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Effects of Proprioceptive Neuromuscular Facilitation (PNF) Exercises and Scapular Stabilization Exercises on Scapular Position and Disability in Boxers with Scapular Dyskinesia

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ABSTRACT

BACKGROUND: Scapular dyskinesis is a irregular motion of the scapula due to poor motor control of the surrounding musculature. This results in the lateral tilting of scapula during many glenohumeral joint movements and weight bearing activities of the upper extremity. Shoulder injuries make up between 7.1% and 27.5% of the total injuries suffered by boxers. Boxers with three or more years of training demonstrate greater dominant arm scapular dyskinesis. So Proprioceptive Neuromuscular Facilitation Exercises in addition to Scapular Stabilization Exercises may help in improving scapular Position and Disability in boxers with Scapular Dyskinesia.

OBJECTIVES: To evaluate the effects of Proprioceptive Neuromuscular Facilitation Exercises and Scapular Stabilization Exercises on Scapular Position and Disability in boxers with Scapular Dyskinesia.

METHODOLOGY: 30 boxers with scapular dyskinesia were selected. Divided into Group A and Group B. Each group consists of 15 subjects. Group A received Scapular Stabilization Exercises. Group B received Proprioceptive Neuromuscular Facilitation Exercises in along with Scapular Stabilization Exercises. The outcome measures were Lateral Scapular Slide test and Disablement in the Physically Active.

RESULT: Using unpaired 't' test comparison of post-test values of Group A and Group B of Lateral Scapular Slide test shows 't' value at 0 degree 2. 5698, and at 45 degree 3. 2078, and at 90 degree 3.6260 and post-test value of Disablement in the Physically Active shows 't' value 6.1537.

CONCLUSION: The study concluded that the Proprioceptive Neuromuscular Facilitation Exercises given along with Scapular Stabilization Exercises were effective in altering Scapular Position and reducing Disability in boxers with Scapular Dyskinesia.

KEYWORDS: Scapular Dyskinesia, Scapular Stabilization Exercises, Proprioceptive Neuromuscular Facilitation Exercises, Disability, Scapular Position

INTRODUCTION

Scapular dyskinesia is the irregular motion of the scapula due to poor motor control of the girding musculature. This results in the side tilting of the scapula during numerous glenohumeral joint movements and weight- bearing conditioning of the upper extremity. During dynamic arm movement, scapular dyskinesis can be clinically characterized by medial or inferomedial border elevation, early scapular elevation or shrugging upon arm elevation, and/ or rapid-fire downcast gyration upon arm lowering.

Boxing is a combat sport that has a high frequence of injuries. Shoulder injuries make up between 7.1 to 27.5 of the total injuries in boxers. Boxers miss 14.2 – 20 training days on average due to shoulder injuries. This leads to dropped strength of girding muscles and reduced ROM results in Scapular Dyskinesia. Boxers with three or further times of training are more prone to develop dominant arm scapular dyskinesis. Exercise may be an effective choice for correcting the scapular position, perfecting scapular muscle performance, and relieving pain. To determine which exercises can most effectively induce serratus anterior muscle activation to treat scapular winging, including scapular stabilization exercises and kinetic chain exercises, these exercises have formerly been included in the shoulder recuperation plan.

Proprioceptive Neuromuscular Facilitation (PNF) is a recuperation conception that promotes motor learning, motor control, strength, and mobility. PNF ways include diagonal patterns, rhythmic stabilization, and repeated contractions. Proprioceptive Neuromuscular Facilitation (PNF) Exercises are used to improve the neuromuscular response of the proprioceptors, and their diagonal patterns align with the topographic exposure of the muscle. PNF training is designed to enhance muscle performance through its specific movement patterns. Research has shown that PNF training is more effective than conventional exercise in perfecting muscle performance, relieving pain, enhancing balance, and adding range of motion. This study aims to examine the effects of Proprioceptive Neuromuscular Facilitation Exercises and Scapular Stabilization Exercises on Scapular Position and Disability in Boxers with Scapular Dyskinesia.

METHODOLOGY

STUDY DESIGN

- The study design was pre and post-test experimental study design.

