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EFFECT OF INDIAN CLUBBELL EXERCISES ON CRICKET SPIN BOWLERS

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ABSTRACT

Background: The Shoulder kinematics plays a key role in the cricket bowler's mainly the spin bowler's action mainly the glenohumeral joint, which depends heavily on soft tissues for stability. Spin bowlers are more likely than fast bowlers to sustain these shoulder ailments. Indian clubbells are used to increase muscle strength and shoulder range of motion. The benefits of the Indian clubbells' is ability to exercise the shoulder in several planes of motion.

Objectives: To evaluate the effect of a four week Indian clubbell exercise program on shoulder range of motion and muscle strength in cricket spin bowlers.

Methodology: Thirty male cricket spin bowlers (18–25 years) were randomly allocated into a Shoulder Workout group (SW, n = 15) and a Cricket Practice group (CP, n = 15). The SW group performed Indian clubbell exercises in addition to regular cricket training, while the CP group continued cricket practice alone. Shoulder horizontal adduction ROM and internal and external rotation muscle strength were measured at baseline, week 2, and week 4 using a goniometer and handheld dynamometer. Data were analyzed using ANOVA and independent t tests.

Result: The Shoulder Workout group, using Indian clubbell exercises, showed significant improvements in shoulder horizontal adduction range of motion and internal and external rotation muscle strength for both dominant and non-dominant shoulders over four weeks. The Cricket Practice group had modest gains in horizontal adduction range of motion but no notable changes in rotation strength. Shoulder Workout group outperformed Cricket Practice group across all measured outcomes.

Keywords: Indian clubbell exercise, Cricket spin bowling, Shoulder range of Motion, Muscle Strength, Rotator cuff.

Introduction

Spin bowling is a crucial and highly strategic component of cricket. Contrary to common perception, spin bowlers dominate limited-overs formats, with the top three bowlers in one-day cricket and the leading bowler in Twenty20 cricket being spinners. Spin bowling relies on imparting rotation to the cricket ball, causing it to deviate from its original trajectory after pitching, thereby deceiving batters through variations in flight, pace, and turn. [2]

Unlike fast bowling, spin bowling emphasizes ball control rather than speed, achieved by maintaining the ball's seam orientation to direct the desired turn towards the batter. [12] The shoulder complex plays a pivotal role in transferring forces generated by the lower limbs and trunk during overhead throwing actions. [8] Due to this stabilizing function and the high angular velocities involved, significant stresses and torques are imposed on the glenohumeral joint (GHJ). Repetitive overhead movements further subject the muscles, bones, and joints of the upper extremity to substantial mechanical loads. [9] Athletes engaged in overhead throwing sports demonstrate altered internal and external rotation strength ratios in the dominant arm compared to the non-dominant arm. [10] During bowling, the internal rotators contribute concentrically to arm acceleration, while the external rotators function eccentrically to decelerate the arm. [13]

The bowling action begins with shoulder abduction, followed by glenohumeral external rotation (ER) and internal rotation (IR). The supraspinatus initiates abduction, after which the subscapularis and other rotator cuff muscles contract concentrically to generate internal rotation torque. Simultaneously, the external rotators act eccentrically to stabilize the humeral head and prevent anterior translation. Repetitive ER and IR are produced through coordinated concentric and eccentric contractions of the rotator cuff musculature. [6] Therefore, adequate rotator cuff strength and optimal glenohumeral rotation are essential for sustained bowling performance.

Despite evidence supporting training interventions that enhance shoulder strength and range of motion in overhead athletes, limited research has focused on cricket players. [4] Progressive resistance training has shown positive effects on shoulder strength among overhead-throwing athletes with shoulder discomfort. [7] Establishing an effective shoulder exercise regimen for cricket spin bowlers and evaluating its influence on shoulder strength and range of motion is therefore essential.

