

# Comparison of Joint Mobilization and Energy Conservation Technique in Rheumatoid Arthritis Patients in Hand Joints

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## Abstract

**Background:** Rheumatoid arthritis is an auto-immune inflammatory condition that affects the hand, wrist, and knee joints. Joint mobilization is frequently used in RA patients. This study was to find the effectiveness of Joint mobilization and Energy conservation technique using range of motion measurement and Sollerman hand function test in hand joints.

**Purpose:** This study is to find the effect of Joint mobilization and Energy conservation technique which is a non-invasive procedure on Rheumatoid arthritis patients.

**Materials and Methods:** A group of 60 Rheumatoid arthritis patients were selected according to inclusion and exclusion criteria from Saveetha medical college and hospital and SAGA Rehabilitation centre. They were divided into Joint mobilization group: (n=30) the subjects were treated with Joint mobilization and taught exercises to gain strength and mobility for 3 days a week for 4 weeks for 15-30 minutes and Energy conservation group: (n=30) the subjects are taught pacing the activities, prescribing assistive devices, foam-covered handles, wide grip handles using large joints to lift objects, teaching Proper body mechanics and Ergonomic considerations to be followed for 4 weeks. Study period: November 2022 to April 2023.

**Result:** A statistically significant difference between Joint Mobilization and Energy conservation technique groups reveals that Joint mobilization has significant effects in lowering stiffness and pain and improving ROM of hand joints.

**Conclusion:** Joint mobilization worked more effectively than energy conservation techniques in RA patients.

**Keywords:** Rheumatoid Arthritis, Joint Mobilization, Energy conservation technique, ROM, Hand joints, Sollerman hand function test.

## Introduction

In Rheumatoid arthritis (RA), our immune system wrongly harms healthy cells in our bodies, leading to

swelling in the areas of the body that are impacted. The joints of the knee, hand and wrist are frequently impacted by RA<sup>1</sup>. This tissue damage can lead to prolonged or persistent discomfort, shakiness, and

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deformity. Rheumatoid arthritis can also affect various tissues throughout the body, including those in the eyes, heart, lungs, and other organs. The most typical signs of Rheumatoid arthritis include pain, stiffness, tenderness and swelling in multiple joints, a warm feeling, fatigue, weight loss, deformities contractures, nodules, cysts, decreased energy, lack of appetite, and weakness. People who are aged over 60, and people who are born with Human leukocyte antigen (HLA) class II genotype can make it worse. Most women who had never given birth, smokers, and obese people are more likely to catch arthritis. It's safer to consult and diagnose rheumatoid arthritis earlier than 6 months. We can get diagnosed by physical assessment tests, X-ray, and lab tests by diagnosing HLA gene tests<sup>1</sup>. Drugs like methotrexate, leflunomide, hydroxychloroquine, and sulfasalazine are given as pharmacological interventions. Nonpharmacological interventions seem to be more effective and valuable these days, such treatments like psychological treatments like relaxation techniques and physiotherapy treatments such as hydrotherapy, splint therapy, hot pack, cryotherapy, massage therapy, acupuncture, yoga, and deep breathing can relieve pain in the joint area<sup>1</sup>. Joint mobilization instruction places a lot of emphasis on teaching students how to accomplish tasks like picking up goods with two hands, and distributing the weight of objects across the palm while avoiding rotating motions that press the fingers in an ulnar position. The balance between activity and relaxation is the basic way of energy saving. plan and organize the area, halt all activities or a portion of them, and cut back on the weight you put on your joints<sup>1</sup>. The efficacy of exercise programs for Rheumatoid arthritis for the whole body came to the conclusion that dynamic exercise improved muscular strength and endurance without having a negative impact on the disease's activity or discomfort<sup>2</sup>. Joint mobilization may properly reflect changes in the participant's ability to perform the strengthening exercises when their symptoms worsen<sup>3</sup>. A home strengthening exercise program was created using just hand weights and elastic bands to ensure accessibility for people with Rheumatoid arthritis and was proven to be clinically useful and cost-effective<sup>4</sup>. The management of Rheumatoid arthritis symptoms and deformities benefits from joint mobilization technique such as rest and splinting, employing compressive gloves, assistive technology,