STUDY SETTING

- The study was conducted at the Strength Pattern Fitness Studio Gandhimanagar, Coimbatore.

STUDY DURATION:

- The total study duration of the study was 6 months. Treatment duration was 6 weeks.

GROUP – A

- Frequency – 3 days/week
- Duration – 40minutes/session

GROUP – B

- Frequency – 3 days/week
- Duration – 1 hour/session

STUDY SAMPLING:

Sample: 30 boxers with scapular dyskinesia who fulfilled the predetermined inclusion criteria and exclusion criteria were selected and divided into 2 groups based on simple random sampling method each group consists of 15 subjects. Group are named as group A and B.

Group A- Scapular Stabilization Exercises.

Group B- Proprioceptive Neuromuscular Facilitation Exercises in along with Scapular Stabilization Exercises.

OUTCOME MEASURE

- Scapular Position - Lateral Scapular Slide Test (LSST)
- Disability - Disablement in the Physically Active Scale (DPA)

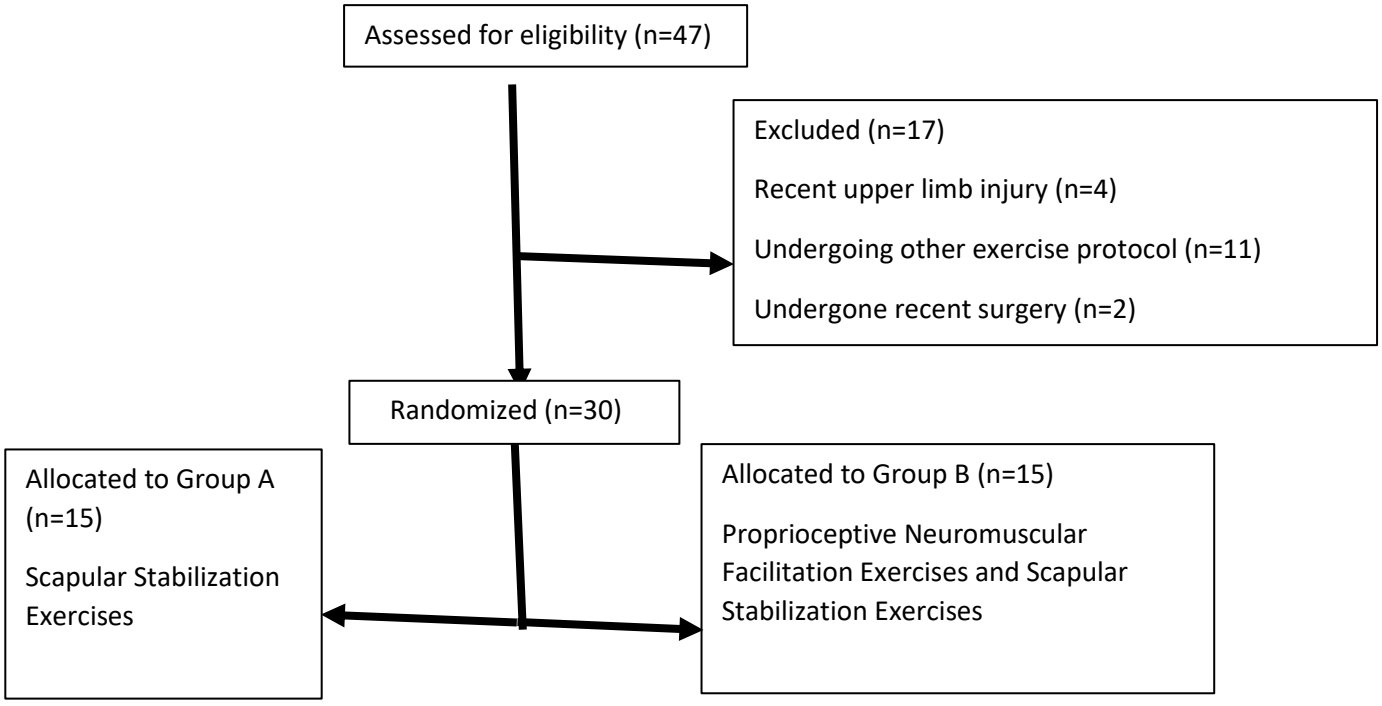
CRITERIA FOR SELECTION

INCLUSION CRITERIA

- Age – 25 – 33 years.
- Only male boxers are included
- Boxers who were playing more than 3 years
- Boxers with altered scapular resting position with positive Lateral Scapular Slide Test.
- Boxers who are willing to participate in the study.

