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EFFECT OF ACTIVE RELEASE TECHNIQUE WITH SCAPULAR STRENGTHENING ON SHOULDER PAIN AND FLEXIBILTY OF PECTORALIS MAJOR MUSCLE IN BUTTERFLY STROKING SWIMMERS

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ABSTRACT

Background: Swimming is a racing activity that may be done individually or in a team. One needs to use their entire body to move through the water. There are several health advantages to competitive swimming, despite the possibility that athletes may suffer from a number of ailments, such as tendinitis in the knees or shoulders. People of various ages and backgrounds frequently have shoulder pain, which can lead to discomfort, limited mobility, and a lower quality of life

Purpose of study: The aim is to study effectiveness of active release technique in pectoralis major muscle tightness along with strengthening of scapular muscle for pain relief and muscle flexibility in butterfly stoking swimmers.

Method: A total number of 35 individuals are selected for the study. Pre and post treatment pain and intensity assessments using the NPRS, LENGTH, MMT AND RANGE OF MOTION scales were made. 35 participants were separated into groups A and B, where 17 subjects received ART treatment with scapular strengthening exercises and the remaining 18 received only scapular strengthening exercises.

Result: The normality of the data was verified through the Shapiro-Wilk test. To compare mean and standard deviations within and between groups, Student paired t tests and independent t-tests were employed. Throughout the study, a Confidence Interval of 95% was maintained, with a significance level set at less than 0.05.

Conclusion: Analysis of the data concluded that the groups A was more effective for showing the improvement in pain and rom, strength, flexibility. In swimmers with shoulder pain, scapular strengthening exercise with ART showed a greater improvement in pain and ROM, MMT, muscle length in pectoralis muscle than just scapular strengthening.

Keywords: Swimmers, NPRS, ROM, Muscle length, MMT, flexibility

INTRODUCTION

India has a diverse sporting culture, with cricket being the most popular. However, swimming is also an important sport that has been gaining attention in recent years, both recreationally and competitively **[1, 2]**. Swimming, while offering cardiovascular and muscular benefits, also exposes athletes to certain musculoskeletal risks, notably shoulder injuries **[3]**. Among these, the most commonly reported condition is swimmer's shoulder, a term encompassing various painful shoulder pathologies including rotator cuff tendinopathy and impingement syndromes **[3-5]**.

Swimmer's shoulder affects both amateur and elite swimmers, with prevalence rates reported between 40% and 91% depending on the population studied **[3, 6]**. This high incidence is primarily attributed to repetitive overhead motions involved in swimming strokes, especially freestyle and butterfly **[7-10]**. The biomechanics of these strokes require continuous internal rotation and abduction, which place significant stress on the glenohumeral joint and the surrounding soft tissues **[9, 11, 12]**.

Overuse and improper stroke mechanics are major contributors to the development of swimmer's shoulder **[13-15]**. The high training volumes and intensities typical in competitive swimming amplify these risks **[16-19]**. Muscle imbalances, scapular dyskinesis, and poor core stability further exacerbate the condition **[20-24]**. For instance, inadequate activation or delayed firing of scapular stabilizers like the serratus anterior and trapezius can lead to altered shoulder kinematics and increased subacromial stress **[25-27]**.

Diagnosis of swimmer's shoulder involves a combination of clinical examination, patient history, and imaging techniques when necessary **[4, 28, 29]**. Key indicators include localized pain during overhead activity, restricted range of motion, and muscle weakness **[4, 30]**. Clinical tests such as Neer's and Hawkins-Kennedy impingement signs are commonly used **[5]**.

Management strategies are multifaceted, encompassing both conservative and preventive approaches. Rehabilitation typically involves rest, ice, nonsteroidal anti-inflammatory drugs (NSAIDs), and physical therapy focusing on correcting muscle imbalances and improving scapular stability **[31-33]**. Active Release Technique (ART) and manual therapy have shown effectiveness in reducing pain and improving range of motion **[15, 34-37]**. Strengthening of the rotator cuff and periscapular muscles is vital, along with neuromuscular control training **[38-40]**.

