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# Effectiveness of Reflexive Neuromuscular Stabilization versus Black Burn Exercises on Pain, Range of Motion and Function among Young Athletes with Rotator Cuff Tendinitis: A Pilot Study

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## ABSTRACT

**Objectives:** Overhead athletes are more likely to experience shoulder pain and injury. Due to the many actions that take place through numerous planes, the throwing motion's sequencing activates numerous joints and muscles. RNS and Black Burn includes activity of the shoulder girdle musculature.

**Methods:** 20 subjects fulfilling the inclusion criteria were included in the group and were randomly allocated into two groups. Group A underwent Reflexive Neuromuscular Stabilization Exercise and Group B underwent Black Burn exercise for 4 weeks. Pain was assessed using VAS, Range of Motion was assessed using Goniometry and Function was assessed using Western Ontario Rotator Cuff Index pre and post treatment intervention.

**Results:** The results of the WORC and Goniometry for Shoulder Abduction and External Rotation were reported in mean and standard deviation. On comparison of pre and post intervention of mean difference and standard deviation of Group A Reflexive Neuromuscular Stabilization vs Group B Black Burn Exercise, Group B showed significant improvement in VAS score ( $1.4589 \pm 0.7633$ ), WORC Scores ( $169.02 \pm 97.14$ ), Range of Motion – Shoulder Abduction ( $22.71 \pm 7.43$ ) and Shoulder External Rotation ( $20.95 \pm 7.95$ ).

**Conclusion:** This study concluded that both the group showed improvement in WORC scores and Goniometry but clinically and Statistically Group B showed significant improvement with Black Burn Exercise among Athletes with Rotator Cuff Tendinitis.

**KEYWORDS:** Reflexive Neuromuscular Stabilization, Black Burn Exercise, Rotator Cuff Tendinitis, Pain.

## I. INTRODUCTION

Goetti P, Denard PJ, Collin P, Ibrahim M, Hoffmeyer P, Lädermann has conducted a study on Shoulder Biomechanics in normal and selected pathological condition who concluded that the shoulder “Mobility is further enhanced by translation of the humeral head on the glenoid cavity of scapula, but the consequence of this tremendous mobility is perhaps a predisposition to instability and impingements. Second, mobility is assumed by 18 muscles that act in synergy. Consequently, isolating each of them is impossible, making precise kinematic analysis and clinical examination difficult. Third, the glenohumeral joint has the characteristics of an active non- weight-bearing joint, leading to major bony and muscular modifications and frequent tendon overuse.”<sup>(1)</sup>

The supraspinatus, infraspinatus, teres minor, and subscapularis are the four tendons of muscles that surround the shoulder joint and make up the rotator cuff. Each of them is placed over the humerus and scapula, also known as the shoulder blade. The tendons cooperate to lift the arm over the head, rotate the shoulder, and support the joint.



Cramer JD, Nasypany found in their study on Efficacy of reflexive neuromuscular stabilization during treatment of scapular dyskinesia in an overhead athlete: A case report. International journal of sports physical therapy and reported that "Reflexive Neuromuscular Stabilization (RNS) is an updated concept which is derived from Reactive Neuromuscular Training (RNT) and is an umbrella term describing a variety of rehabilitation techniques designed to restore dynamic stability and motor control to an injured joint. This is achieved through utilizing movement pattern exercises which facilitate the central nervous system's (CNS) ability to interpret and integrate signals received from periphery."<sup>(2)</sup>

According to Panse R, Yeole U, Pawar K, Pawar who conducted study on Effects of Blackburn exercises in shoulder impingement on pain and disability in rock climbers concluded that "Black burns are a specific set of shoulder exercises meant for strengthening at end ranges of motion. Strength in these end ranges is important, because throwing, swinging, and running happens at these extremes. When the throwing activities are done, loading forces and weight tends to appear on scapula and crank the arm into maximum external rotation. This pushes the shoulder to its limit in terms of mobility. Black Burn Exercises Serves as An Effective Treatment For improving Muscle Activation, muscles balance and kinaesthetic input That Prevents Injury"<sup>(3)</sup>

A Visual Analogue Scale (VAS) is a measurement tool used to attempt to quantify a trait or attitude that is thought to span a range of values and is difficult to measure directly. For instance, the level of pain that a patient experience can be anywhere along a continuum, from none to extremely high levels. The patient sees this spectrum as continuous rather than in distinct steps, as would be implied by the categories of none, mild, moderate, and severe. The VAS was developed in order to capture this notion of an underlying continuity.<sup>(6)</sup>

A questionnaire called the Western Ontario Rotator Cuff (WORC) Index was specifically created to aid in understanding the specific signs, symptoms, and functional restrictions connected with an RC tendinopathy. It is an outcome metric that clinicians use to assess the health of patients with this pathology. For those with an RC tendinopathy, it can assist in setting goals, prognostic markers, and an overall rehabilitation programme.<sup>(4)</sup>

