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Original Research Article

Effects of Core Stability Exercise in Periarthritis Shoulder on Pain, Range of Motion and Quality of Life - An Interventional Study

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ABSTRACT

Background: Periarthritis shoulder has an incidence of 3%-5% in the general population and up to 20% in those with diabetes. Greater core stability benefits performance by providing a foundation for greater force production in the upper and lower extremities. Thus, core muscle exercises have a theoretical basis in rehabilitating various musculoskeletal disorders.
Method: After obtaining approval from the institutional ethics committee out of 68 participants, 20 were excluded. Pre-data of pain, range of motion (ROM), and functional ability score were taken before intervention. Participants were randomly divided into two groups. Group A (control group) received Conventional therapy and Group B (experimental group) received Conventional therapy plus core stability exercise (5 sessions/week) for 4 weeks. Post-intervention data on pain, ROM and functional ability scores were collected for both groups. Pre-data and post-data were compared within group and between groups statistically.
Results: Within Group A and Group B pain, shoulder ROM, and functional ability score post-4-week showed significant improvement compared to pre-data ($p<0.00$). Between groups (Group A and Group B) analysis of pain, shoulder ROM and functional ability score post 4 weeks of intervention did not show a significant difference ($p>0.05$). Thus, statistically between Group A and Group B there was no significant difference after 4 weeks of intervention on pain, shoulder ROM and functional ability score.
Conclusion: Group B showed statistically no significant effect compared to Group A on pain, shoulder ROM and functional ability score in the peri-arthritis shoulder.

Keywords: Periarthritis shoulder, Frozen shoulder, adhesive capsulitis, Core stability exercise.

INTRODUCTION

Periarthritis scapulohumerale" and "painful periarthritis of the shoulder," were first mentioned by Duplay (1872) and Putnam (1882) respectively. (1) Codman referred this condition as "frozen shoulder" in 1934(2), but Neviaser (3) renamed it "adhesive capsulitis" to better describe the pathology. Periarthritis shoulder (PA) is typically marked by pain and a gradual loss of shoulder active and passive range of motion. (4) Incidence in the general population has been estimated to be between 2% and 3%. (4)(5)(6) This number is higher in the diabetic population (7), where patients with type 2 diabetes mellitus are claimed to have a prevalence of 30%. (8) About 77 million people suffer from diabetes mellitus in India. The global diabetes prevalence will rise to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 and thus the prevalence of PA could also be increased. (1) It is also claimed that women are more likely than men to develop periarthritis shoulder, particularly between the ages of 40 and 60. (4)(6)(9)(10) The problem often advances extremely slowly towards

spontaneous remission, although some individuals may continue to experience impairment,
according to the results of various long-term studies. [11][12][13][14][15] Periarthritis shoulder is a well-known disorder with distinct phases of intense pain, escalating stiffness and gradually regaining complete shoulder range of motion. Yet the exact cause is still unknown. [16] The following criteria can be used to diagnose periarthritis shoulder:

(i) minimum 3-month history of shoulder pain severe enough to awaken the patient at night.

(ii) Increasing shoulder motion restriction, especially loss of at least 50% ROM than the normal range of external rotation. [17]

Many benefits of core stabilization have been emphasized, ranging from reducing low back pain to enhancing athletic performance and avoiding injuries. [18]

Core musculature includes abdominals in the front, the paraspinals and glutei in the back, the diaphragm is the roof, and the pelvic floor and hip girdle muscles are the bottom of the muscular box. [19] Twenty-nine muscle pairs that support stabilizing the spine, pelvis, and kinetic chain during functional motions are contained within this box. Without these muscles, compressive forces as low as 90 N, or a load significantly lower than the upper body's weight, would cause the spine to become mechanically unstable. [20]

Normal kinetic chain activation reduces compression, translational or shearing forces, increases force generation and correct distribution along distal moving part. [21]

The Shoulder Pain and Disability Index (SPADI) is a patient-completed questionnaire with 13 items assessing pain level and extent of difficulty with ADLs requiring the use of the upper extremities. The pain subscale has 5-items and the Disability subscale has 8-items. [22] Intraclass correlation coefficient ≥0.90 for SPADI. [23]

Measurements of shoulder ROM with a standard goniometer demonstrate intraclass correlation coefficients ranging from 0.80 to 0.99. [24]

The Numeric Pain Rating Scale (NPRS) is a reliable method to assess pain. [25] Intraclass correlation coefficient of the NPRS is 0.95.[26][27]

The pressure biofeedback unit (PBU) measures the movement of the lumbar spine in relation to an air-filled reservoir and helps to retrain stabilizing muscles during upper or/and lower extremity movement (Jull et al, 1993). Such pressure sensors can be used to give beneficial visual biofeedback during therapy and an objective measurement of the deep abdominal muscle. [28]

Fig 1.1 The preferential contraction ratios of transversus abdominis on the variations of knee angles during abdominal drawing-in maneuver in wall support standing - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Pressure-biofeedback-unit_fig1_262734045 [accessed 25 Feb, 2023]

Greater core stability improves performance by providing the foundation for greater force production in the upper and lower extremities. Thus, core muscle exercises have been incorporated in the rehabilitation for various musculoskeletal disorders, injury prevention and improved performance. [30]

Exercises for core stability are essential in cases of spinal instability. Extensive spinal instability is evident in a radiograph, but functional or clinical instability is more difficult to identify. According to Panjabi, clinical instability is the loss of the spine's capacity to sustain normal patterns of displacement under physiological loads without causing an immediate or subsequent neurologic impairment, a significant deformity, or excruciating pain. [32] The spine stability system consists of the following interacting elements:

- Neuromuscular control (neural elements)

- Passive subsystem (osseous and ligamentous elements)
- Active subsystem (muscular elements)

In other words, appropriate sensory input that alerts the central nervous system to interactions between the body and its surroundings, providing constant feedback and enabling movement refinement, is also necessary for the spine's stability. [33] Hence, for the best spinal stabilization, a comprehensive core stabilizing program would take into account sensory and motor components associated with these systems.