The shoulder joint functions in three-dimensional planes, enabling approximately 180° of circumduction in the dominant bowling arm. [11] Exercise equipment providing resistance throughout this circumduction may be particularly beneficial. Indian clubbells are weighted, bowling-pin-shaped implements ranging from 1 to 20 kg that offer continuous resistance during multi-planar circumduction exercises. [5]

Clubbell training has recently gained popularity in sports conditioning and is considered a foundational component of modern strength training systems that integrate traditional practices with contemporary science. [1] Clubbell exercises involve swinging movements rather than lifts, allowing greater muscular flexibility and reduced injury risk compared to conventional resistance training. They also offer unique kinetic variations and functional movement patterns. [14] However, the effect of an Indian clubbell shoulder workout regimen on shoulder kinematics in cricket players remains underexplored. Therefore, this study aims to examine the effect of an Indian clubbell exercise program on shoulder muscle strength and range of motion in cricket spin bowlers.

Significances:

Cricket spin bowlers face a high risk of shoulder injuries due to repetitive, high-torque bowling actions, with shoulder pain prevalence reported at 43.88% [15]. Standard cricket training often lacks targeted shoulder conditioning, particularly for rotator cuff strength and range of motion (ROM), critical for injury prevention. Indian clubbell exercises, effective in other overhead sports, remain unstudied in cricket. This study evaluates a four-week clubbell program to enhance shoulder ROM and strength, addressing a gap in evidence-based interventions to reduce injury risk and improve performance in spin bowlers.

Objective:

The aim of this study is to examine the effect of a four-week exercise training programme on the shoulder complex to improve range of motion and muscle strength in spin bowlers.

Materials and Methods

Study Design: Experimental study

Study Duration: 6 Months

Sample technique: Random sampling method

Sample size: 30

Sample Population: Cricket Spin Bowlers

Sample setting: Bootcamp cricket academy, Rising star cricket academy, Sixes cricket club, Bengaluru, Karnataka, India

Materials used:

Indian Clubbell

Goniometer

Hydraulic handheld Dynamometer

Selection criteria;

Inclusion criteria:

- Male cricketer of 18 to 25 years, playing senior club cricket
- Having at least five years of spin bowling experience as their primary playing position.
- No history of shoulder pain in the past 12 months.

Exclusion criteria:

- Ligament reconstruction surgery
- Any neck or upper limb Pathology
- Any major systemic disease

- Recent fractures
- Part time spinners

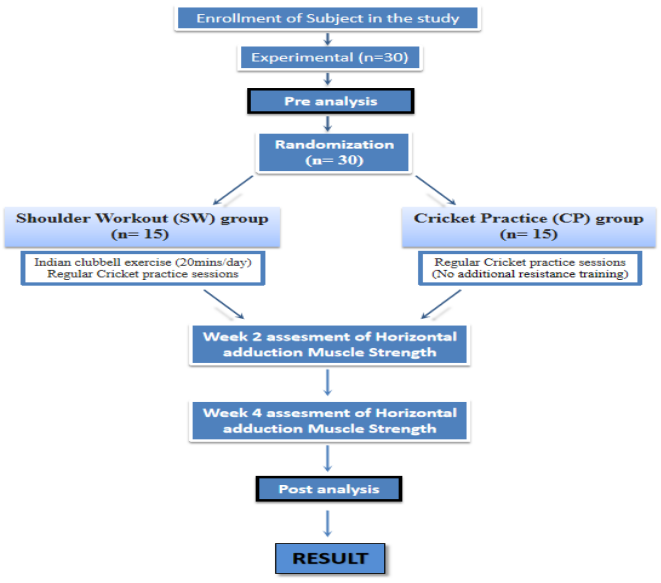
Outcome measures:

- Horizontal Adduction Range of Motion
- Muscle strength

		N	Mean	Std. Deviation	t value	p value
Age	Cricket Practice	15	20.600	2.746	0.554	0.584
	Shoulder Workout	15	20.067	2.520		
Experience	Cricket Practice	15	6.467	0.915	1.578	0.126
	Shoulder Workout	15	7.133	1.356		
Weight	Cricket Practice	15	64.000	7.121	0.721	0.477
	Shoulder Workout	15	66.000	8.036		
Height	Cricket Practice	15	166.467	7.945	1.529	0.138
	Shoulder Workout	15	170.667	7.078		
		Left	**Right**	**Left %**	**Right %**	
Dominant side	Cricket Practice	2	13	13.3%	86.7%	
	Shoulder Workout	2	13	13.3%	86.7%	