Preventive strategies emphasize proper stroke technique, adequate warm-up and cool-down routines, cross-training, and limiting training volume to avoid overuse **[41-45]**. Coaches and athletes should monitor symptoms closely and adjust training loads accordingly **[46, 47]**.

Given the growing popularity of swimming in India and globally, awareness and early intervention strategies are essential to mitigate the risk of swimmer's shoulder and ensure the longevity and health of athletes **[1-3, 48-57]**.

METHODOLOGY

This interventional study was conducted on 35 butterfly swimmers with shoulder pain and pectoralis major tightness (N=35). A type of informed consent was given to all the individuals who participated in the study. Data was collected from the Swimming Association. All the individuals were recruited according to the inclusion and exclusion criteria.

The inclusion criteria were swimmers who had practiced middle (200 and 400 meters) and long (800 and 1500 meters) distances and had been participating in swimming for at least 2 years. Participants engaged in swim training for 3 hours per day, 5 days per week. All individuals had pectoralis major muscle tightness, reduced range of motion (ROM) at the shoulder joint, and were able to attend sessions regularly. Both male and female swimmers were included.

Exclusion criteria included swimmers with a history of trauma or surgery, those taking analgesics or muscle relaxants, non-cooperative patients, swimmers with a severe injury to the pectoralis major muscle within the past 3 months, unwillingness to participate or sign informed consent, presence of infections like tuberculosis (T.B.), inflammatory conditions such as rheumatoid arthritis or ankylosing spondylitis, osteomyelitis, those unable to attend sessions regularly, and swimmers with any cardiovascular, neurological, or psychological disorders.

The intervention was provided for **6 days per week for 6 weeks**. Each session included 10 repetitions, which were progressively advanced with a 10-second hold. Pre- and post-intervention assessments were conducted using NPRS, ROM, muscle length tests, and MMT.

RESULTS

Table 1: Between group analysis of the NPRS for both groups

Variables	Group A Mean + SD		Group B Mean + SD		t	p
NPRS	3.44	1.76	3.11	1.02	0.70	0.49

Table 2: Between group analysis of the ROM for both groups

Variables	Group A Mean + SD		Group B Mean + SD		t	p
Flexion	176.94	3.89	177.28	2.56	-0.304	0.763
Extension	55.83	3.93	55.72	3.14	0.094	0.926
Abduction	176.39	4.13	176.44	2.87	-0.047	0.963
Internal Rotation	83.06	6.89	83.06	6.89	-0.815	0.421
External Rotation	88.06	3.04	90.28	6.48	-1.317	0.196

Statistical analyses of ROM data did not suggest statistically significant differences between group analyses for ROM ($p > 0.05$)

Table 3: Between group analysis of the length for both groups

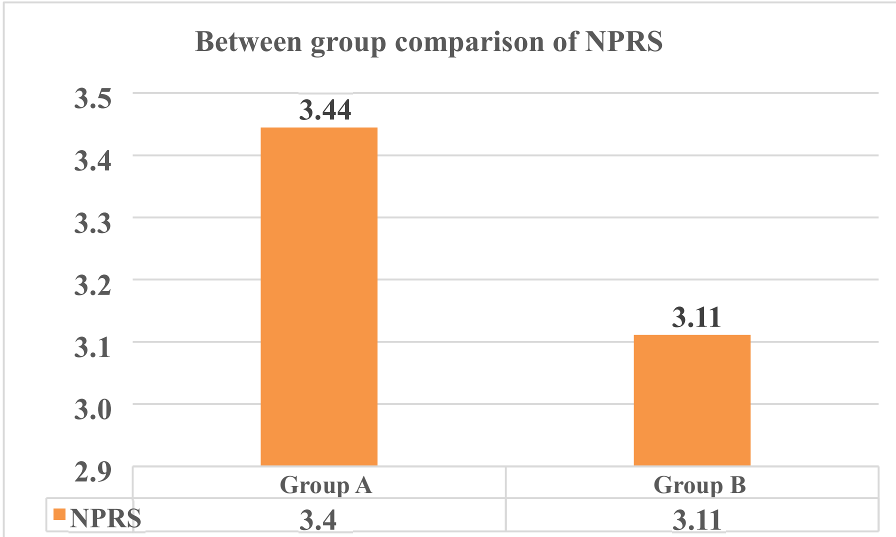
Variables	Group A Mean + SD		Group B Mean + SD		t	p
Length	7.46	0.64	9.03	0.51	-8.173	0.000

Statistical analyses of all length suggest statistically significant differences between group analyses for ROM ($p < 0.05$).