Recent research from the Queensland physiotherapy group highlighted the importance of the deep core musculature, particularly the transversus abdominis and multifidi, for maintaining core stability. [19] McGill and other biomechanists place more emphasis on larger "primary mover" muscles that contribute to stability, like the abdominal obliques and quadratus lumborum. [34] It seems that for optimum spinal stabilization, a synchronized contraction of all deep and superficial core muscles is required. [35]

As, core stability improves spinal stability which in turn reduces the risk of shoulder injuries and improve shoulder joint function. [36,37] Thus, core stability exercise was incorporated in PA participants along with conventional protocol to study the effect on pain, ROM and quality of life (QOL).

MATERIALS & METHODS

ETHICAL APPROVAL: Ethical approval was obtained from the institutional ethics committee. (Registration No: ECR/1573/Inst/GJ/2021)

STUDY DESIGN: Interventional study.

STUDY SETTING: Physiotherapy college.

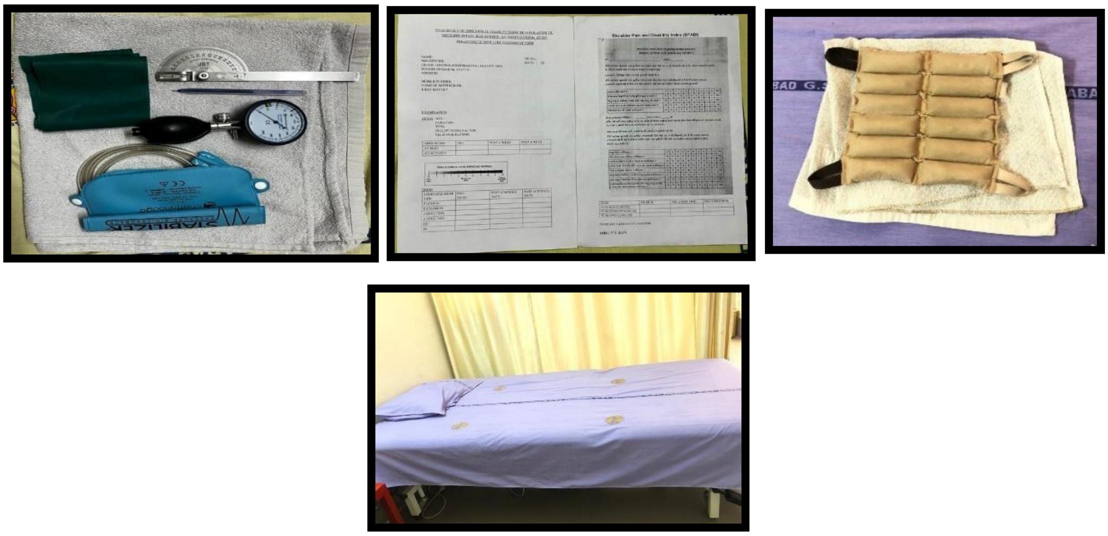
INTERVENTION DURATION: 4 weeks (5 sessions per week)

SAMPLE SIZE: Total 48 (24 in each group)

MATERIALS REQUIRED

1) Pen, Pencil, Paper
2) Treatment plinth
3) Goniometer
4) SPADI scale sheet
5) Patient informed consent form
6) Assessment form
7) Hot pack
8) long towel
9) Elastic TheraBand
10) Pressure biofeedback

Photograph 2.1 MATERIALS REQUIRED FOR STUDY



SELECTION CRITERIA

INCLUSION CRITERIA:

- Willingness to participate.
- Age group above 18 yrs.
- Both males and females were included.
- Person with periarthritis shoulder with a duration of more than 3 months.

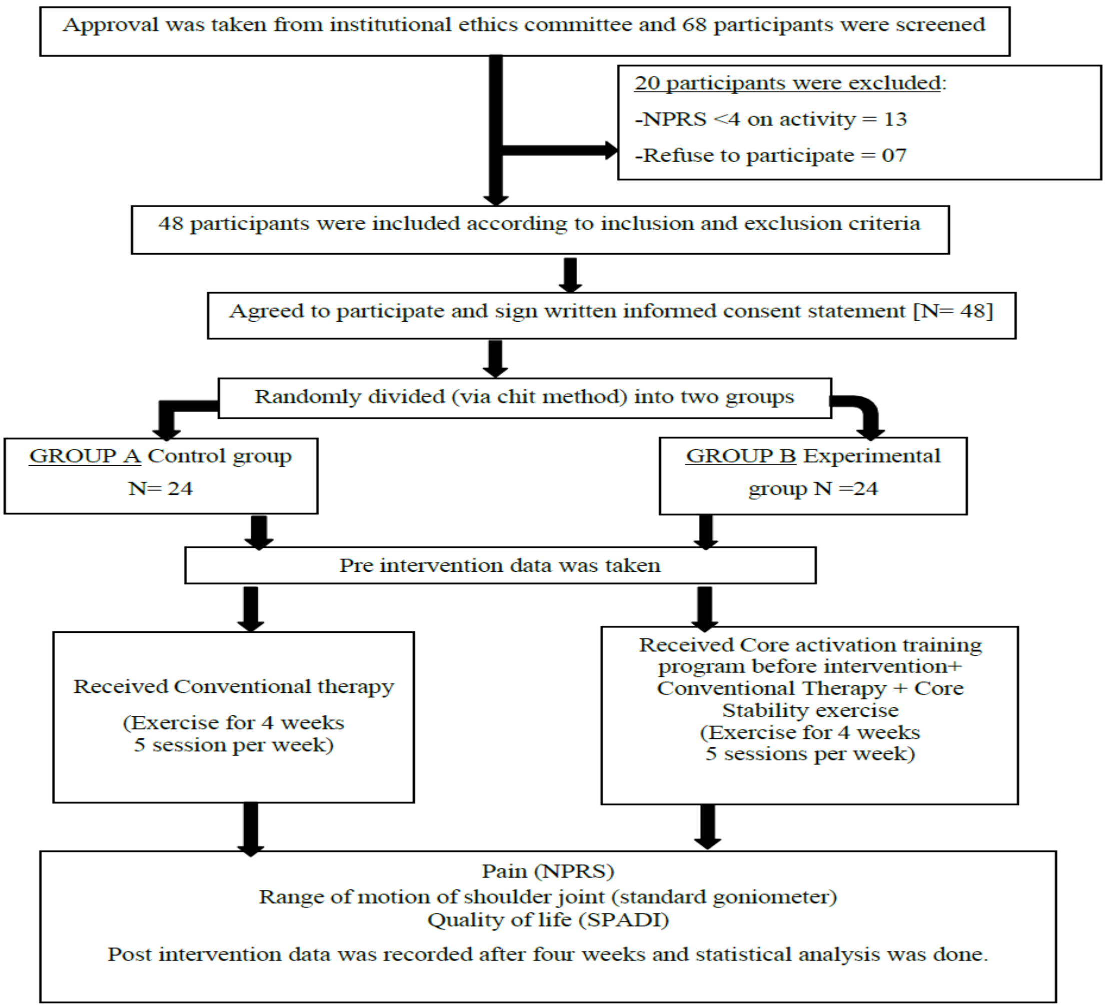
- Person with shoulder pain NPRS score 4 or more on activity.
- Unilateral Periarthritis shoulder.

