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Effect of Static Stretching Versus Hold-Relax Technique on Pectoral Muscle Flexibility in Forward Round Shoulder Posture

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ABSTRACT: The forward round shoulder is an abnormal posture seen most commonly in association with altered scapular kinematics. Peculiar kinematics of the scapula occurs due to tightness of the pectoral muscles. Changes in the shoulder position would cause increased stress, which results in impingement syndromes. Muscle tightness is predominant in the alteration of scapular kinematics. Stretching plays a role in relieving tightness. Traditionally static stretching is recommended, but proprioceptive neuromuscular facilitation, the Hold-Relax technique, is used as an alternative measure that would bring back the muscle length. So, the purpose of this study is to identify the effect of static stretching versus hold-relax technique on pectoral muscle flexibility in forwarding round shoulder posture. Fifty-two volunteers were selected for the experimental research based on the predetermined selection criteria. They all were divided randomly into two groups: static stretching group (SSG) and Hold-Relax group (HRG). Standardizing the duration, frequency, and intensity of the interventions was challenging to ensure consistent application across participants. The study was carried out for eight weeks, and the outcomes were shoulder external rotation range of motion using a universal goniometer. Forward shoulder posture was measured using the sahrmann technique. The result of the study calculated using SPSS 20.0, and the results show that external shoulder rotation is 11.9 with ($p < 0.05$) and sahrmann technique is 15.01 ($p<0.05$). Thus, this study concluded that there were significant differences noted in both groups. Comparing the groups, the hold-relax technique (HRG) has significantly improved compared with static stretching (SSG).

Keywords: Pectoralis muscle tightness, Hold-relax technique, Static stretching, Sahrmann technique, Shoulder external rotation.

INTRODUCTION

Forward round shoulder posture is one of the common shoulder disorders following prolonged use of monitors, smartphones, or tablets, long study hours, overuse of the shoulder, or carrying heavy backpacks (Ghanbari *et al.*, 2008). It was noted that 36% of adolescents have uneven shoulder levels, and abnormal neck posture (forward head posture) was 25% (Neiva *et al.*, 2009). It is observed that around 73% of the healthy individuals have forward shoulder posture (Cho 2008).

Musculoskeletal structures are becoming incorrect due to reduced physical activity and adaptation to awkward postural habits. Forward shoulder or round shoulder posture is characterized by the acromion protraction in front of the line of gravity, abnormal protraction at the shoulder with downward rotation and the scapula tilted anteriorly (Mosaad *et al.*, 2020). Correlation exists with the forward shoulder and head postures in adolescent ages (Yang *et al.*, 2013).

The mechanism behind the forward shoulder posture is due to muscular imbalances. It is observed a shortening of the anterior shoulder muscles, which includes pectoralis minor, pectoralis major, serratus anterior, and upper trapezius, in contrast with lengthening of middle and lower trapezius and rhomboids (Vakili *et al.*, 2016). This imbalance results in abnormal kinematics between the glenohumeral and scapular orientations, increasing the risk of shoulder, arm, and neck pain (Singla and Veqar 2017).

Shortening of the muscles, especially the pectoral muscles, causes anterior tilting of the scapula and

internal rotation. There is a reduction of upward scapular rotation, which predisposes to shoulder impingement syndrome (Borstad and Ludewig 2005). A rounded shoulder could cause complications like an increase in thoracic intradiscal pressure, reduced mobility in the thoracic spine, and may also cause altered breathing that results in breathing difficulty (Patel and Patel 2020).

Physiotherapy and rehabilitation are the common in managing the altered kinematics of the scapula and shoulder. Standard management for the forward round shoulder includes heat therapy, myofascial massage, soft tissue releases, manual therapy, active or passive stretching, and postural corrections (Kim *et al.,* 2016). However, no single technique is effective in managing the round forward shoulder.

Static stretching generally consists of slow and sustained stretching to the shortened muscle to attain a new length. Static stretching is applied to the muscle to the new point where the tension limits further movements of the muscles. Usually, the stretch has to hold for 30 seconds, often advisable (Bang and Deyle 2020). Static stretching involves achieving a specific range of motion (ROM) and keeping the muscle lengthened for a period. Some recent studies have identified that there is no effect in increasing the passive length of the muscles (Bradley *et al.,* 2007). The efficacy of stretching in the selection or dosages of techniques and the condition of the patient remains debatable (Lai *et al.,* 2019). Stretching is also hypothesized to result in structural adaptations of muscles and other soft tissues (Medeiros and Lima 2017).