Study Design

This investigation employed a randomized controlled trial approach. Enrolled Spinners first had their dominant-side shoulder rotator muscle strength (combining internal and external rotators) assessed. They were then ordered by this baseline strength and randomly allocated using a coin flip to either a shoulder workout (SW) group or a cricket practice-only (CP) group. Pre-study i.e. baseline measurements showed no statistical differences between groups. Testing occurred for both groups at baseline and at the conclusion of weeks two and four. The study's CONSORT flowchart



Methodology Flowchart

Testing Procedures

Horizontal Adduction

An IS IndoSurgicals Goniometer (IndoSurgicals Pvt. Ltd., Delhi, India) measured shoulder horizontal adduction range of motion (ROM). This was assessed with the shoulder abducted to 90° and elbow flexed to 90°. The goniometer pivot was at the acromioclavicular joint, stationary arm vertical to the floor, and mobile arm aligned to the elbow lateral epicondyle. Passive adduction was applied, and the angle noted. Isometric resisted strength for rotation and horizontal adduction ROM were recorded at baseline and weeks two and four (follow-up).

Measuring Horizontal Adduction

Muscle Strength

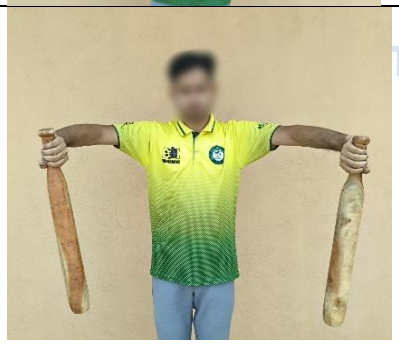
Measurements were taken on both sides with participants lying supine on a raised examination table. Muscle strength was quantified using a Baseline hydraulic handheld dynamometer (FEI, Inc., Texas, USA). After a warm-up of 10 internal rotation (IR) and external rotation (ER) shoulder motions, participants practiced the assessment protocols. They completed three rotational contractions per side, separated by 30-second breaks. Strength testing occurred with the shoulder at 90° abduction and elbow at 90° flexion. For external rotators, the dynamometer was set 2 cm above the radius styloid process on the forearm's back side. Internal rotator strength was gauged with placement 2 cm from the wrist fold on the forearm's front. The device was secured by the assessor, and bowlers maintained position against resistance for five seconds in isometric break tests. Instructions were: "Push as forcefully as possible; resist my attempt to shift your arm." Uniform motivation was offered during the five-second hold. Averages from three repetitions were analysed, with all testing done post-standard cricket warmup on the same day for both groups.

Measuring Muscle Strength

The Shoulder Exercise Programme

Throughout the program, SW group bowlers engaged in Indian clubbell workouts for 20 minutes daily on three non-consecutive days weekly over four weeks. Clubbells of 1kg and 1.5kg each (Customized in Karnataka) were utilized. Proper form was demonstrated and instructed to ensure accurate performance. SW bowlers received video demos and workout logs. CP bowlers had no program or equipment access.

Exercise	Photo	Description	Sets x Reps
Frontal Axis Rotations		Grip the clubbells at a 90-degree shoulder abduction angle and carry out shoulder rotations.	3sets x 10reps
Sagittal Axis Rotations		Grasp the clubbells at a 90-degree shoulder flexion angle and execute shoulder rotations.	3sets x 10reps

Transerve Axis Rotations		Grasp the clubbells at a 180-degree shoulder flexion angle and execute shoulder rotations.	3sets x 10reps
Abduction Upright Rotations		Grip the clubbells with your arms raised to a 90-degree shoulder abduction angle and perform internal and external shoulder rotations.	3sets x 10reps
Abduction Upside Down Rotations		Hold the clubbells inverted at a 90-degree shoulder abduction angle and perform internal and external shoulder rotations.	3sets x 10reps
Scapular Plane Upright Rotations		Grip the clubbells in an upright position aligned with the scapular plane and perform internal and external shoulder rotations.	3sets x 10reps
Scapular Plane Upside Down Rotations		Grip the clubbells upside down in the scapular plane and execute internal and external shoulder rotations.	3sets x 10reps
Shoulder Abduction & Adduction		Grip the clubbells at a 90-degree shoulder abduction angle, execute horizontal adduction, swing them around the head, and return to the 90-degree abduction position to complete the movement. Alternative on both sides	3sets x 20reps