Table 4: Between group analysis of the MMT for both groups

Variables	Group A Mean + SD		Group B Mean + SD		t	p
Infraspinatus	4.50	0.51	4.83	0.38	-2.204	0.034
Teres Minor	4.50	0.51	5.00	0.00	-4.123	0.000
Middle Trapezius	5.00	0.00	4.94	0.24	1.000	0.324
Rhomboids	5.00	0.00	5.00	0.00	-8.173	0.000

Statistical analyses of MMT suggest statistically significant differences between group analyses for ROM ($p < 0.05$). except for Middle trapezius which was 0.324 ($p > 0.05$).



Graph 1: Between groups analysis of the NPRS

The above graph was representative of the analysis of the mean difference for NPRS between both groups. The Group A value was 3.44 and the Group B value was 3.11. Which suggested that group B is more effective in terms of reduction in pain than group A

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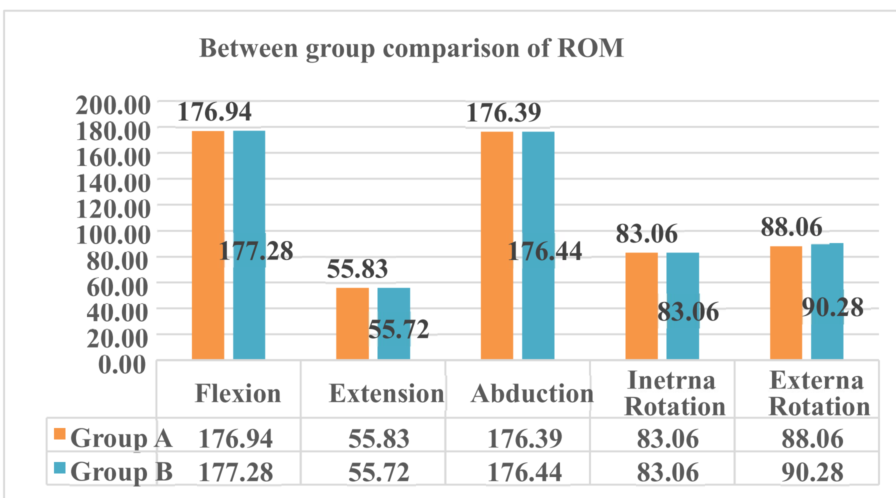
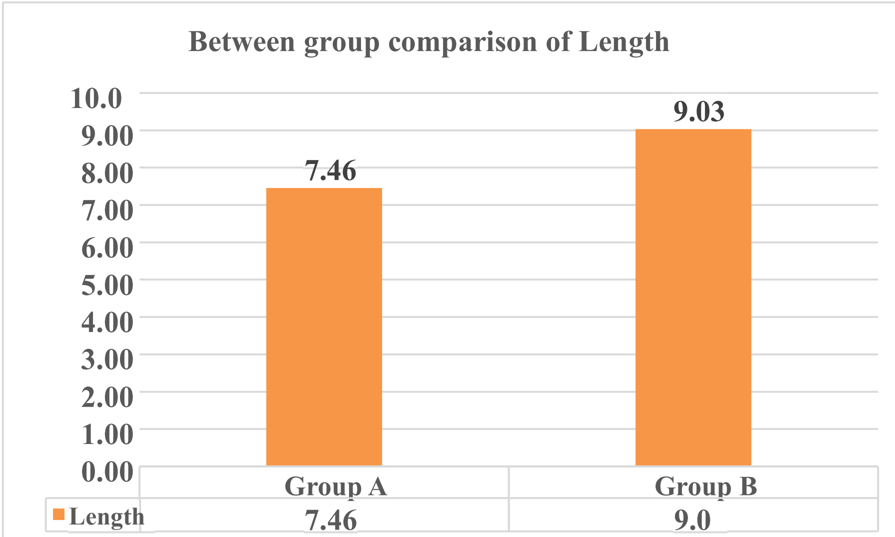