EXCLUSION CRITERIA:
- Any history of trauma around the shoulder complex within 1 year.
- Any neurological and cardiopulmonary condition.
- Person with periarthritis shoulder with a duration of less than 3 months.
- History of traumatic shoulder pathology, fracture, shoulder surgery, osteomyelitis.
- Musculoskeletal deformity in upper quadrant of the body, shoulder dislocation, brachial plexus injury.

WITHDRAWAL CRITERIA:
- If the patient wishes to discontinue treatment.

Subjects were screened for periarthritis shoulder and included in the study as per inclusion criteria. The written informed consent form was taken from participants. Participants were divided into 2 groups randomly by chit method. Group A (control) received conventional treatment while Group B (experimental) received conventional treatment plus core stabilization exercise. Group B participants received training for the activation of core muscle by pressure biofeedback before intervention. 5 sessions per week were given to participants. Progression of core stability exercise was done as per the participant's endurance.Both groups were screened at 4 weeks of intervention for Pain, ROM and SPADI (functional scale). The result was analyzed by using the SPSS 20.0 version.

CHART 2.1 METHODOLOGY FLOW CHART



A) Conventional physiotherapy treatment for periarthritis shoulder [52]

1) Hot pack
2) Maitland mobilization
3) Pendulum stretch: Perform 10 revolutions in each direction once a day. Increasing the diameter of the swing as the symptom improves without forcing it. As symptoms improve, increase the stretch by holding a light weight (three to five pounds) on the arm.
4) Towel stretch: This involves holding one end of a long towel behind your back and grabbing the opposite end with your other hand. Hold the towel in a horizontal position. Perform 10 repetitions.
5) Finger walk: Face a wall three-quarters of an arm's length away. Reach out and touch the wall at waist level with the fingertips of the affected arm. With your elbow slightly bent, slowly walk your fingers up the wall, spider-like, until you have raised your arm as far as you comfortably can. Your fingers should be doing the work, not your shoulder muscles. Slowly lower your arm with the help of the good arm, if necessary. Perform 10 repetitions.
6) Cross-body reach: Sit or stand. Use your good arm to lift your affected arm at the elbow, and bring it up and across your body, exerting gentle pressure to stretch the shoulder. Hold the stretch for 15 to 20 seconds. Perform 10 repetitions.
7) Armpit stretch: Using your good arm, lift the affected arm onto a shelf about breast-high. Gently bend your knees, opening up the armpit. Deepen your knee bend slightly, gently stretching the armpit, and then straighten. With each knee bend, stretch a little further, but don't force it. Perform 10 repetitions.
8) Outward rotation: Hold a rubber exercise band between the hands with the elbows at a 90–degree angle, close to the sides. Rotate the lower part of the affected arm outward two to three inches and hold for five seconds. Perform 10 repetitions.
9) Inward rotation: Stand next to a closed door, and hook one end of [a rubber exercise band around the doorknob. Hold the other end with the hand of the affected arm, holding the elbow at a 90-degree angle. Pull the band toward the body two or three inches and hold for five seconds Perform 10 repetitions. These are active stretching and strengthening exercises prescribed by Harvard Medical School for the management of periarthritis shoulder. Though there is no strong evidence yet supporting their effectiveness in the management of periarthritis shoulder, these stretching and strengthening exercises were utilized in this study alongside with hot pack to ascertain their effectiveness in the treatment of periarthritis shoulder.

CONVENTIONAL TREATMENT PROTOCOL

(A) (B) (C)

Photograph 2.2 (A) Pendulum stretch, (B) Towel stretch, (C) Finger walk

(D) **(E)** **(F)**

Photograph 2.2 (D) Cross-body reach, (E) Armpit stretch (F) Outward rotation, Inward rotation

MAITLAND MOBILIZATION

(A) (B)

(C) **(D)**

Photograph 2.3 Maitland mobilization (A) Posterior glide (B) Caudal glide (C) Anterior glide (D) Posterior glide for ROM above 90

B) Core muscle stability exercise [51]

Core Activation Training Program Was Given Before Intervention.

1) Abdominal Drawing-In: The participants were asked to pull their navel deeply to the lumbar region and maintain the contraction for five seconds while breathing lightly in a supine hook-lying position. Ten repetitions with a five-second rest between the repetitions.

2) Abdominal Drawing-In with Alternating Upper Extremity Movement: The participants were asked to flex their shoulders in the forearms pronated position and return to a neutral position alternatingly five times while maintaining the abdominal contraction. The target dose for this exercise was 10 sets of five repetitions with a five-second rest between the sets.

3) Abdominal Drawing-In with Alternating Lower Extremity Movement: The participants were asked to flex the hip joint and return to a neutral position alternatingly five times while maintaining the knee joint flexion at 90 degrees and abdominal contraction. The target dose for this exercise was 10 sets of five repetitions with a five-second rest between the sets.

4) Abdominal Drawing-In with Alternating Upper and Lower extremity Movement: The participants were asked to flex their contralateral upper and lower extremities and return to a neutral position alternatingly five times while maintaining the abdominal contraction in the supine position. The target dose for this exercise was 10 sets of five repetitions with a five-second rest between the sets.