EXCLUSION CRITERIA

- Boxers who had recent upper limb fracture, fracture of vertebrae and ribs and dislocation of the shoulder.
- Boxers who were on any other exercise protocol for scapular dyskinesia.
- Neurological deficit affecting upper limb function.
- Undergone recent surgery in the upper limb.



PROCEDURE:

A total of 47 subjects were screened, of which 30 subjects met the inclusion criteria. To assess the scapular dyskinesia, we have done Lateral Scapular Side Test (LSST). To evaluate the disablement, we provided the Disablement in the Physically Active Questionnaire (DPA). They were randomly allocated into 2 groups, 15 participants in Group - A and 15 participants in Group - B.

Group A - Received Scapular Stabilization Exercises for six weeks on the basis of 3 days/week and duration of 40minutes/session [8].

STAGES	EXERCISES
1.	Upper trapezius stretching (30 secs-3reps)
	Teres major stretching (30 secs-3reps)
	Pectoralis major stretching (30 secs-3reps)
	Wall slide (20 reps-3sets)
	Towel slide (20 reps-3sets)
	Supine serratus punches (20 reps-3sets)
	Scapula retraction (20 reps-3sets)
	Y formation (20 reps-3sets)
2.	Upper trapezius stretching (30 secs-3reps)
	Teres major stretching (30 secs-3reps)
	Pectoralis major stretching (30 secs-3reps)
	Side lying wiper exercise (20 reps-3sets)
	Knee push – up plus (20 reps-3sets)
	Forward leaning with swiss ball (20 reps-3sets)
	Chest press (20 reps-3sets)
	Dynamic hug (20 reps-3sets)

SCAPULAR STABILIZATION EXERCISES

Upper trapezius stretching

Teres major stretching

Pectoralis major stretching

Wall slide

Towel Slide

Supine serratus punches

Y formation

Side lying wiper exercises

Group B - Received Proprioceptive Neuromuscular Facilitation Exercises and Scapular Stabilization Exercises for six weeks on the basis of 3 days/week and duration of 1 hour/session.

The Proprioceptive Neuromuscular Facilitation exercises used are upper limb patterns and scapular patterns, and the principles of the "timing for emphasis" and "irradiation" [9].

S.N	PATTERNS	PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION EXERCISES
1	UPPER LIMB PATTERNS	D1 – flexion, adduction, external rotation
2		D2 – flexion, abduction, external rotation
3	SCAPULAR PATTERNS	D1 – Anterior elevation – posterior depression
4		D2 – posterior elevation – anterior depression

PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION EXERCISES

Upper limb: D1 flexion

Upper limb: D2 flexion

Scapular pattern: D1 flexion

Scapular pattern: D1 extension

Scapular Pattern: D2 flexion

Scapular Pattern: D2 extension

Table - 1
Demographic Data
Group – A
Scapular Stabilization Exercises

S.N	AGE GROUP	NO. OF SUBJECTS
1.	25-27	7
2.	28-30	6
3.	31-33	2
	TOTAL	**15**

Graph - 1
Demographic Data – Age
Group – A

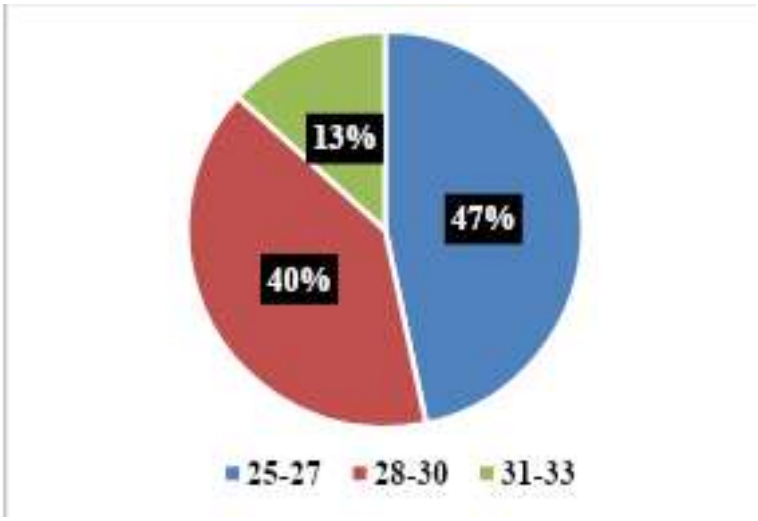


Table - 2
Demographic Data
Group – B
Proprioceptive Neuromuscular Facilitation Exercises

S.N	AGE GROUP	NO. OF SUBJECTS
1.	25-27	6
2.	28-30	6
3.	31-33	3
	TOTAL	**15**

Graph - 2
Demographic Data
Group - B

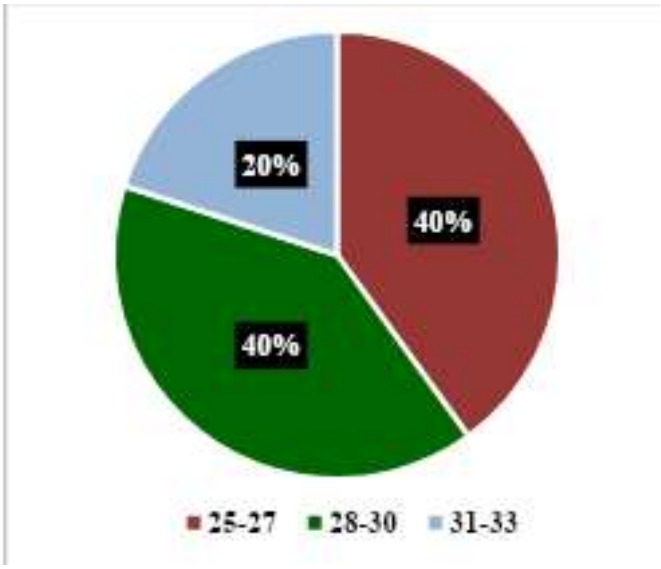


Table - 3
Lateral Scapular Slide Test (LSST) – Scapular Position
Paired 'T' Test Group - A
Scapular Stabilization Exercises

POSITIONS	MEAN		MEAN DIFFERENCE	STANDARD DEVIATION	't' VALUE
	PRE-TEST	POST-TEST			
0 degree	1.43 cm	1.12 cm	0.31	0.257	3.3682
45 degree	2.14 cm	1.54 cm	0.6	0.434	12.0836
90 degree	2.60 cm	1.82 cm	0.78	0.457	10.9831

The comparison of pre – test and post – test values of Lateral Scapular Slide Test for Group – A showed that the calculated 't' value for 0 degree – 3.3682, 45 degree – 12.0836, 90 degree – 10.9831 is significantly greater than tabulated 't' value 2.145 at 5% level of significance. Thid shows that there is a significant improvement on Scapular Position following Scapular Stabilization Exercises.

Graph - 3
Lateral Scapular Slide Test (LSST) – Scapular Position
Paired 'T' Test Group – A
Scapular Stabilization Exercises

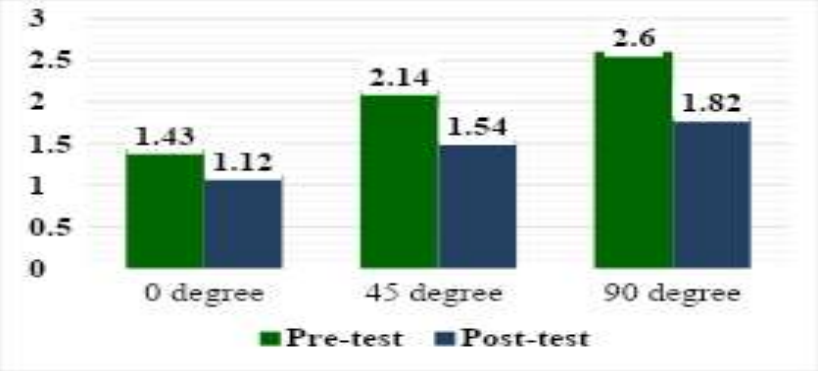


Table - 4
Lateral Scapular Slide Test (LSST) – Scapular Position
Paired 'T' Test Group – B
Proprioceptive Neuromuscular Facilitation Exercises

