Research Article

# Comparison of the Effects of Conventional Physical Therapy Versus Progressive Overload Training in Patients with Shoulder Impingement Syndrome; A Randomised Clinical Trial

**Muhammad Mustafa Qamar,[1] Ayesha Basharat,[2] Qurba Kiran,[3] Amar Nazir,[4] Waqas Ahmad,[5] Shahnai Basharat[6]**

*[1,2,5]Department of Allied Health Sciences, University of Sargodha; [3]Shalimar School of Allied Health Sciences Lahore; [4]Department of Medicine, Sargodha Medical College; [6]University Institute of Nutrition, University of Lahore*

## Abstract

**Background:** Rotator cuff tendinitis and shoulder impingement are regarded as the frequent intrinsic reasons for shoulder discomfort and disability.

**Objective:** A study was conducted to compare the effects of conventional physical therapy and progressive overload training in patients with shoulder impingement syndrome.

**Methods:** Thirty patients with shoulder impingement syndrome were included. These patients were randomised into two groups. One group received structured, progressive resistance training, and the other received conventional therapy. The intervention group participants participated in progressive resistance training three days per week for six weeks. The numeric pain rating scale was used to assess pain intensity and the range of motion measured by the goniometer. The statistical package for social sciences (SPSS), version 21 for Windows, was used for data analysis. An independent t-test was used to compare the effects between the two groups.

**Result:** Out of 30 participants, there were twenty-four females and six males. The mean age of the participants was 44±5.1 years. Participants from the intervention group had better pain control ($P < 0.05$) and improved range of motion ($P < 0.05$) compared to the control group.

**Conclusion:** We conclude in this group of patients, progressive overload training was more effective in alleviating pain and improving the range of motion in patients with shoulder impingement syndrome.

**Corresponding Author |** Dr. Muhammad Mustafa Qamar, Assistant Professor, Department of Community Medicine, Sargodha Medical College, University of Sargodha ; **Email:** mmustafaqamar@gmail.com

**Keywords |** Progressive Strength Training, Impingement syndrome, range of motion, pain intensity

## Introduction:

The shoulder performs various activities of daily living, which may cause overstress, resulting in rotator cuff strain or impingement syndrome.[1] Charles Neer first described shoulder impingement in 1972. It is a progressive medical condition that may arise due to structural or biomechanical malalignments.[2-4] Shoulder problems have been reported in 24 percent of older adults.[5] There are many occupants, and psychological and lifestyle factors contribute to shoulder pain resulting in substantial morbidity. Sustained awkward posture, heavy lifting, overhead work, sedentary lifestyle, and work-related stress may contribute to shoulder disorders.[6] Shoulder impingement syndrome is associated with glenohumeral capsule laxity, hypomobility

or hypermobility, abnormal scapular movement, rotator cuff muscle/tendon weakness, postural deviations, and scapular dyskinesis.[6,7] It is more common in sedentary people than in athletes such as swimmers, basketball players, and baseball players.[8,9]

Several clinical strategies have been used to manage shoulder impingement syndrome. These strategies focus on restoring a full range of motion, improving rotator cuff and scapular stability, and reducing pain and discomfort. Progressive resistance training (PRT) is an exercise strategy in rehabilitation to improve muscle bulk and strength[10]. When designing a progressive strength training program, it is essential to keep in mind the initial load, rest interval, frequency, duration of the exercises, and progression mode. Progressive strength training can be used effectively and safely in any population.[11-14] These are equally effective in the short and long term.[15-17] However, few studies have shown that progressive strength training can improve life quality in people who are disabled or in pain.[18] Additionally, there is no evidence regarding the proper protocol for progressive resistance exercises. Although strength training is incorporated in the acute phase of rehabilitation to improve muscular strength and balance, the heavy dosage may cause muscle soreness, fatigue, and healing. So, proper dosage, frequency, intensity, and duration are essential for treating shoulder problems effectively.