5) Opposite Arm Leg Raises in Prone Position: The participants were asked to lift their contralateral upper and lower extremities to the horizontal plane alternatingly five times while maintaining the abdominal contraction in the spine position. The target dose for this exercise was 10 sets of five repetitions with a five-second rest between the sets.

6) Pelvic Tilt While Standing: The participants were asked to contract their gluteal and abdominal muscles to rotate their hips in a posterior direction and maintain the contraction for five seconds while breathing lightly in the standing position. Ten repetitions with a five-second rest between the repetitions were the target dose for this exercise.

7) Forward Lunge: The participants were asked to step forward, flex the hip as far as the contralateral knee touches slightly to the floor and then, push off the front leg and return to the starting position. Emphasis was placed on maintaining a neutral spinal posture, contracting the abdominal muscles, and breathing normally throughout the exercise. Tens sets of five repetitions for each side with a five-second rest between the sets was the target dose for this exercise.

CORE TRAINING PROGRAM AND STABILITY EXERCISE

(I) Core training program using PBU

(A)

(B)

(C)

(A) Abdominal drawing-in with alternating upper extremity movement
(B & C) Abdominal drawing-in with alternating lower extremity movement (during 1st 2 week)

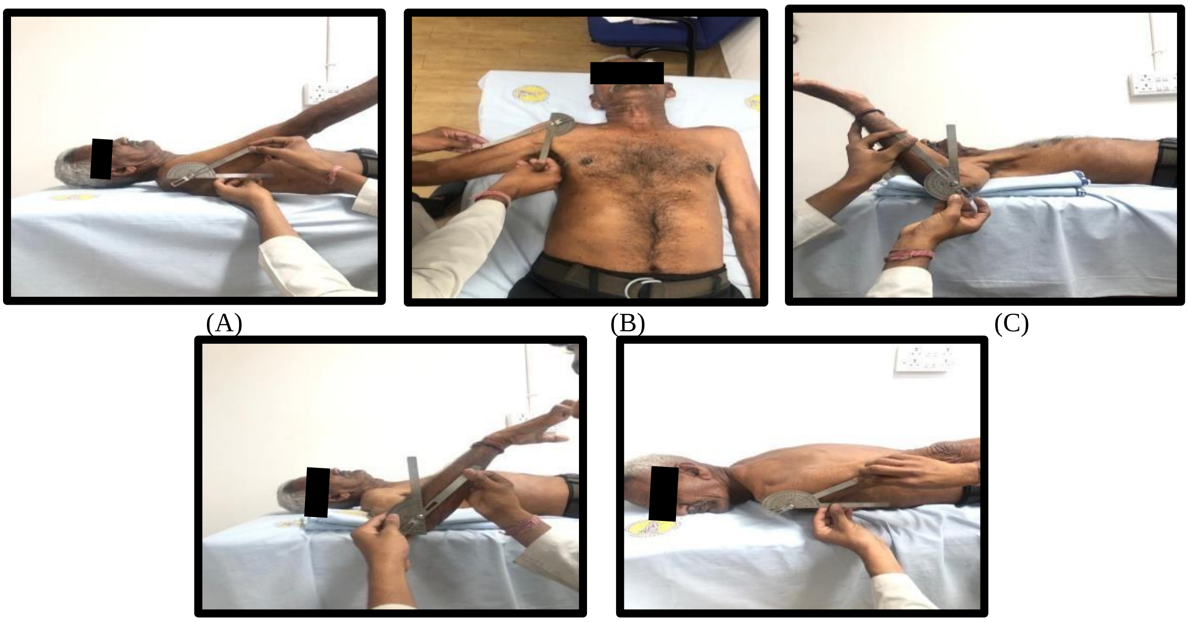
(D) (E)

(D) Abdominal drawing-in with alternating upper and lower extremity movement,
(E) Opposite arm leg raises in a prone position (progression during 3rd and 4th week)
Photograph 7.4 CORE MUSCLE TRAINING AND STABILITY EXERCISE

OUTCOME MEASURE

- Numeric pain rating scale (reliability=0.67 to 0.96 and validity=0.86 to
- 0.95) [25][26][27]
- Shoulder ROM (Intraclass correlation coefficients ranging from 0.80 to 0.99[24]
- SPADI scale (Intraclass correlation coefficient ≥0.90 for SPADI [23])

SHOULDER RANGE OF MOTION



(A) (B) (C)

(D) (E)

Photograph 2.5 SHOULDER ROM (A) Shoulder flexion (B) Shoulder abduction
(C) Shoulder external rotation (D) Shoulder internal rotation (E) Shoulder extension

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS version 16.0 and Microsoft Excel 10. The level of significance was kept at 5% and the confidence interval (CI) at 95%. Data was not normally distributed according to the Shapiro-Wilk test, so non-parametric tests have been applied. Descriptive analysis was obtained by mean and standard deviation. Within-group analysis and between-group analysis were done for

outcome measures NPRS, ROM and SPADI recorded at baseline and post 4 weeks of intervention. Changes in outcome measures were analyzed within groups by the Wilcoxon Signed Rank test and between groups by the Mann-Whitney U test.

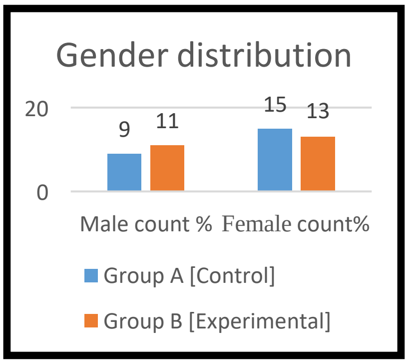
RESULT

Table 1 shows Gender distribution among the 2 groups.

Gender	Group A [Control]	Group B [Experimental]
Male count %	9 [37.5%]	11 [45.83%]
Female count%	15 [62.5%]	13 [54.17%]
Total	24	24

There was a female predominance in both groups.