and adaptive equipment<sup>5</sup>. Manual therapy technique are frequently employed to regain mobility and lessen discomfort in the treatment of musculoskeletal diseases like rheumatoid arthritis<sup>6</sup>. Small intensity motions with traction are used in the three levels of mobilisation to release and counteract any compressive pressures on the joint<sup>7</sup>. Grade II soft joint mobilisation with oscillations avoids clenching of the muscle fibres surrounding the joint<sup>8</sup>. Moderate exercise causes noticeable changes in the blood levels of various indicators of joint metabolism following a night of rest<sup>9</sup>. The results of the Sollerman hand function exam, which evaluates practical skills in performing daily tasks and the quality of seven key hand grips, show a strong correlation with disabilities<sup>10</sup>. It is accurate and repeatable to use the test. Physiotherapists can utilize the test, which is straightforward and takes around 20 minutes to complete, to assess hand function<sup>11</sup>. If Maitland Mobilization manual oscillations might suppress nociceptive and/or sympathetic activity, we would anticipate a rise in PT after these types of manual oscillations<sup>12</sup>.

### Aim

To compare the effectiveness of joint mobilization and Energy conservation technique using a range of motion measurement in hand joints.

### Materials and Methods

This was an experimental study conducted on Rheumatoid arthritis patients age between 30 to 75. The patients were selected using a convenient sampling technique with computer generated random methods, according to the inclusion and exclusion criteria from Saveetha Medical College and Hospital and SAGA rehabilitation center. The entire study procedure was conducted from November 2022 to April 2023.

#### Inclusion Criteria:

- Age: 30 to 75 yrs
- Subjects with grade I, II Rheumatoid Arthritis
- Morning Stiffness
- Swelling in soft tissues and Metacarpophalangeal joints and Interphalangeal joints

**Exclusion Criteria:**

- Subjects with grade III, IV Rheumatoid arthritis
- OA, Ankylosis Spondylolysis, Chronic kidney disease, Congenital-heart disease.
- Muscle diseases, malignancies, Unstable heart conditions, Diabetes Mellitus
- Recent fractures and injuries within 6 months
- Surgeries in Upper Limb.

**Outcome Measures**

Subjects were assessed using:

**ROM Measurement:**

A joint's range of motion is the total amount of movement it is capable of making in all directions. It's a frequent method of evaluation that is utilized to gauge the body's joint flexibility and mobility. It gives us accurate information about how much movement there is in a certain area of our body. It is measured in degrees. It is utilized for a variety of things, including functional evaluation, treatment planning, progress tracking, and baseline establishment.

**Sollerman Hand Function Test:**

The Sollerman hand function test is a technique for assessing the upper extremity and hand functional limitations. It is frequently used to evaluate hand function in patients with a range of illnesses, including neurological disorders, hand injuries, or musculoskeletal disorders. The Sollerman hand function test consists of a number of uniform activities that are intended to assess 5 main hand functions Grip and pinch strength, Gross motor coordination, Dexterity, Sensory function, and Fine motor function. It consists of 20 subtests to assess the hand function grading from 0 to 4. Each subtest is graded from 0 to 4. The total score for the test is 80. Normal scores for a hand function are 77 to 79<sup>11</sup>.

**Procedure**

A group of 60 patients diagnosed with Rheumatoid arthritis were selected conveniently according to inclusion and exclusion criteria before the study began. The subjects were given a thorough explanation, and an informed consent form was obtained from them. The pre and post-test values

were measured using range of motion (ROM) measurement and the Sollerman hand function test. The subjects were divided into the Joint mobilization group and the Energy conservation technique group, with 30 samples each.

**Joint mobilization group:**

The 30 subjects are taught joint mobilization and exercises for 3 days a week and it was continued for 4 weeks. For each session, the duration ranges from 15 to 30 minutes, Techniques such as gliding or sliding, traction, and oscillatory mobilization are given to the patients. Grade - I and II Maitland mobilization are used here. With mobilization, exercises are given to the patients.