The current study compared the effects of conventional physical therapy and progressive overload training in patients with shoulder impingement syndrome.

## Methods:

Thirty patients (24 Females, 6 Males) were selected from a private physiotherapy clinic, diagnosed with shoulder impingement syndrome by using Neer & Hawkin test by purposive sampling. Their age range were 40-50 years. The study duration was from January 2020 to March 2020.

All patients with a history of cervical or shoulder pain, fracture, or shoulder dislocation were excluded. The sample size was calculated by G*power software. It was based on previous studies with similar outcome measures (ROM),[12, 19] and suggested an 8º difference. Therefore, assuming α=0.05 and statistical power 80%, with a dropout rate of 10 percent, the sample size was 30 participants. The participants were randomly divided into two groups. One group received structured, progressive resistance training for six weeks, and the other received conventional physical therapy. The intervention group participants participated in a three-day per week for six weeks progressive resistance training on the shoulder. For training, ten repetitions maximum was observed in all participants in the interventional group. 60% of 1RM was the primary workload for all participants. This load was progressed 10 % at the end of every week up to six weeks. The other group received therapy for six weeks, including hot packs and ROM exercises. Measurements were taken at baseline and after the study by the same physical therapist and following the same protocols. He was blinded about the groups and study protocols. A numeric rating scale was used to assess the intensity of pain. Zero indicates no pain, while ten indicates maximum pain. The range of motion (ROM) was calculated by using goniometry. Written informed consent was obtained from all the selected participants and demonstrated the potential hazards and benefits of this research. The study was also approved by the Sargodha medical college ethical committee (UOS/SMC/ 6494), according to the Helsinki accord.

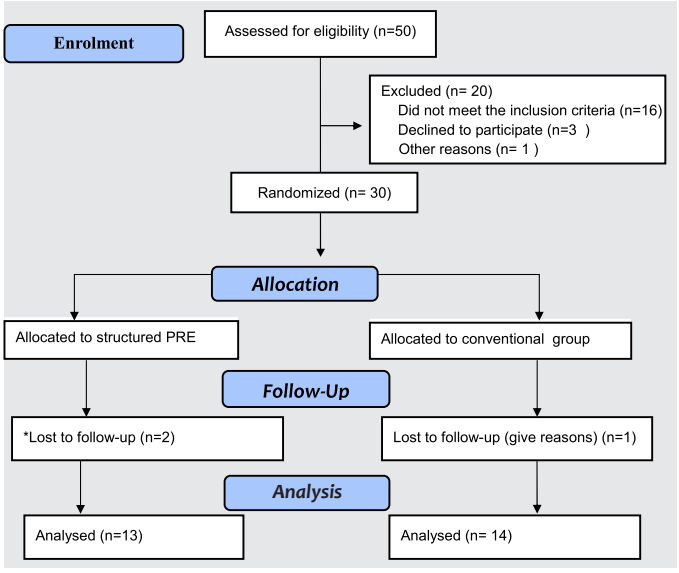


**Figure 1:** *Consort flow chart of study*

The data were illustrated as a mean, and percentage changes were assessed to rule out the impact of overload training on selected parameters. An independent t-test was used for statistical analysis. <0.05 was assumed as statistically significant. SPSS version 22 (SPSS for Windows, SPSS Inc., Chicago, IL, USA) was used for

data analysis.

## Results

The study included thirty participants (24 females and 6 males). The participants' average age was 44±5.1 years. Their average height was 169± 3.4 centimeters, and their weight was 75±6.4 kilograms. Three subjects dropped out due to some domestic problems. Twenty-seven subjects (22 Females, 05 males) completed the study. Their demographics are shown in Table 1.