Proprioceptive neuromuscular facilitation (PNF) is a modified form of stretching technique utilized to improve muscle elasticity and has been shown to positively affect the active and passive ROM. PNF stretching plays a vital role in improving the joint range and muscle length using myotatic reflex. Various concepts of the PNF technique used are Hold relax, Contract to relax, and Contract to relax antagonist contract. Hold relax (HR) technique is applied to stimulate the muscles when the agonist is too weak. The restricted muscle is put in a position of stretch followed by an isometric contraction of the limited muscle. Joint or the body parts is repositioned either actively or passively to the new limit of the range of motion following contractions.

Studies related to the forward round shoulder are much limited, and fewer studies on the student population. Works of literature in this are limited on improving posture and functional disability. To date, there was a limited number of studies examining the effect of forwarding round shoulder posture on muscle length and shoulder motions. So, this study is conducted to investigate the impact of the static and hold-relax technique on the forward round shoulder.

MATERIAL AND METHODS

An experimental study design was conducted on volunteers having forward shoulder posture. The study was conducted for eight weeks in an Outpatient Department of AVMC & Hospital, Pondicherry. This study was approved by the Institutional Ethical Committee, AVMC & Hospital, Pondicherry. Once the approval was obtained, the study was initiated with a notice about the study to select volunteers on various areas of the university campus and hospital campus. Those who volunteer to participate were taken for analysis based on predetermined inclusion criteria. There are around 100 volunteers visited the OPD, and from them, 83 volunteers were selected for the screening for the study. The screening was conducted on 83 volunteers by an experienced physiotherapist, and 71 volunteers were eligible for the study criteria. Selection criteria of the study include, age group of 18—27 years, both genders, having rounded shoulder, pectoralis minor muscle tightness noted using Vernier's calliper (Borstad, 2008), not having any shoulder injuries previously, not having any cervical problem, congenital upper limb problems were ruled out. History of recent injuries over the upper limb was also ruled out. The lottery method was carried out with the help of a computer to select 56 volunteers for the study. All these volunteers were randomly divided into either static stretching group (SSG) or Hold and Relax group (HRG). A clear explanation about the study to all the volunteers and written consent was obtained from them, and the volunteers can withdraw from the study at any point in time. Volunteers in the SSG underwent passive stretching of the pectoralis muscle for 15 mins followed by shoulder exercises for 10 minutes (Franco *et al.,* 2008). Volunteers in the HRG underwent a relaxation technique for 15 mins followed by shoulder exercises for 10 minutes (Putt *et al.,* 2008). A standard home program instructed to both the groups, the study was conducted for alternate days, three days in a week, and eight weeks. The senior physiotherapist who does initial screening is involved in collecting the pre-test values and post-test values; he is not part of the study. After three weeks of study, two people from each group withdrew from the study due to personal reasons. So, this study concluded with 26 participants in each group. Outcome measures were Shoulder external rotation range of motion using a universal goniometer, and forward shoulder posture was measured using sahrmann technique.

RESULTS AND DISCUSSION

Statistical analyses were carried through SPSS 20.0. The study was done to identify the effect of the groups and the character traits of the groups, which was given in tables I, II & III. Demographic and other analysis were done using descriptive statistics shown in Table I.

The Student's t analysis to find out the difference between the group was shown in Table 2 & 3. It's been exhibited that the critical value of at $p < 0.05$.

The purpose of the study was to identify the effect of static stretching versus hold-relax training on pectoral muscle flexibility in forward round shoulder posture. Static stretching was applied to one group of participants, and Hold relax applied to another. Descriptive statistical analysis was used to analyse participants' demographic data. No strong relationship exists on abnormal posture with food habits or sleep. In contrast, a mild relationship exists between the number of writing hours and the hours used for gadgets (Mobile phones, laptops, desktops, and tablets). The sample size is however small to quantify the connection.

Table 1: Demographic and Variable analysis.

Age group	Number of participants	Male	Female
18-20 yrs	17	19.30 ± 0.823	18.86 ± 0.69
21-23 yrs	20	22.2 ± 0.919	21.5 ± 0.71
24-27 yrs	15	25± 1.15	25.75± 0.707
Total	52	-	-
Food habits			
Vegetarian	24	21.9± 1.49	22.21± 2.99
Non-Veg	28	22.35±2.80	22± 2.79
Total	52	-	-
Number of hours Sleeping			
4-6 hrs	22	22.72± 2.87	22.18± 3.09
7-9 hrs	28	21.5± 2.03	22.07± 2.76
> 9hrs	2	19.5 ± 0.5	0
Total	52	-	-
Number of hours Writing			
1-2 hrs	21	21.91 ± 2.91	20.9 ± 2.08
2-4 hrs	18	20.8± 1.87	21.36± 2.88
> 4 hrs	13	23.50± 1.64	24.71 ± 2.29
Total	52	-	-
Number of hours Watching electronic Gadgets			
2-4 hrs	7	25.01 ± 1.63	26.01 ± 1.01
4-6 hrs	21	21.46 ± 2.42	23.31 ± 2.58
6-8 hrs	20	21.67 ± 2.06	20.78 ± 1.30
>8 hrs	4	19.67 ± 0.58	18.33 ± 0.58
Total	52	-	-

Table 2: Analysis of the External range of motion of Shoulder.