POSITIONS	MEAN		MEAN DIFFERENCE	STANDARD DEVIATION	't' VALUE
	PRE-TEST	POST-TEST			
0 degree	1.49 cm	0.85 cm	0.64	0.309	13.4427
45 degree	2.22 cm	1.12 cm	1.1	0.262	17.8264
90 degree	2.76 cm	1.34 cm	1.42	0.232	13.1092

The comparison of pre – test and post – test values of Lateral Scapular Slide Test for Group – B showed that the calculated 't' value for 0 degree – 13.4427, 45 degree – 17.8264, 90 degree – 13.1092 is significantly greater than tabulated 't' value 2.145 at 5% level of significance. Thid shows that there is a significant improvement on Scapular position following Proprioceptive Neuromuscular Facilitation Exercises.

Graph - 4
Lateral Scapular Slide Test (LSST) – Scapular Position
Paired 'T' Test Group - B
Proprioceptive Neuromuscular Facilitation Exercises

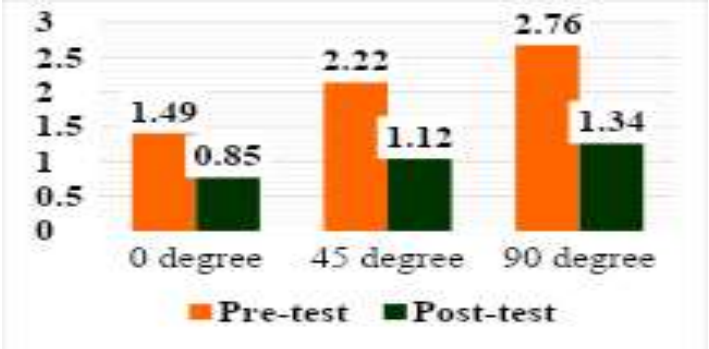


Table – 5
Lateral Scapular Slide Test (LSST) – Scapular Position
Unpaired 'T' Test - Group A Vs Group B
(Post - Test Values)

POSITIONS	POST-TEST MEAN		MEAN DIFFERENCE	STANDARD DEVIATION	't' VALUE
	GROUP A	GROUP B			
0 degree	1.12 cm	0.85 cm	0.27	0.309	2.5698
45 degree	1.54 cm	1.12 cm	0.42	0.262	3.2078
90 degree	1.82 cm	1.34 cm	0.48	0.232	3.6260

The comparison of post – test values of Lateral Scapular Slide Test for Group – A and Group – B showed that the calculated 't' value for 0 degree – 2.5698, 45 degree – 3.2078, 90 degree – 3.6260 is significantly greater than tabulated 't' value 2.048 at 5% level of significance. Thid shows that there is a significant improvement on Scapular position following Proprioceptive Neuromuscular Facilitation Exercises.

Graph - 5
Lateral Scapular Slide Test (LSST) – Scapular Position
Unpaired 'T' Test - Group A Vs Group B
(Post - Test Values)