**Table 1:** *Physical characteristics of the participants*

| | PRE Group | Conventional Group |
|---|---|---|
| | (10 Females, 03 males) | (12 Females, 02 males) |
| **Age (Years)** | 43.9± 6.2 | 44.2±5.2 |
| **Height (Cm)** | 170.2 ±3.2 | 168.7 ±4.6 |
| **Weight (Kg)** | 74.4 ±6.7 | 76.9 ±9.8 |

*Values expressed in mean and SD*

There was no difference in pain intensity between the two groups at baseline. Interestingly, after devising progressive strength training, a noticeable improvement in pain intensity was seen in the intervention group ($p<0.05$; Figure 2).

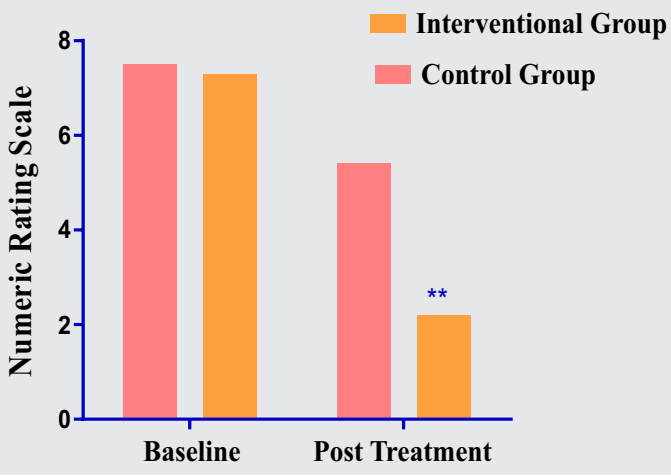


**Figure 2:** *Intensity of pain in control and interventional group before and after a study*

** Statistically significant compared to the control group*

The range of motion was limited in both groups. However, after the study period, significant improvement was seen in all range of motion of the intervention group (Table-2)

**Table 2:** *Range of motion at pre- and post-study in control and interventional group*

| | Control Group | | Interventional Group | |
|---|---|---|---|---|
| | Before Study | After Study | Before Study | After Study |
| **Flexion** | 118 | 128 | 121 | 136* |
| **Extension** | 39 | 41 | 41 | 53* |
| **Abduction** | 122 | 124 | 125 | 135* |
| **Medial Rotation** | 32 | 36 | 33 | 44* |
| **Lateral Rotation** | 63 | 65 | 65 | 80* |

**Statistically significant compared to the control group*

## Discussion:

It has been suggested that routine physiotherapy is an effective treatment for shoulder impingement syndrome. However, there is no consensus on the most effective exercise therapy. The current study was carried out to examine the effect of Progressive overload training in shoulder impingement syndrome. We found that structural overload exercise significantly improved pain and range of motion in shoulder impingement syndrome. These findings are critical for reducing the usage of tablets and avoiding many of the hazards connected with their use.

A study was conducted to investigate the effects of conventional Physical Therapy and Eccentric exercises on the treatment of Rotator Cuff Tendinopathy. Eccentric load training effectively reduced discomfort and enhanced physical function.[20] Nauton and fellows conducted a study to analyse the effects of progressive resistance exercises on rotator cuff pain. They recruited 468 subjects with rotator cuff pain and divided them into a progressive resistance training group, non-resistance, and placebo groups. There was 15% more improvement in pain in the progressive resistance training group than in other groups.[21] This study comprised a long duration of 6 months. In this study, no information is available regarding the progression of exercise. Likewise, another study suggests strength training's effectiveness in increasing the range of motion in all directions in a patient with idiopathic shoulder pain. Although they had found improvement in range of motion, pain intensity was the same.

A researcher found acromioplasty as effective as exercise in reducing symptoms. They concluded that a more conservative approach should be incorporated to manage

shoulder impingement syndrome despite surgical procedures.[22] In a recent review, the researchers examined the effects of surgical and conventional treatments on pain intensity and functional capacity in subacromial pain syndrome patients. They concluded that there was no difference in combined surgery and physiotherapy treatment compared to physiotherapy alone.[23] Our finding unveiled a noticeable difference in pain & discomfort; therefore, variations in other studies' outcomes. Other research demonstrated no noticeable changes in the functional level of patients with shoulder impingement syndrome.[13,16] So, progressive strength training might rehabilitate all shoulder injuries to improve pain, range of motion, discomfort, quality of life, and overall performance.