Viraj N. Gandbhir; Bruno Cunha. Conducted a study on Goniometer stating that "A Goniometer is a device that measures an angle or permits the rotation of an object to a definite position. In orthopedics, the former description applies more. The art and science of measuring the joint ranges in each plane of the joint are called goniometry. The term 'goniometry' has its origin from two Greek words, gonia, which means angle, and metron, which means to measure. The first known use of a primitive version of the modern-day goniometer was by a Dutch physician and mathematician named Gemma Frisius, who used it to calculate and record the position of celestial bodies with respect to Earth."<sup>(5)</sup>

This study aims to prove the effectiveness of Reflexive Neuromuscular Stabilization versus Black Burn Exercises on Pain, Rang of Motion and Function among young Athletes with Rotator Cuff Tendinitis.

## II. METHODS OF COLLECTING DATA

The study design is a comparative study that aims to compare two or more groups based on a particular outcome or variable. The study was conducted in the Physiotherapy OPD of Parul Sevashram Hospital, located at Po: Limda, Ta: Waghodia, Dist: Vadodara. The sample size of the study is 20, and the sampling method used was simple random sampling using the Conceal Envelop method. The sample selection was based on the inclusion-exclusion criteria set by the researchers. The intervention duration was 4 weeks, with 4 sessions per week. The total study duration was 1 year, and data collection was conducted for 6 months.

### INCLUSION CRITERIAS

The study included both male and female participants aged between 20 to 30 years who were pre-diagnosed by Orthopaedic and had restricted range of shoulder abduction and external rotation. The participants were required to be willing to participate in the study and be able to understand English and/or Gujrati language.

### EXCLUSION CRITERIAS

The exclusion criteria for the study included patients with partial thickness, full thickness tear or surgical repair of rotator cuff muscle/tendon, history of fracture or dislocation of shoulder/elbow, history of any neurological,





neuromuscular, or vascular disorders, systemic disorders such as rheumatoid arthritis, AS etc. Non-cooperative patients were also excluded from the study.

### OUTCOME MEASURES

Visual Analog Scale – To assess Pain

Western Ontario Rotator Cuff Index - To assess Function of Shoulder Joint

Goniometry - To assess Range of motion (Abduction & External Rotation)