GRAPH 3.1 OF (A) GENDER DISTRIBUTION (B) AGE DISTRIBUTION



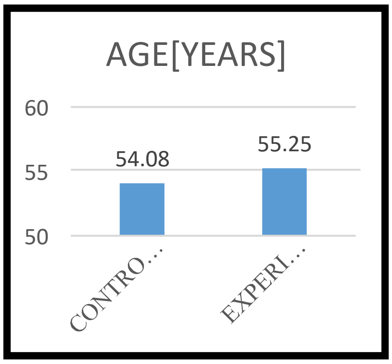


Table 2 shows the baseline data

Characteristic	Control Group [Mean±SD]	Experimental Group [Mean±SD]
Age [Years]	54.08±6.16	55.25±6.12
Duration [Months]	8.5±3.24	8.79±3.26
SPADI Total Score	85.75±5.61	84.83±7.38
Characteristic	**Control Group [Mean±SD]**	**Experimental Group [Mean±SD]**
Pain At Rest [NPRS]	1.38±1.13	1.33±1.09
Pain At Activity [NPRS]	6.67±1.40	6.54±1.10
Flexion	101.46±14.02	99.17±12.65
Extension	24.17±7.32	21.04±5.31
Abduction	78.75±15.83	84.79±12.11
External Rotation	25.21±9.03	25.42±9.88
Internal Rotation	32.08±10.10	30.21±11.08

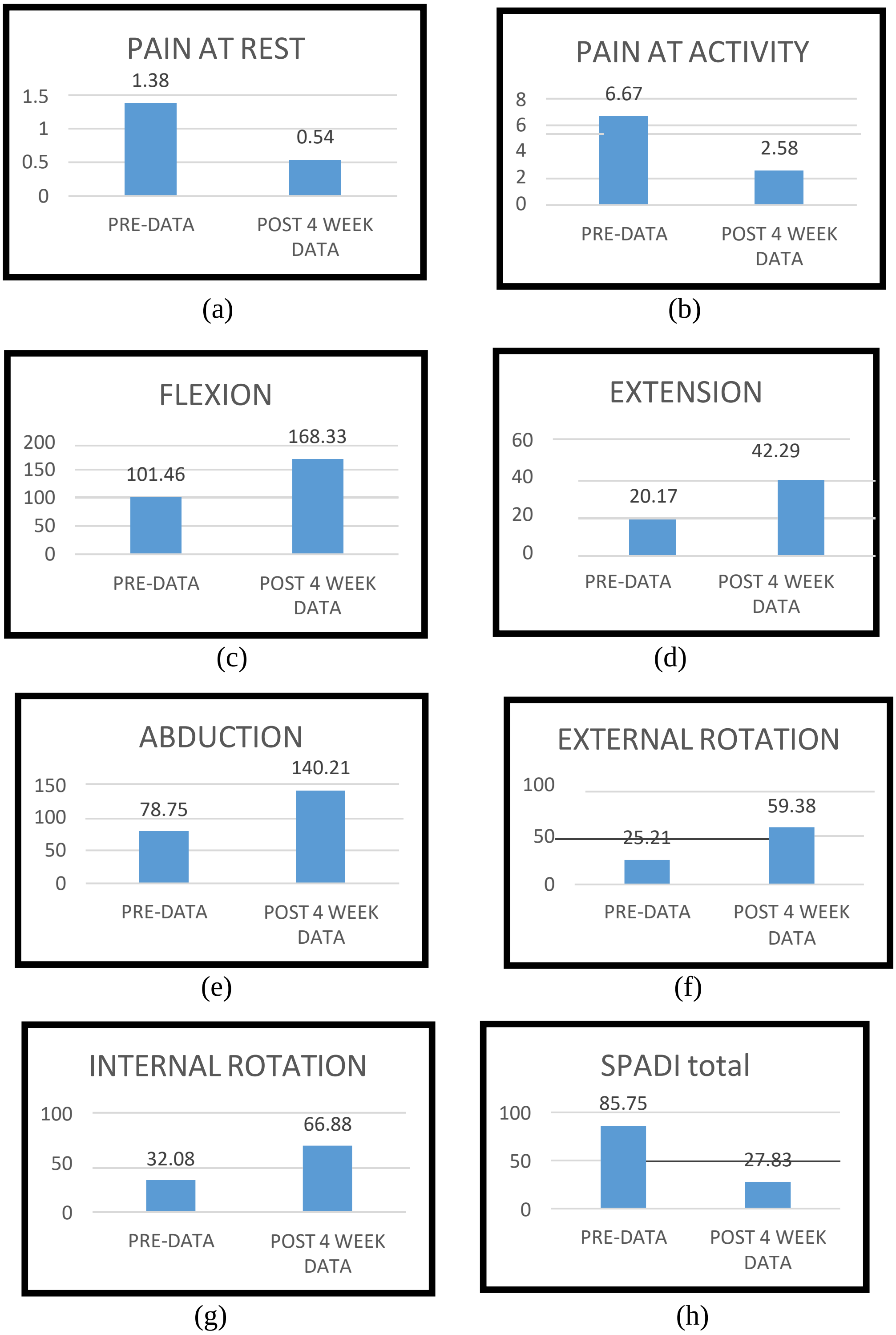
(A) Within Group Analysis

(I) Group A - In the control group pre- and post-4-week data analysis showed statistically significant differences i.e., p<0.05 for pain (NPRS), ROM, and QOL (SPADI).

