movement for the task completion. And in experimental group, patients were practiced for the 5 selected

tasks by giving several repetitions for 10 mins in Part 1 and 2. Hence, post therapy, patient's performance score improved as patients were able to perform their selected problem areas better than previously. Similarly, the improvement in Satisfaction score, relates to fulfillment of selected goals that were meaningful to the patient's need and which was achieved through improved ability in performance of problem areas.

In support of this concept, in a systematic review done by Hai V. Le et al (2016) stated that, in management of non-operative Adhesive capsulitis- there is no universal treatment algorithm to treat, and therefore treatment should be patient-specific.

Hence, in the present study results, the experimental group showed better improvement in Performance and Satisfaction when compared with the control group.

Similar results were found in the study of Aishwarya Swaminathan et al. (2014) showing the effectiveness of Client- centred care using COPM in neuro-degenerative condition, and had stated the similar results about the patient's increase in performance and satisfaction scores as self-perceived by the patient i.e improvement in the functional status. And Horst et al in 2017 concluded about the influence of activity-oriented therapy along with conventional therapy improves the performance in daily life activities in Frozen Shoulder patients. Stated that, practicing activities leads to better performance. Pain reduction as well as increased range of motion, can also be influenced effectively by influencing structures during the performance of the activities rather than treating these alone. Brain plasticity may be the explanation for the positive treatment results rather than plasticity of peripheral structures alone. [4,5,19]

Hence, the results of this study indicating that, Actual ADL training under therapists' supervision promotes improvement in daily living function and Satisfaction, only when the treatment is tailored according to the patients selected problem areas. Because,



the results were self-perceived satisfaction by the patients.

**Limitation:** Inadequate sample size. Only subacute stage taken. No differentiation done between primary (spontaneous painful contracture of the glenohumeral joint with no distinct causes) and secondary type (caused by rotator cuff ruptures, neurological impairments and metabolic disorders, associated with diabetes mellitus). **Future studies** can be done on larger sample size (at least 15 or more samples in each group) to prove the hypothesis significantly. And bilateral involvement can be taken. As well on effects of different preparatory method (Hot/cold/contrast bath) & Gender base too.

## CONCLUSION

In this study, on therapeutic basis it is found that Conventional Occupational Therapy and Actual ADL training were effective in subacute stage of Adhesive Capsulitis. But when Client-centered care perspective taken into consideration, the Actual ADL training found better than Conventional Occupational therapy, because of the greater improvement in performance and satisfaction scores of COPM in Experimental group.

## Declaration by Authors

**Ethical Approval:** Approved

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