### MATERIALS USED

Consent Form

Diary/ Paper

Pen/Pencil

Questionnaire

Goniometer

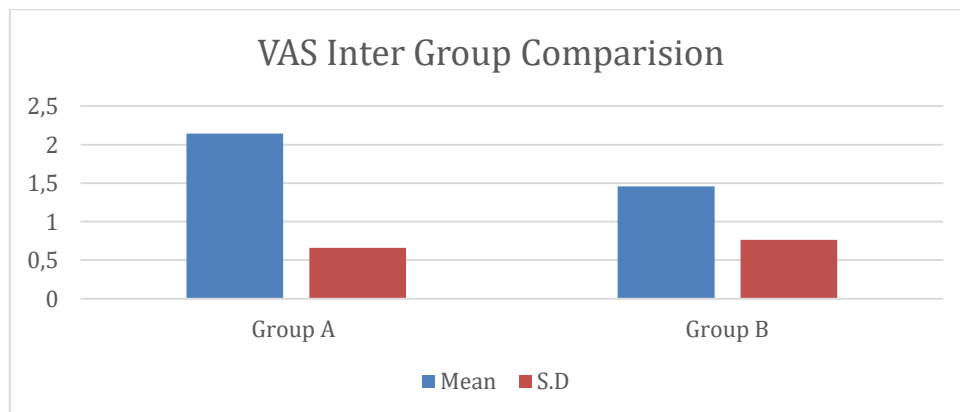
TheraBand

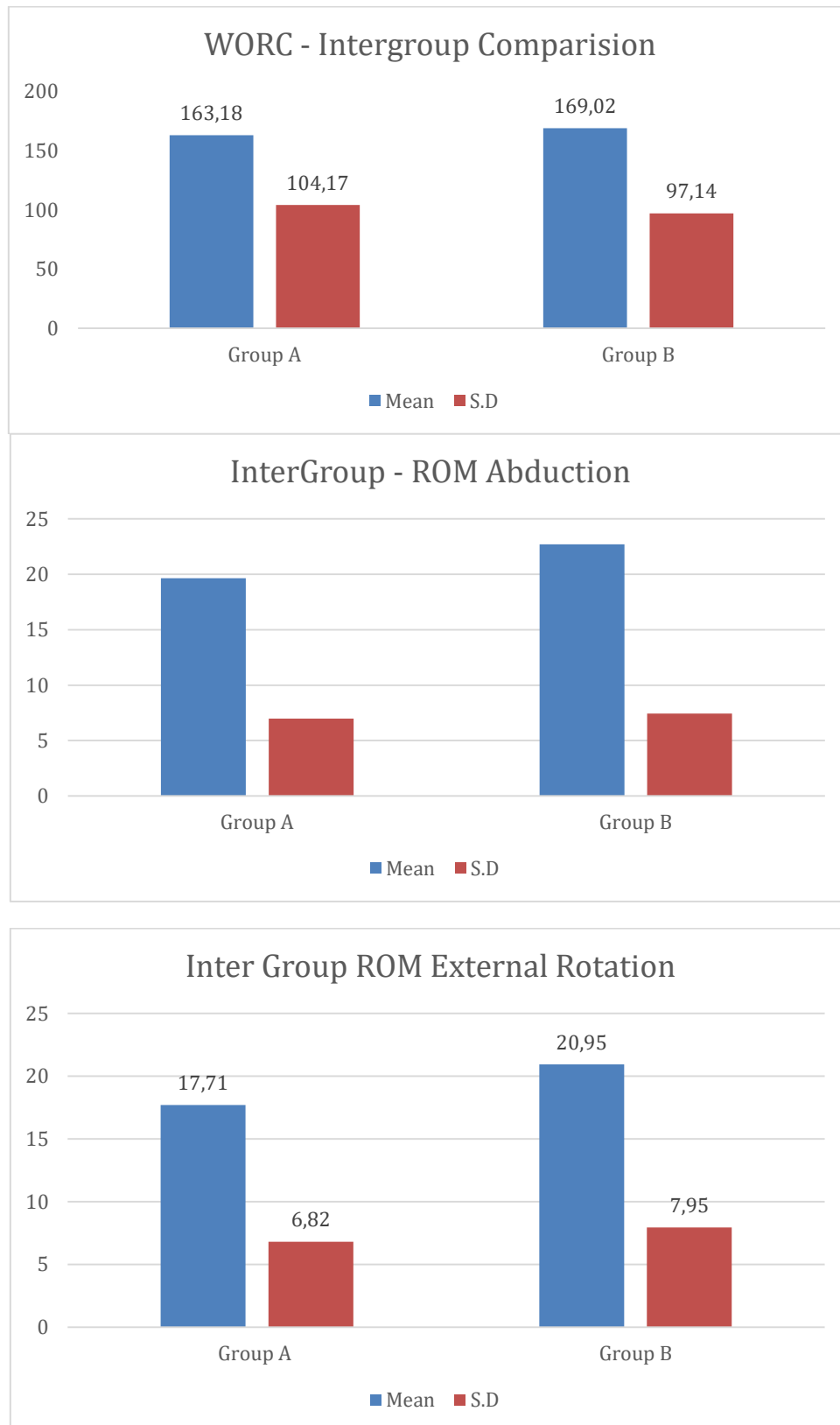
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Athletes who were willing to participate in the study were explained the study and were signed the written informed consent. They were included in study based on inclusion criteria and were randomly allocated into 2 groups, Group A (Reflexive Neuromuscular Stabilization Exercise) and Group B (Black Burn Exercise). A total of 20 session were conducted for 4 weeks for 5 days in a week. The Session included individual exercise protocols for Black Burn Exercises and Reflexive Neuromuscular Stabilization Exercises along with the conventional physiotherapy. Pre and Post Intervention WORC and Goniometry Ranges were assessed.

### III. RESULT

SPSS Version 20 was used for statistical analysis for this study. In the present study, 20 participants with Rotator Cuff tendinitis, age group between 20 to 30 were taken and divided into two groups, Group A and Group B. Microsoft Excel 2019 was used for data analysis. Normality variant done; and there we found data was normally distributed. So, for pre and post comparison of within group Wilcoxon signed Ranked test was used and for the between group comparison Mann Whitney U test was used. Confidence interval for this study was taken 0.95.





The results of the WORC, goniometry, and VAS ranges were presented as mean and standard deviation. Reflexive Neuromuscular Stabilization (Group A) vs. Black Burn Exercise (Group B) pre- and post-intervention mean difference



and standard deviation comparisons show significant improvement in VAS ( $1.4589 \pm 0.7633$ ), WORC Scores ( $169.02 \pm 97.14$ ), Range of Motion - Shoulder Abduction ( $22.71 \pm 7.43$ ), and Shoulder External Rotation ( $20.95 \pm 7.95$ ) scores, respectively. After the intervention, there was a statistically significant difference between group A and group B, according to the p-value considered, which was  $< 0.05$ . The WORC score and range of motion increased more in group B's findings than in group A's, though. This research indicates that Black Burn Exercises improve function and range of motion and reduce VAS scores among athletes with rotator cuff tendinitis, rejecting the null hypothesis in the process. As a result, this can be added to the treatment plan for additional research and injury prevention.