Standing Pendular Action		Adopt a stance, grip clubbells in both hands, and execute a controlled, slow pendular movement.	3sets x 10reps

Statistical Analysis

Horizontal Adduction (in degrees)		Mean	Std. Deviation	F value	p value
Cricket Practice	Baseline	32.733	1.163	6.567	0.006
	Week 2	33.133	1.060		
	Week 4	33.467	1.246		
Shoulder Workout	Baseline	32.400	1.352	98.982	p<0.001
	Week 2	33.933	1.280		
	Week 4	35.067	1.100		

Table- Dominant Horizontal Adduction across the time point

Horizontal Adduction (in degrees)		Mean	Std. Deviation	F value	p value
Cricket Practice	Baseline	31.800	0.941	13.258	p<0.001
	Week 2	32.467	0.915		
	Week 4	32.600	0.910		
Shoulder Workout	Baseline	31.400	1.183	108.203	p<0.001
	Week 2	33.800	1.146		
	Week 4	35.400	1.056		

Table- Non-Dominant Horizontal Adduction across the time point

IR		Mean	Std. Deviation	F value	p value
Cricket Practice	Baseline	9.733	1.280	0.651	0.482
	Week 2	9.733	1.307		
	Week 4	9.533	1.564		
Shoulder Workout	Baseline	9.333	1.496	532.465	p<0.001
	Week 2	12.700	1.437		
	Week 4	16.400	1.606		

Table- Dominant hand Internal rotation across the time point

ER		Mean	Std. Deviation	F value	p value
Cricket Practice	Baseline	8.800	1.334	1.542	0.232
	Week 2	8.533	1.395		
	Week 4	8.533	1.586		
Shoulder Workout	Baseline	7.833	1.460	701.734	p<0.001
	Week 2	11.467	1.260		
	Week 4	14.800	1.412		

Table- Dominant hand external rotation across the time point

IR		Mean	Std. Deviation	F value	p value
Cricket Practice	Baseline	9.567	1.613	3.792	0.060
	Week 2	9.067	1.635		
	Week 4	9.100	1.844		
Shoulder Workout	Baseline	9.200	1.131	575.450	p<0.001
	Week 2	12.733	1.321		
	Week 4	16.100	1.583		

Table- Non Dominant hand internal rotation across the time point

ER		Mean	Std. Deviation	F value	p value
Cricket Practice	Baseline	8.833	1.263	2.579	0.104
	Week 2	8.400	1.606		
	Week 4	8.467	1.506		
Shoulder Workout	Baseline	8.367	1.217	592.663	p<0.001
	Week 2	11.967	0.972		
	Week 4	14.900	1.039		