- **Active ROM Exercises** - Flexion, Extension, Abduction, Adduction of fingers, and Circling of wrist.
- **Strengthening Exercises** - Grip strength can be increased by training with rubber bands, a hand grip exerciser, and a sponge ball.
- **Dexterity Exercises** - Stretching, Drawing, Writing, Buttoning, and Unbuttoning the Shirt Buttons.

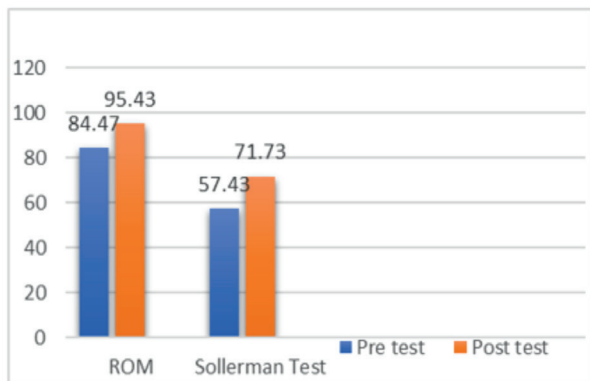
**Energy conservation group:**

The 30 subjects were taught energy conservation techniques to reduce fatigue and overexertion of joints. These lifestyle modifications intend to optimize daily functioning followed for 4 weeks. The energy conservation technique are mentioned below:

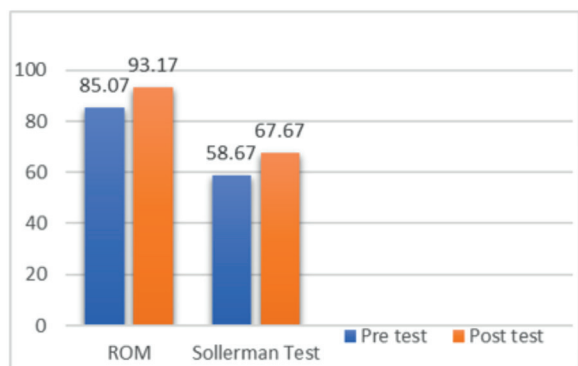
- **Prioritizing and Planning:** Planning your daily activities by making schedules and larger tasks into smaller tasks.
- **Time Management:** Pacing ourselves by taking regular breaks to prevent fatigue at your joints.
- **Joint Protection:** Using proper body mechanics. e.g.: using large joints to lift weights instead of your hands.
- **Assistive devices:** Usage of assistive devices reduces energy expenditure. e.g.: Foam Handlers, Jar Openers, Long-handled tools, and Reachers.
- **Task Modifications:** Avoiding repetitive activities and giving breaks between tasks.
- **Energy Saving Technique:** Using Gravity has an advantage while doing an activity.

- **Ergonomic Modifications:** Environmental and ergonomic changes are a must in energy conservation in RA patients. e.g.: desktop modifications, mouse devices, adjustable chairs, shelves, and doors should be set up with long handles.

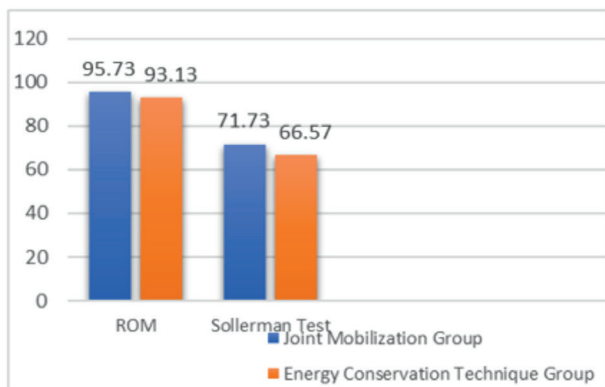
**Data Analysis**



**Graph-1 Pre-test and Post-test values of the Joint Mobilization group**



**Graph-2 Pre-test and Post-test values of Energy conservation technique group**



**Graph-3: Post-test values of Joint mobilization and Energy conservation technique group**

**Results**

- Statistical analysis of quantitative data showed statistically significant differences between Joint mobilization and Energy conservation technique groups.
- The Joint mobilization group mean values for ROM measurement and the Sollerman test were 95.43(2.58) and 71.73(3.94) whereas for the Energy conservation technique 93.17(2.88) and 67.67(3.83)
- The significance level of  $p < 0.0001$  was judged statistically using the unpaired t-test.
- This suggests that Joint mobilization in Rheumatoid arthritis patients with stiffness and reduced ROM was more effective than the Energy conservation technique.