Our research noticed a remarkable overall improvement in shoulder movement, including abduction, flexion, extension, and medial and lateral rotation in the Interventional group. No mentionable changes were seen in the control group. Reduced pain intensity and improved range of motion may help improve function and daily living activities. The patient may avoid activities because of the pain associated with movement. Subscapularis, supraspinatus, infraspinatus, and teres minor muscular strength increased scapulohumeral stability. These muscles help to strengthen, stabilise, and balance the joint.[24] These positive changes may affect mental, social, emotional, and physical health compared to the control group.

This study has a clinical implication. Overload training can help with shoulder impingement syndrome and improve pain and physical function. The patients included in the current study came from a single hospital. Due to specific demographics, clinical features, small sample size, and a brief follow-up of the participants, the current study's findings cannot be generalised.

## Conclusion

We conclude in this group of patients, progressive overload training was more effective in alleviating pain and improving range of motion in patients with shoulder impingement syndrome.

**Ethical Approval:** Given
**Conflict of Interest:** The authors declare no conflict of interest.
**Funding Source:** None

## References

1. Mihata T, Lee TQ, Hasegawa A, Kawakami T, Fukunishi K, Fujisawa Y. Arthroscopic superior capsule reconstruction can eliminate pseudoparalysis in patients with irreparable rotator cuff tears. Tam J Sports Med. 2018; 46(11):2707-16.
2. Cools AM, Michener LA. Shoulder pain: can one label satisfy everyone and everything. BMJ Open Sport Exerc. Med. 2017; 12(6): 416-417
3. Cordasco FA, Wessel LE, Hendel MD, Ticker JB. Dr. Charles Neer's last surgical case: a historical perspective. J Shoulder Elbow Surg. 2016; 25(11): 358-64.
4. Dhillon K. Subacromial Impingement Syndrome of the Shoulder: A Musculoskeletal Disorder or a Medical Myth. Malays. Orthop. J. 2019; 13(3):1-3.
5. Bento TPF, Genebra cvds, Cornelio GP, Biancon RDB, Simeao SFAP, Vitta AD. Prevalence and factors associated with shoulder pain in the general population: a cross-sectional study. Fisioter. Pesqui 2019; 26(4): 401-6.
6. Koyonos L, Kraeutler MJ, O'Brien DF, Ciccotti MG, Dodson CC. A prospective cohort study investigating the effect of generalised joint hypermobility on outcomes after arthroscopic anterior shoulder stabilisation. Phys Sportsmed. 2016; 44(4):380-4.
7. Liaghat B, Skou ST, Jorgensen U, Sondergaard J, Sogaard K, Juul-Kristensen B. Heavy shoulder strengthening exercise in people with hypermobility spectrum disorder (HSD) and long-lasting shoulder symptoms: a feasibility study. Pilot Feasibility Stud. 2020; 6(1): 1-13.
8. Pirnes KP, Kallio J, Kankaanpaa A, Hakkinen A, Tammelin T. Associations of neck and shoulder pain with objectively measured physical activity and sedentary time among school-aged children. Scand J Pain. 2020; 7(1): 1-7.
9. Naggar TEDM, Maaty AIE, Mohamed AE. Effectiveness of radial extracorporeal shock-wave therapy versus ultrasound-guided low-dose intra-articular steroid injection in improving shoulder pain, function, and range of motion in diabetic patients with shoulder adhesive capsulitis. J Shoulder Elbow Surg. 2020; 29(7):1300-9.
10. Turgut E, Duzgun I, Baltaci G. Stretching exercises for subacromial impingement syndrome: effects of 6-week program on shoulder tightness, pain, and disability status. J Sport Rehabil. 2018; 27(2):132-7.
11. Maestroni L, Read P, Bishop C, Papadopoulos K, Suchomel TJ, Comfort P, et al. The benefits of strength training on musculoskeletal system health: practical applications for interdisciplinary care. Sports Med. 2020 ;

50(8):1431-50.