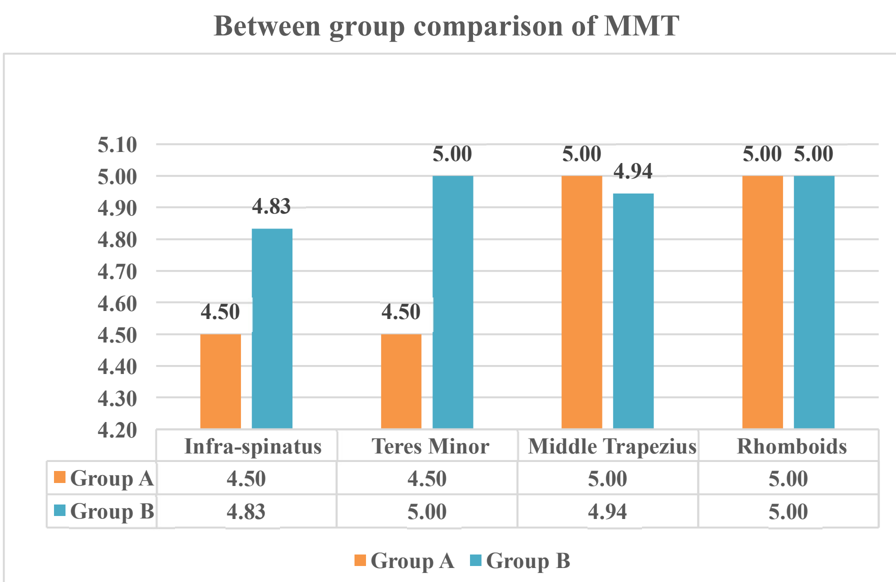
Graph 2: Between groups analysis of the ROM

The above **Graph 2** was representative of the analysis of the mean difference for ROM for both groups. This suggested that for flexion, and extension group A was effective whereas for abduction, and external rotation group B was effective and the value remained the same for both groups for internal rotation.



Graph 3: Between groups analysis of Length

Above mention **Graph 3** is suggestive of between between-group analysis of length. For group A the mean difference of length was 7.46 and for group B the mean difference was 9.03.



Graph 4: Between groups analysis of MMT

Above mention graph is suggestive of between-groups analysis of MMT. In group B, the mean difference of MMT for infraspinatus, teres minor, middle trapezius and rhomboids shows improvement in strength as compared to group A.

DISCUSSION

Swimming places high demand on the shoulder, often leading to "swimmer's shoulder" caused by repetitive motion, muscular imbalance, and poor technique. This study involved 35 competitive swimmers randomly assigned to two groups: Group A received Active Release Technique (ART) plus scapular strengthening, while Group B received only strengthening exercises. ART was applied for 6 weeks to release soft tissue adhesions, improve mobility, and reduce pain.

Results showed that Group A had greater improvements in pain relief, flexibility, and pectoralis muscle length, while Group B primarily gained muscle strength. Significant differences were noted in NPRS ($p < 0.01$), muscle length, and MMT for muscles like teres minor and rhomboids. Strength alone (Group B) was not as effective in improving shoulder mobility or comfort during swimming.

The findings suggest that combining ART with strengthening is more effective for reducing shoulder pain and improving functional performance in swimmers. These results align with previous studies supporting ART for musculoskeletal issues in athletes. Further research is recommended to explore its long-term benefits.

CONCLUSION

Analysis of the data concluded that the groups A was more effective for showing the improvement in pain and rom, strength, flexibility. In swimmers with shoulder pain, scapular strengthening exercise with ART showed a greater improvement in pain and ROM, MMT, muscle length in pectoralis muscle than just scapular strengthening

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