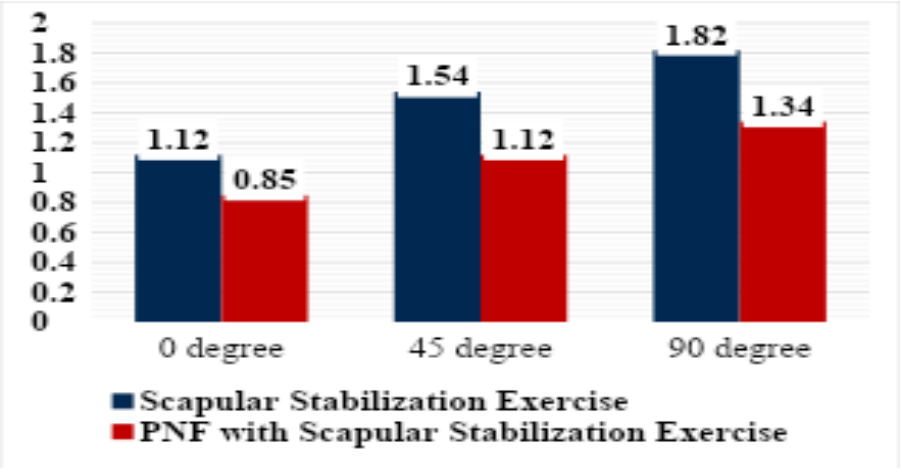


Table - 6
Disablement In the Physically Active (DPA)
Paired 'T' Test Group – A
Scapular Stabilization Exercises

S.N	GROUP A	MEAN	MEAN DIFFERECE	STANDARD DEVIATION	't' VALUE
1.	PRE-TEST	34.93			
2.	POST-TEST	18.13	16.80	2.56	28.6121

The comparison of pre – test and post – test values of Disablement in the Physically Active Scale for Group – A showed that the calculated 't' value 28.6121 is significantly greater than tabulated 't' value

2.145 at 5% level of significance. Thid shows that there is a significant improvement on Disability following Scapular Stabilization Exercises.

Graph - 6
Disablement In the Physically Active (DPA)
Paired 'T' Test Group – A
Scapular Stabilization Exercises

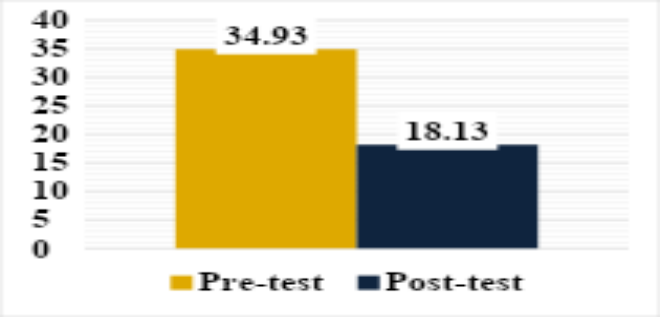


Table - 7
Disablement In The Physically Active Scale (DPA)
Paired 'T' Test Group – B
Proprioceptive Neuromuscular Facilitation Exercises

S.N	GROUP B	MEAN	MEAN DIFFERECE	STANDARD DEVIATION	't' VALUE
1.	PRE-TEST	36.53			
2.	POST-TEST	13.8	22.73	0.94	57.4057

The comparison of pre – test and post – test values of Disablement in the Physically Active Scale for Group – B showed that the calculated 't' value 57.4057 is significantly greater than tabulated 't' value 2.145 at 5% level of significance. Thid shows that there is a significant improvement on Disability following Proprioceptive Neuromuscular Facilitation Exercises.

Graph - 7
Disablement In The Physically Active Scale (Dpa)
Paired 'T' Test Group - B
Proprioceptive Neuromuscular Facilitation Exercises

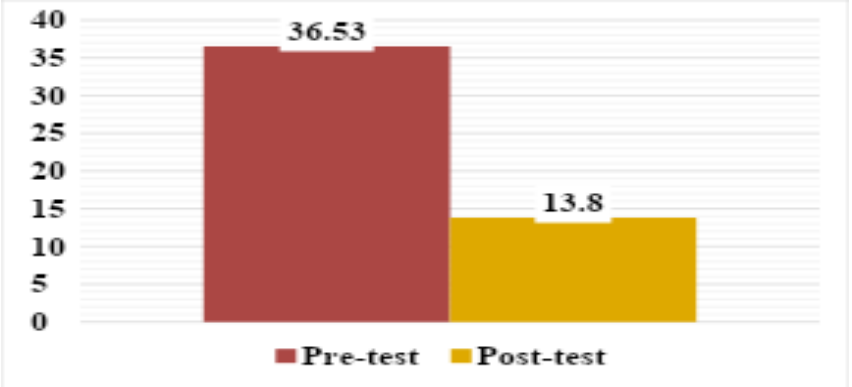
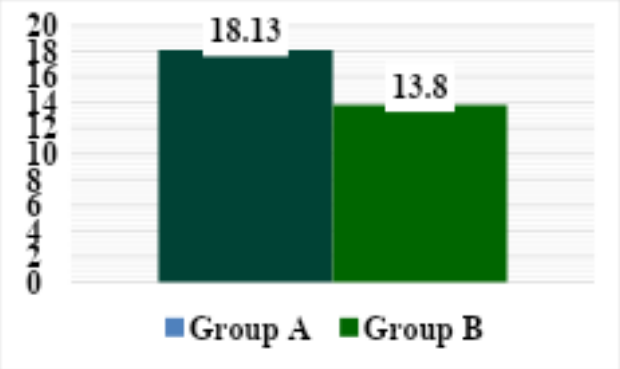