#### IV. DISCUSSION

The current study is randomized controlled trial. The purpose of this study was to evaluate the effectiveness of Reflexive Neuromuscular Stabilization Exercise versus Black Burn exercise on Pain, Rang of Motion and Function among young athletes with rotator cuff tendinitis. Where Group A received Reflexive Neuromuscular Stabilization along with conventional physiotherapy and Group B received Black Burn Exercises along with conventional physiotherapy. However, in both the group, Group A and Group B there was statistically significant improvement found in post intervention score for VAS, WORC and Goniometry ROM, but there was statistically higher significance in Group B for WORC and Goniometry ROM.

The result of present study shows that, Black Burn Exercises along with conventional physiotherapy and Reflexive Neuromuscular stabilization along with the conventional physiotherapy, both are effective for reducing pain and improving range of motion and function after 4 weeks of intervention in participants with Rotator Cuff Tendinitis among our 20 participants. In Reflexive Neuromuscular group mean score before treatment for VAS score 4.245, WORC and Goniometry Range of Motion were 973.65 on 2100 and 92.24 shoulder abduction, 35.38 for shoulder external rotation. After treatment, they were VAS 1.685, WORC 810.47 on 2100, 111.85 for shoulder abduction, 53.09 for shoulder external range of motion respectively. And in Black Burn Exercise mean score for VAS 3.943, WORC before treatment they were 971.71 on 2100, 91.91 for shoulder abduction, 36.68 for shoulder external rotation respectively. After treatment, they were for VAS 0.7514, WORC 805.33 on 2100, 113.21 for shoulder abduction, 54.04 for shoulder external rotation with p value 0.00.

A study which was conducted in year 2018 by Joshua D. Cramer over scapular dyskinesia among an overhead athlete state that "Reflexive Neuromuscular Stabilization provided stimulus to the muscles to restore (groove) the desired motor patterns. Keeping in mind about the muscles around the shoulder joint, various part of this exercise protocol engages different part of shoulder and scapular muscles. Shrugging along with cueing improves activation of upper fibers of trapezius. Reach, Roll and Lift involves Serratus Anterior, External Rotator and lower fibers of Trapezius respectively. Net involves pillow press technique. While keeping in mind the production of isometric contraction among the lower fibers of the trapezius, restoring its normal action. Thus, leading to neuromuscular activation of, muscles of the shoulder girdle. Therefore, RNS can be proved as a useful protocol in activation and restoring normal functioning and coordination of the muscles"<sup>(7)</sup>

Another study was conducted by LambaDheeraj and UpadhyayRitambhara K. on the effect of black burn exercises versus conventional physiotherapy in rehabilitation of Rotator cuff injuries. They concluded that "black burn exercises significantly lead to improvement in function and strength along with reduction in pain among patients with rotator cuff injuries. This article subsequently supports the effectiveness of the Black Burn exercise". The outcomes that were used VAS for pain, Goniometry for Range of motion and 1RM for strength and were assessed for pre and post intervention with total 30 participants. "They also stated that People with rotator cuff injury or Syndrome are present with weakness of scapulohumeral muscles and their improper control of the glenohumeral and scapulothoracic movements during arm elevation. Strengthening exercises are most important non operative and postoperative treatment in rotator cuff injuries."<sup>(8)</sup> Thus, this concludes highly effective exercises regimens in patients with Rotator cuff tendinitis or injury.

Therefore, comparing the above literatures that suggest both the treatments equally effective in the treatment of Rotator cuff Tendinopathy in their respective ways, but our study concludes while comparing both the intervention that administrating Black Burn Exercises among the athletes with Rotator cuff tendinitis statistically Function and Range of Motion showed improvement in scores and reduction of the VAS scores.



## V. CONCLUSION

The current study was carried out to assess the effectiveness of Reflexive Neuromuscular Stabilization Exercise versus Black Burn Exercises along with conventional therapy in both groups on Pain, Range of motion and Function among the participants. Based on the statistical evaluation, it was concluded that Black Burn Exercise along with the conventional physiotherapy has significant effect in reducing pain, improving range of motion and simultaneously the function of the Athlete wit Rotator Cuff Tendinitis.

## LIMITATIONS

The participants were taken from a single geographical area, which limits the generalizability of the findings. The small sample size may affect the statistical power of the study and limit its ability to detect significant differences. Additionally, the intervention duration was relatively short, and no long-term follow-up was conducted to assess the sustained benefits of the intervention. Despite these limitations, the study provides valuable insights into the use of the Black burn Exercise as an adjunct to conventional physiotherapy, and future studies with larger sample sizes and longer follow-up periods may help to further elucidate its potential benefits.

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