Table 3 Within-group analysis of Group A Control group

Variables	Pre-Data [Mean±SD]	Post 4 Week [Mean±SD]	Z Value	P-Value	Significance
Pain At Rest	1.38±1.13	0.54±0.72	-3.94	0.00	Significant
Pain At Activity	6.67±1.40	2.58±0.58	-4.35	0.00	Significant
Flexion	101.46±14.02	168.33±8.68	-4.33	0.00	Significant
Extension	20.17±7.32	42.29±5.71	-4.33	0.00	Significant
Abduction	78.75±15.83	140.21±20.51	-4.31	0.00	Significant
External Rotation	25.21±9.03	59.38±10.46	-4.31	0.00	Significant
Internal Rotation	32.08±10.10	66.88±6.89	-4.30	0.00	Significant
SPADI Total	85.75±5.61	27.83±1.43	-4.29	0.00	Significant

MEAN VALUES OF GROUP A (CONTROL) PRE AND POST 4 WEEK INTERVENTION (PAIN, ROM AND FUNCTIONAL OUTCOME)



Graph 3.2 shows mean of Group A (control) (a) Pain at rest pre and post-4-week (b) Pain at activity pre and post-4-week (c) Flexion pre and post-4-week (d) Extension pre and post-4-week (e) Abduction pre and post 4-week (f) ER pre and post 4-week (g) IR pre and post 4-week (h) SPADI pre and post 4 weeks between groups

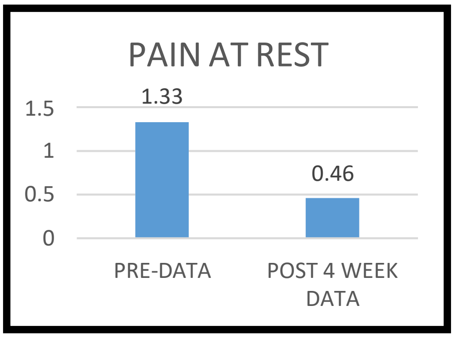
(II) Group B - In the experimental group pre-and post-4-week data analysis showed statistically significant difference i.e., $p<0.05$ for pain (NPRS), ROM and QOL (SPADI).

Table 4 Within-group analysis of Group B Experimental group

Variables	Pre-Data [Mean±SD]	Post 4Week [Mean±SD]	Z Value	P-Value	Significance

Pain At Rest	1.33±1.09	0.46±0.59	-3.83	0.00	Significant
Pain At Activity	6.54±1.10	2.08±1.14	-4.34	0.00	Significant
Flexion	99.17±12.65	169.38±7.71	-4.39	0.00	Significant
Extension	21.04±5.31	40.83±7.02	-4.33	0.00	Significant
Abduction	84.79±12.11	145.83±11.39	-4.31	0.00	Significant
External Rotation	25.42±9.88	61.88±9.98	-4.29	0.00	Significant
Internal Rotation	30.21±11.08	66.88±14.13	-4.30	0.00	Significant
SPADI Total	84.83±7.38	26.63±2.32	-4.29	0.00	Significant

MEAN VALUES OF GROUP B (EXPERIMENTAL) PRE AND POST 4 WEEK INTERVENTION (PAIN, ROM AND FUNCTIONAL OUTCOME)



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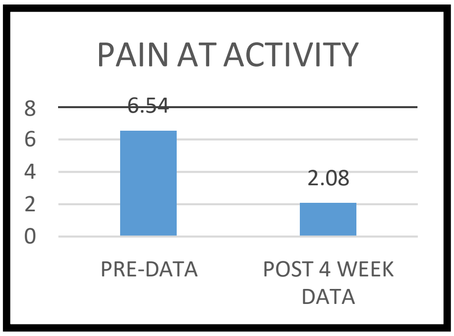

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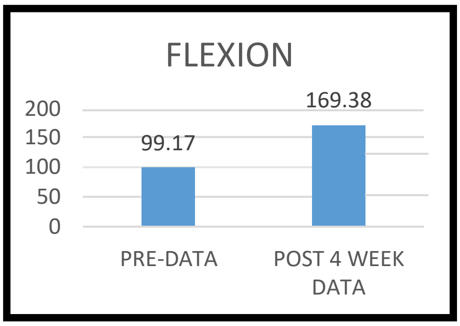

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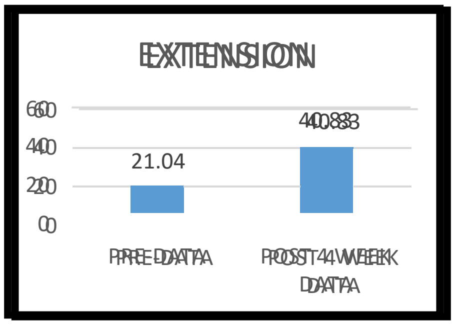

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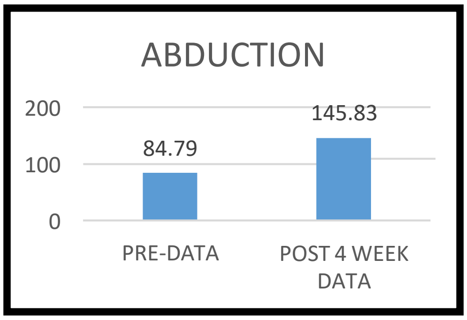

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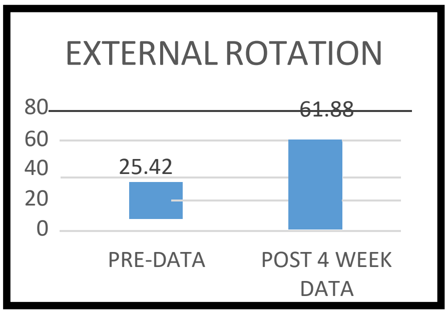

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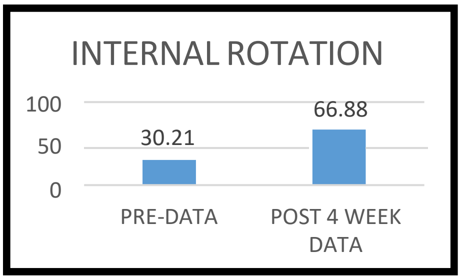

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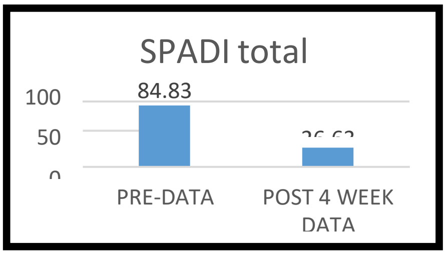


(h)

Graph 3.3 shows the mean of Group B (experimental) (a) Pain at rest pre- and post-4-week (b) Pain at activity pre-and post-4-week (c) Flexion pre- and post-4-week (d) Extension pre and post-4-week (e) Abduction pre and post-4-week (f) ER pre and post-4-week (g) IR pre and post-4-week (h) SPADI pre and post 4 weeks between groups

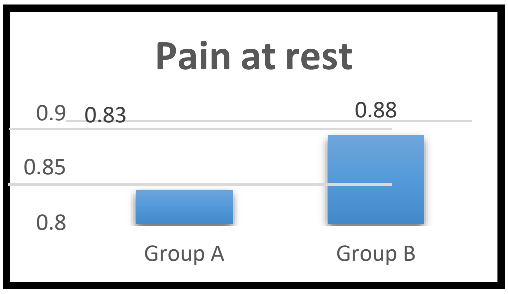
(B) Between Group Analysis

Comparison of pain (NPRS), ROM and QOL (SPADI) between two groups (Group A & Group B) after 4 week of intervention showed non-significant values i.e., p>0.05.