Table - 8
Disablement In The Physically Active Scale (DPA)
Unpaired 'T' Test - Group A Vs Group B
(Post – Test Values)

S.N	POST-TEST MEAN	MEAN	MEAN DIFFERECE	STANDARD DEVIATION	't' VALUE
1.	GROUP A	18.13	4.33	0.94	6.1537
2.	GROUP B	13.8			

The comparison of post – test values of Disablement in the Physically Active Scale for Group – A and Group - B showed that the calculated 't' value 6.1537 is significantly greater than tabulated 't' value 2.048 at 5% level of significance. Thid shows that there is a significant improvement on Disability following Proprioceptive Neuromuscular Facilitation Exercises.

Graph - 8
Disablement In The Physically Active Scale (DPA)
Unpaired 'T' Test - Group A Vs Group B
(Post – Test Values)



RESULT

In this study 30 boxers were selected to find the effects of Proprioceptive Neuromuscular Facilitation Exercises and Scapular Stabilization Exercises on Scapular Position and Disability in boxers with Scapular Dyskinesia.

The post-test mean value of Lateral Scapular Slide Test in Group A is 1.12 cm at 0^0, 1.54 cm at 45^0 and 1.82 cm at 90^0 (Table 3) and Group B is 0.85 cm at 0^0, 1.12 cm at 45^0 and 1.34 cm at 90^0 (Table 4). This confirms that the significant improvement in the Scapular Position of Group B is better than Group A. The post-test mean values of Disablement in the Physically Active in Group A is 18.13 (Table 6) and Group B is 13.8 (Table 7). This confirms that the significant improvement in disability of Group B is better than the Group A.

The effects of Scapular Stabilization Exercises are elicited by comparing the pre and post-test values of Group A using paired 't' test values represented in Table 3 and 6. The calculated paired 't' values of Group A are 3.3682 at 0^0, 12.0836 at 45^0 and 10.9831 at 90^0 and 28.6121. The effects of Proprioceptive Neuromuscular Facilitation Exercises are elicited by comparing the pre and post-test values of Group B

using paired 't' test values represented in Table 4 and 7. The calculated paired 't' values of Group B are 13.4427 at 0^0, 17.8264 at 45^0 and 13.1092 at 90^0 and 57.4057. The unpaired 't' values of post-test for the comparison of Group A and Group B are given in the Table 5 and 8.

Comparing the data between the post-test values, Group B who underwent Proprioceptive Neuromuscular Facilitation Exercises and Scapular Stabilization Exercises appears to be improved in Scapular Position and Disability than the Group A who underwent Scapular Stabilization Exercises. This result rejects the null hypothesis and accepts the alternate hypothesis.

CONCLUSION

The present study conducted among male boxers with scapular dyskinesia underwent the treatment including Proprioceptive Neuromuscular Facilitation Exercises and Scapular Stabilization Exercises for duration of 6 weeks showed greater improvement in the Scapular Position and reducing Disability compared to group that underwent Scapular Stabilization Exercises alone. Therefore, the study concluded that the Proprioceptive Neuromuscular Stabilization Exercises given along with Scapular Stabilization Exercises were effective in altering scapular position and reducing disability in boxers with Scapular Dyskinesia.

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