12. Kwok JY, Kwan JC, Auyeung M, Mok VC, Lau CK, Choi KC, et al. Effects of mindfulness yoga vs stretching and resistance training exercises on anxiety and depression for people with Parkinson disease: a randomised clinical trial. JAMA neurology. 2019; 76(7):755-63.
13. Cauley JA, Giangregorio L. Physical activity and skeletal health in adults. Lancet Diabetes Endocrinol . 2020; 8(2):150-62.
14. Garcia-Hermoso A, Ramirez-Velez R, Saez de Asteasu ML, Martinez-Velilla N, Zambom-Ferraresi F, Valenzuela PL, et al. Safety and effectiveness of long-term exercise interventions in older adults: a systematic review and meta-analysis of randomised controlled trials. Sports Med. 2020;50(6):1095-106.
15. Srivastava S, Eapen C, Mittal H. Comparison of Mobilisation with Movement and Cryotherapy in Shoulder Impingement Syndrome-A Randomised Clinical Trial. J. Clin. Diagnostic Res. 2018; 12(10): 01-05.
16. Srivastava S, Eapen C, Mittal H. Comparison of Mobilisation with Movement and Cryotherapy in Shoulder Impingement Syndrome-A Randomised Clinical Trial. J. Clin. Diagnostic Res. 2018; 12(10): 01-05.
17. Welling W, Benjaminse A, Lemmink K, Dingenen B, Gokeler A. Progressive strength training restores quadriceps and hamstring muscle strength within 7 months after ACL reconstruction in amateur male soccer players. Phys Ther Sport. 2019; 40:10-8.
18. Brændvik SM, Koret T, Helbostad JL, Loras H, Brathen G, Hovdal HO. Treadmill training or progressive strength training to improve walking in people with multiple sclerosis? A randomised parallel group trial. Int. J. Physiother. 2016; 21(4):228-36.
19. Mcclure PW, Bialker J, Neff N, Williams G, Karduna A. Shoulder function and 3-dimensional kinematics in people with shoulder impingement syndrome before and after a 6-week exercise program. Phys. Ther. 2004; 84(9):832-48.
20. Fatima A, Ahmed A. Effectiveness of routine physical therapy with and without eccentric loading training for the rehabilitation of rotator cuff tendinopathy. Ann. King Edw. Med. Univ.2017; 23(4): 469-473.
21. Naunton J, Street G, Littlewood C, Haines T, Malliaras P. Effectiveness of progressive and resisted and non-progressive or non-resisted exercise in rotator cuff related shoulder pain: a systematic review and meta-analysis of randomised controlled trials. Clin. Rehabil. 2020; 34(9):1198-216.
22. Nazari G, macdermid JC, Bryant D, Athwal GS. The effectiveness of surgical vs conservative interventions on pain and function in patients with shoulder impingement syndrome. A systematic review and meta-analysis. PLOS one. 2019; 14(5):e0216961.
23. Kolk A, Thomassen BJ, Hund H, de Witte PB, Henkus H-E, Wassenaar WG. Does acromioplasty result in favorable clinical and radiologic outcomes in the management of chronic subacromial pain syndrome? A double-blinded randomised clinical trial with 9 to 14 years' follow-up. J Shoulder Elbow Surg. 2017; 26(8): 1407-15.
24. Edwards P, Ebert J, Joss B, Bhabra G, Ackland T, Wang A. Exercise Rehabilitation in the non-operative management of rotator cuff tears: A review of the literature. Int J Sports Phys Ther. 2016; 11(2):279-301.