Table- Non-Dominant hand external rotation across the time point

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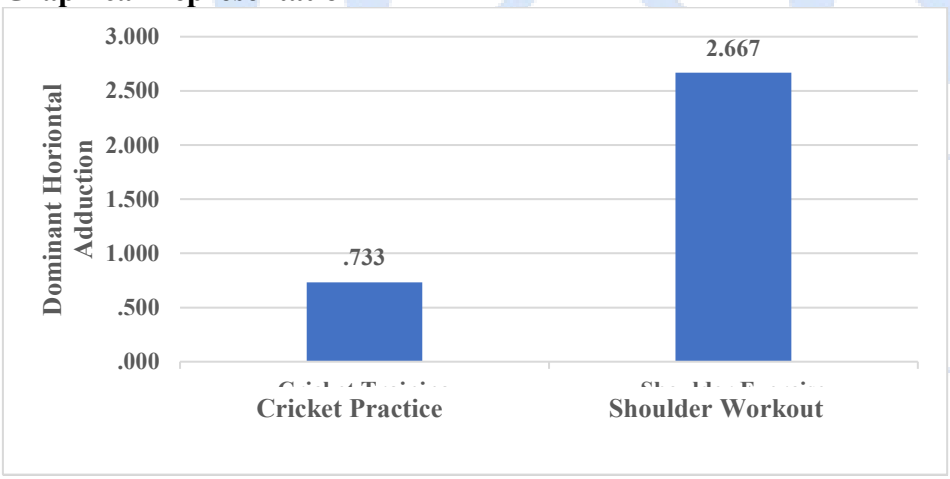
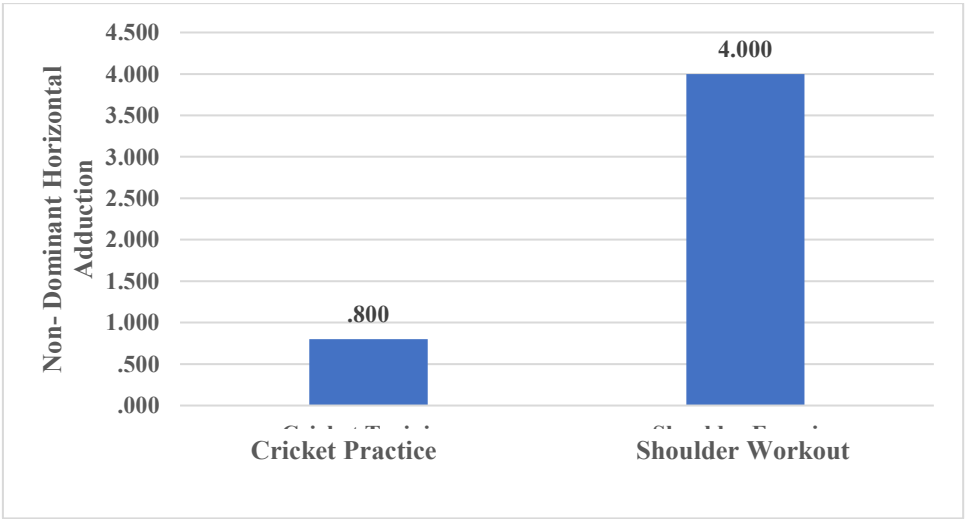
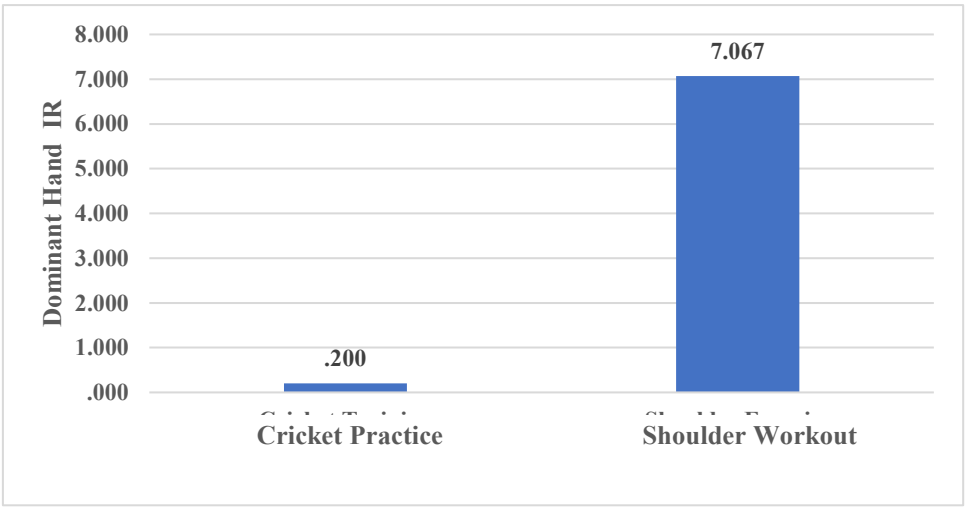
Graphical Representation



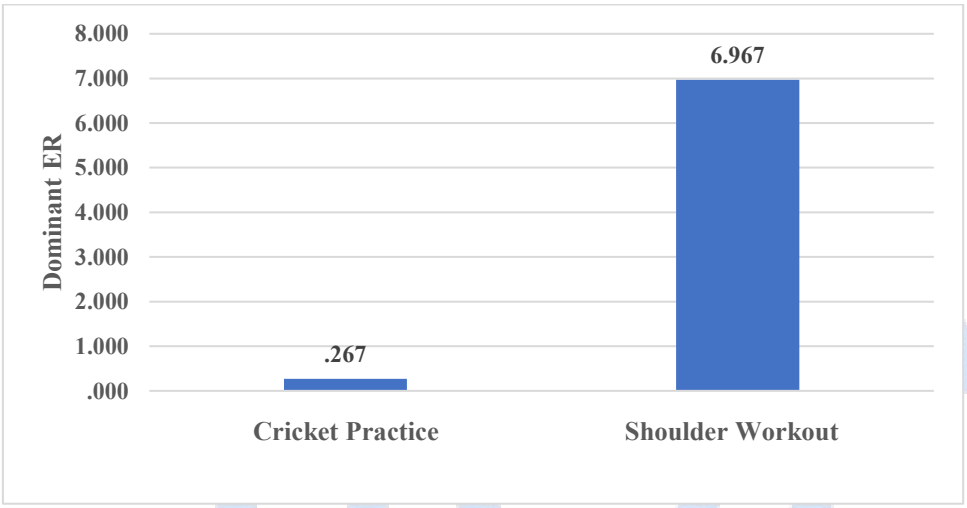
Graph- Representation based on dominant horizontal adduction