**Discussion**

The prevalence rate of rheumatoid arthritis, which affects persons of working age and has no known cure, is 01/81. Increases with age, reaching a maximum of 5% after the age of 55. In 80-90% of Rheumatoid arthritis patients, the hands and wrists are thought to be impacted. The articular ligaments may be damaged, cartilage and subchondral bone may erode, and pannus may invade the joint as a result of the synovitis associated with Rheumatoid arthritis. It is mostly due to the molecules from the HA-rich synovial fluid cavities entering the circulation.<sup>9</sup> While there is emerging evidence that manual mobilization is effective for treating musculoskeletal disorders such as shoulder and elbow discomfort, research on hand and wrist mobilization is still in its infancy.

This study compares the efficacy of joint mobilization and energy conservation techniques in people with rheumatoid arthritis and evaluates the efficiency of the suggested therapies in promoting mobility and reducing stiffness. ROM is taken as an Outcome measure which is measured using a goniometer. The Beneficial effect of the treatment was significantly greater in Joint mobilization than in the Energy conservation technique. In the Joint mobilization group pre-intervention mean of ROM was 84.47(3.22) and the Sollerman test was 57.43(4.96). After treating the subject with Joint Mobilization and exercises, the mean value increased to 95.43(2.58)

and the Sollerman test was 71.73(3.94) which shows a statistically significant difference between the tests. In the Energy Conservation Technique group, the pre-intervention mean of ROM Measurement was 85.07(3.15) and the Sollerman test was 58.67(5.36). After treating the subject with Energy Conservation Technique, the mean value of ROM Measurement was 93.17(2.88) and the Sollerman test was 67.67(3.83) which shows a statistically significant difference between the groups. This indicates that the Joint Mobilization group ROM Measurement and the Sollerman test were significantly higher than the Energy conservation technique group, with a P value of  $< 0.0001$ . As a result, the Joint Mobilization Group exceeds the Energy conservation technique group statistically.

Based on the Statistical Analysis both Groups showed improvement in ROM Measurement and Sollerman test. However, the group who have received Joint Mobilization showed better results in ROM Measurement and Sollerman test than the Joint Conservation Technique Group. An early study by Daniel-Henri Manicourt, Pascal Poilvache, et al., stated that after a night of rest, this study offers compelling evidence that moderate physical exercise causes noticeable changes in the serum levels of various indicators of joint metabolism. Measurement of these variations offers information about altered joint metabolism that is obviously significantly different from information received by monitoring the levels of the changes at a single time point<sup>9</sup>.

An early study by Adrian Levitsky, PhD, a,b Yogan Kisten, MTech, a,b, et al., concluded that Most RA comparison patients had sustained, significant decreases in fatigue. This study shows that patients with rheumatoid arthritis have significant pain reduction in the MCP joint over a period of 2 months which concluded that statistical analysis of the significant difference in p-value is  $< 0.050$ <sup>8</sup>.

An early study by A. V. O'Brien, P. Jones, et al, concluded that hand strengthening exercises may be helpful in the treatment of RA. The hand function of the RA patient is of the highest importance, and this study adds to the body of knowledge to help the therapist in management regimens. This study analysed the unpaired-t test which statistically shows a significant difference in upper limb function

between the strengthening and stretching groups and the energy conservation group, p value = 0.0002<sup>10</sup>.

## Conclusion

Nowadays there are Advanced technologies, new generation DMARDS, and new manual techniques to treat Rheumatoid Arthritis. The experimental study which is done on Rheumatoid Arthritis Patients gives Evidence that Joint mobilization with exercises works effectively on Rheumatoid arthritis patients.

**Ethical Clearance:** Taken from the institutional ethical committee. ISRB number-03/060/2022/ISRB/SR/SCPT

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**Conflict of Interest:** Nil.

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