Groups	Pre-test	S.D	Post-test	S.D	Paired 't' value	S.D	Student 't' value
SSG	51.42	6.91	65.42	4.86	12.5	5.71	11.9
HRG	51.38	5.28	77.69	1.98	21.9	6.13	($p < 0.05$)

Table 3: Analysis of the Sahrmann technique.

Groups	Pre-test	S.D	Post-test	S.D	Paired 't' value	S.D	Student 't' value
SSG	137.23	4.67	157.69	3.13	20.5	5.5	15.01
HRG	137.35	4.41	173.15	4.21	35.9	6.25	($p < 0.05$)

*The probability of this result, assuming the null hypothesis, is less than .0001. This shows there is a significant difference between the pre-test and post-test values and there is difference between the SSG vs HSG.

Stretching is an integral part of improving muscle flexibility, and it usually incorporates the pre exercises and has been suggested to improve muscle flexibility, prevent injuries, and enhances physical performances. Static stretching often increases joint motion. It increases ROM by reducing the tension in the muscles and effectively reducing muscle stiffness. SS increases flexibility after the short-term stretching, and it increases the range of motion. SS increases the short-term flexibility of the muscles, and it is usually in warmup programs. In addition to the improvement of flexibility, the SS also reduces the recovery time

following injury. Studies were done by (Chan *et al.*, 2001) have identified that static stretching increases muscle extensibility following eight weeks of treatment. Still, the increase of ROM is due to an increase in stretch tolerance rather than muscle extendibility.

A hold relaxes a technique of facilitating normal muscle sensation and muscle awareness used to treat hypertonicity or motor dysfunction. HR technique cause relaxation of the shortened muscles, which can be brought by maximal isometric contractions of the muscle in a position of slight stretch. When an extreme stretch is applied to the muscle, the GTOs are stimulated and transmit the impulse to an interneuron in the spinal cord, which inhibits the muscle being stretched. These impulses override the impulses from the muscle spindle cause muscle to relax.

HR technique involves reciprocal muscle inhibition throughout exercises, and a rhythmic contraction leads to an increase in the range of motion in joints. Muscle stretched in HR technique is through the spinal reflex known as reciprocal inhibition, which helps to maximize the increase in ROM. HR increases flexibility by relaxing the contractile component of the muscles while static expansion causes increased elasticity in the noncontractile viscoelastic elements. Pieces of evidence have shown that the HR technique is much effective in muscle activations and improves motor coordination compared with static stretching.

This study has few limitations mentioned are study focused on college students, only these two techniques and the two outcomes were measured. The pain was not taken into consideration, although it reduced following both the methods, no modality was used in this study, and the relationship between the variables was not identified. This study concluded that the Hold-relax technique (HSG) improves external rotation of the shoulder and the sahrmann process compared with Static stretching (SSG). Although there are differences between the pre-test values in both the groups, there was significance found in the hold relax group.

CONCLUSION

This study, involving 52 volunteers with forward, round shoulder posture, divided into static stretching and Hold-Relax groups, measured shoulder external rotation range of motion and assessed forward posture. The results of the study, analysed using SPSS 20.0, revealed significant improvements in both external shoulder rotation (11.9, $p < 0.05$) and forward shoulder posture (15.01, $p < 0.05$) in both groups. However, the Hold-Relax group (HRG) showed significantly greater improvements compared to the static stretching group (SSG). Therefore, based on the findings of this study, it can be concluded that the Hold-Relax technique is more effective than static stretching in improving pectoral muscle flexibility and addressing forward, round shoulder posture. These results highlight the potential benefits of incorporating the Hold-Relax technique as part of rehabilitation and management strategies for individuals with altered scapular kinematics and forward shoulder posture.

FUTURE SCOPE

The study highlights the effectiveness of Hold-Relax technique in improving pectoral muscle flexibility and forward round shoulder posture. Further research is needed to validate findings and explore long-term effects. Future studies should consider larger sample sizes, longer follow-up periods, and control groups.

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Conflict of interest. None.

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