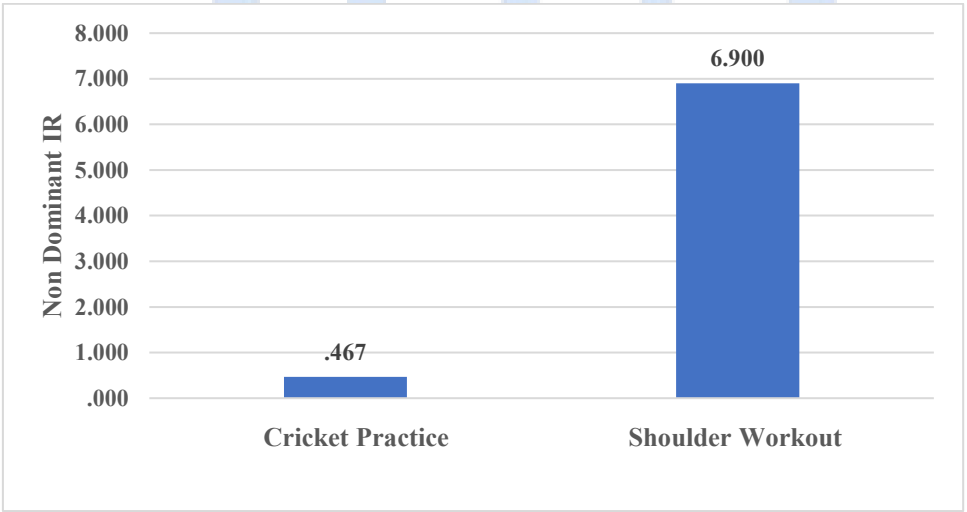
Graph- Representation based on non-dominant horizontal adduction



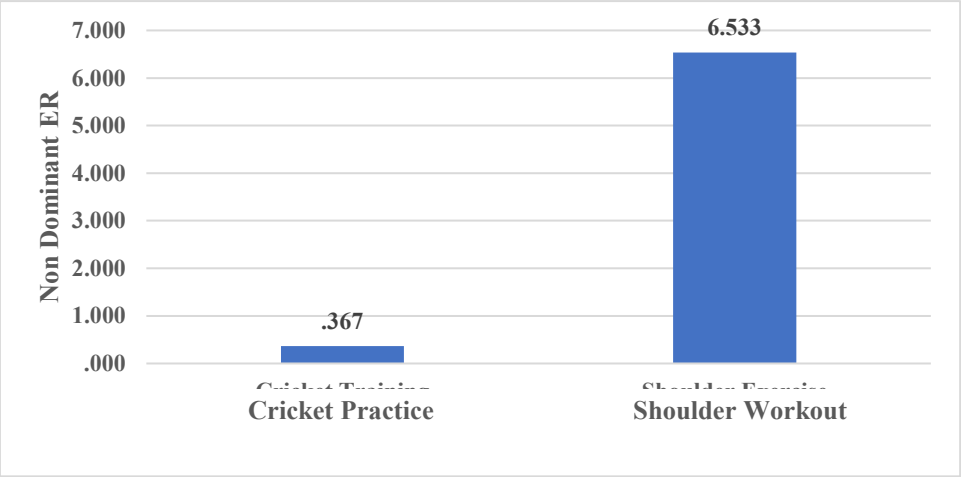
Graph- Representation based on dominant hand internal rotation