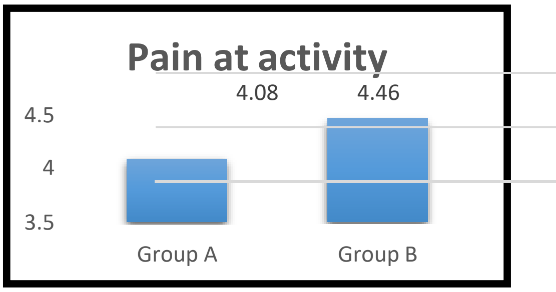
Table 5 Between Group Analysis

VARIABLES	Group A Mean±SD	Group B Mean±SD	Mann-Whitney U	Wilcoxon W	p-value	significance
Pain at rest (Pre-post 4week)	0.83±0.70	0.88±0.68	273.00	573.00	0.73	non-significant
Pain at activity (Pre-post 4week)	4.08±0.93	4.46±1.22	237.00	537.00	0.27	non-significant
Flexion (Pre-post 4week)	67±12	70±10	224.50	524.50	0.16	non-significant
Extension (Pre-post 4week)	18±6	20±5	231.00	531.00	0.22	non-significant
Abduction (Pre-post 4week)	61±10	61±8	278.50	578.50	0.84	non-significant
ER (Pre-post 4week)	34±7	36±10	256.00	556.00	0.50	non-significant
IR (Pre-post 4week)	35±9	37±12	259.00	559.00	0.54	non-significant
SPADI (Pre-post 4week)	57.92±4.65	58.21±5.13	284.50	584.50	0.94	non-significant

MEAN VALUES OF BETWEEN 2 GROUPS PRE AND POST 4 WEEK INTERVENTION (PAIN, ROM AND FUNCTIONAL OUTCOME)



(a)



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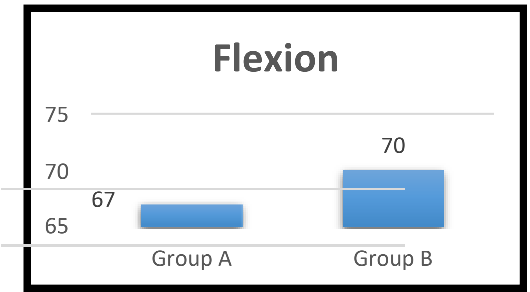

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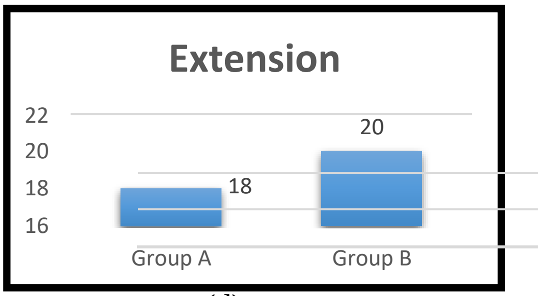

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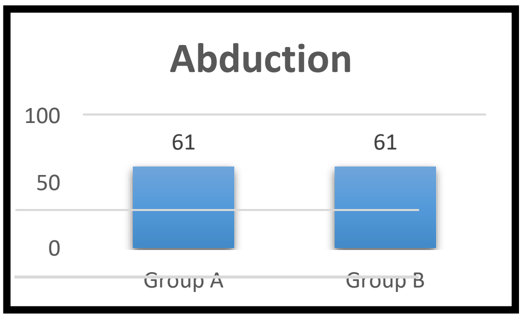

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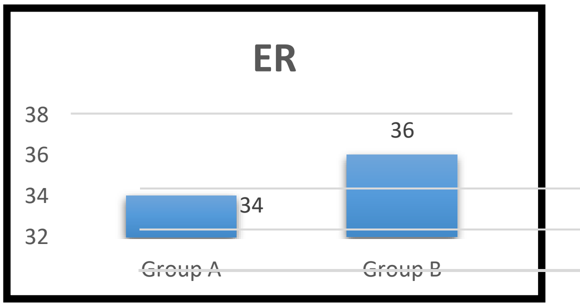
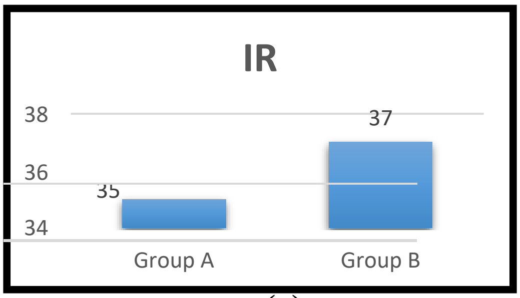
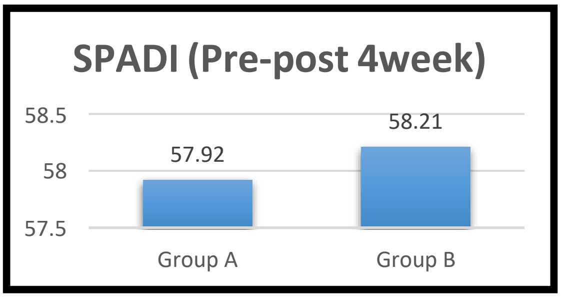


(f)



(g)



(h)

Graph 3.4 shows mean of (a) Pain at rest post-4-week (b) Pain at activity post-4-week (c) Flexion post-4-week (d) Extension post-4-week (e) Abduction post-4-week (f) ER post-4-week (g) IR post-4-week (h) SPADI post 4weeks between groups

Statistically Null hypothesis is accepted, as between Group A (control) and Group B (experimental) there was no significant difference after 4 weeks of intervention on pain at rest and activity, shoulder ROM (flexion, extension, abduction, ER and IR) and QOL (SPADI) in periarthritis shoulder.

Between groups (Group A and Group B) analysis of pain at rest (p=0.725), pain at activity (p=0.270), shoulder flexion (p=0.158), extension (p=0.221), abduction (p=0.842), ER (p=0.502) and IR (p=0.543) and QOL (p=0.942) post 4 weeks of intervention not showed significant difference (p>0.05).

But effect size calculation (Cohen's effect size) of pain at rest (d= 0.1, small effect), pain at activity (d=0.4, small effect), shoulder flexion (d=0.3, small effect), extension (d=0.4, small effect), abduction (d=0.00, no effect), ER (d=0.2, small effect) and IR (d=0.2, small effect), QOL (d=0.1, small effect) after 4 week of intervention showed small effect in Group B compare to Group A (d<=0.02).

DISCUSSION

Based on the present hypotheses, the study focused on core stabilization exercise to increase ROM, reduce pain and improve QOL in Periarthritis shoulder. A total of 48 participants were included in this study (24 in each group). One group received conventional treatment for Periarthritis shoulder while the other group received core stabilization exercise plus conventional treatment.

Both group treatment protocols showed significant improvement at the 4-week follow-up. Statistically between group analysis showed no significant difference. That means both groups showed an equal amount of effect for pain, ROM and SPADI in the Periarthritis shoulder. However according to the effect size calculation study showed that core stability exercise plus conventional exercise has a small to medium effect than only conventional exercise on pain, ROM and QOL in the Periarthritis shoulder (d>=0.2).

There is very little evidence on the effect of core stability exercise in Periarthritis shoulder participants. The literature, by JARI P. AROKOSKI MD, Ph.D. et al and BEHM, DAVID G. et al, showed that the impact of shoulder workouts on core stability has been extensively established. [53,54] [55]

JARI P. AROKOSKI MD, PhD et al demonstrated that varied upper limb movements made when standing or sitting caused different levels of activity in the back and abdominal muscles. [53,54]

BEHM, DAVID G. et al demonstrated that trunk strengthening can occur when resistance exercises for the limbs are performed unilaterally. [55]

TARNANEN's research [56] found that unilateral horizontal shoulder abduction and bilateral shoulder extension while standing were related to the highest activation of the core muscles, specifically the multifidus-longissimus and external oblique-rectus abdominis muscles, respectively. Also, it was demonstrated that when the pelvis was supported, shoulder resistance exercises might increase the resilience and strength of core stability muscles [44][56].

All the 3 studies have shown a significant connection between shoulder stability and core muscle stability.

As periarthritis shoulder is a self-limiting disorder that is predominantly found among women, especially in the diabetic population. It can be primary (idiopathic) or secondary when the cause is known or results from a surgical event [57]. Conventional shoulder injury recovery involves a period of rest, the management of inflammation, and the strengthening of certain muscles [58][59]. Proprioceptive, closed kinetic chain, and scapular-stabilization exercises are further elements of shoulder rehabilitation programs. These workout plans, however, frequently isolate the affected tissue at first while omitting the contributions of the trunk and lower extremities. [60] [61,62] [63]

There isn't much research looking into how core stability affects the upper extremities, but the following are some studies describing the importance of core muscle stability/ strengthening in distal extremities in the prevention of injuries, improving performance and generating maximum torque through proper kinetic chain activation.

MASAHIRO KUNIKI et al showed that Core stability affected spine and female scapular and glenohumeral kinematics during upper limb elevation. Core stability may be one of the potential contributors to shoulder kinematics, particularly in females. [64]

AARON SCIASCIA et al showed that there are mechanical linkages of body segments that allow for the sequential transfer of forces and motions when performing dynamic tasks [18][65]. By being located in the middle of the kinetic chain system as a box, [65][35][66] optimal functioning of the core is required for the production of strong, functional movements of the extremities. [67]

KIBLER AND MCMULLEN frequently referred to a proximal stability method, also known as a kinetic chain approach, in the literature when discussing shoulder rehabilitation. [68] [60,69] This protocol is primarily concerned with driving the scapula and shoulder during the rehabilitation process using distal segments, such as the trunk and legs. It has been suggested that scapula stabilization through kinetic chain workouts can lead to effective and efficient rotator cuff strengthening. [68] A healthy core musculature has been recommended to support a fully functioning kinetic chain system. [67][70][71]

RICHARDSON, JULL et al and GEROLD R. EBENBICHLER et al have suggested several core stability training regimens that aim to lessen back discomfort and avoid damage. Simple, beginning core workouts with low load and high repetitions, or holding time, were the exercises we used for this investigation. Instead of simply strengthening the core, the main objective of our workout selection was to retrain the core's muscles [35][72][73]. By enhancing the participant's ability to manage the core region, we hoped to increase core stability [71].

SAHRMANN S et al suggested that like in every other program for improving core stability, abdominal drawing-in, which was known to activate both the oblique and transversus abdominis muscles is important [74]. The additional exercises included dynamic motions of the upper and lower extremities to increase muscle activation and distal stability, as well as correct lumbopelvic control.

The majority of this research attempted to establish a consistent connection between core stability/strength and performance in sports including swimming, rowing, running, and throwing. [75][76][77][78]

KEOGH, JUSTIN W L showed that there are no significant differences (p = 0.132-0.999) or large effect sizes were observed for the static core stability (CS) measures and shoulder press performance in unstable vs. stable conditions. Core stability training may therefore only lead to significant improvements in functional dynamic performance if the postures, mode and velocity of contraction performed in training, are similar to the competitive tasks. [79]

Our study showed that group B(Experimental) had a small clinical effect compared to group A(Control) in periarthritis shoulder on pain, ROM and QOL.

CONCLUSION

The present study concludes that core stability exercise does not have any superior effect compared to conventional exercise on pain, ROM and QOL in periarthritis shoulder.

Declaration by Authors

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