Graph -Representation based on dominant hand external rotation



Graph- Representation based on non-dominant hand internal rotation



Graph: Representation based on non-dominant hand external rotation

The SE group exhibited highly significant improvements in dominant hand IR ($F = 532.465$, $p < 0.001$) and ER ($F = 701.734$, $p < 0.001$), as well as non-dominant hand IR ($F = 575.450$, $p < 0.001$) and ER ($F = 592.663$, $p < 0.001$), over the four-week intervention. Horizontal adduction also improved significantly in both dominant ($F = 98.982$, $p < 0.001$) and non-dominant ($F = 108.203$, $p < 0.001$) shoulders. In contrast, the CT group showed modest improvements in horizontal adduction (dominant: $F = 6.567$, $p = 0.006$; non-dominant: $F = 13.258$, $p < 0.001$) but no significant changes in IR or ER ($p > 0.05$). Between-group comparisons confirmed that the SE group's improvements were significantly greater across all outcomes ($p < 0.001$), with effect sizes indicating robust differences (e.g., $t = 23.636$ for dominant ER).

		Mean(improvement)	Std. Deviation	t value	p value
Dominant Horizontal Adduction	Cricket Practice	0.733	0.704	6.555	p<0.001
	Shoulder Workout	2.667	0.900		
Non Dominant Horizontal Adduction	Cricket Practice	0.800	0.561	9.388	p<0.001
	Shoulder Workout	4.000	1.195		
Dominant hand IR	Cricket Practice	0.200	0.960	19.783	p<0.001
	Shoulder Workout	7.067	1.050		
Dominant hand ER	Cricket Practice	0.267	0.842	23.636	p<0.001
	Shoulder Workout	6.967	0.834		
Non Dominant hand IR	Cricket Practice	0.467	1.043	19.383	p<0.001
	Shoulder Workout	6.900	1.039		
Non Dominant hand ER	Cricket Practice	0.367	0.915	20.425	p<0.001
	Shoulder Workout	6.533	0.935		

Discussion

This study investigated the effects of a four-week Indian clubbell exercise program on shoulder range of motion (ROM) and muscle strength in cricket spin bowlers, comparing a shoulder exercise (SE) group with a cricket training (CT) group. The results demonstrate significant improvements in both dominant and non-

dominant shoulder horizontal adduction, internal rotation (IR), and external rotation (ER) in the SE group, while the CT group showed minimal or no significant changes in most outcomes. These findings provide valuable insights into the potential benefits of Indian clubbell exercises for enhancing shoulder kinematics in spin bowlers, a population prone to shoulder injuries due to the repetitive and high-torque demands of their bowling action [12]

Limitations of the Study

Despite its strengths, the study has several limitations. The four-week duration may be insufficient to fully capture long-term adaptations in muscle strength and ROM; as physiological changes often require 8–12 weeks. [20] The use of 1kg and 1.5kg clubbells, while appropriate for initiating multi-planar training, may have been too light to maximize strength gains in trained athletes. Future studies could incorporate progressive overload by increasing clubbell weight or session intensity. The absence of a placebo group limits the ability to rule out placebo effects or the influence of participant expectations in the SE group's improvements. Additionally, the study did not assess bowling performance outcomes (e.g., spin rate, accuracy), which would provide insight into whether the observed improvements translate to on-field benefits. Finally, the sample was limited to male spin bowlers, reducing generalizability to female athletes or other cricket roles (e.g., fast bowlers).

Future Scope

Future research should investigate longer intervention periods (8–12 weeks) to evaluate sustained effects on shoulder strength, range of motion, and injury risk. Incorporating performance-related variables such as bowling speed, spin rate, and accuracy would help establish the functional relevance of Indian clubbell exercises. Comparative studies evaluating clubbells against other resistance tools such as dumbbells or elastic bands are recommended. Further research including female cricketers, fast bowlers, and adolescent players would enhance generalizability. Longitudinal studies with injury surveillance are also warranted to determine whether improvements in shoulder function translate into reduced injury incidence among spin bowlers. [4, 5, 19]

Conclusion

The four-week Indian clubbell exercise program significantly improved shoulder horizontal adduction range of motion and internal and external rotation strength in cricket spin bowlers, outperforming standard cricket training in both dominant and non-dominant shoulders. These results underscore the value of clubbell exercises as an effective, practical intervention to enhance shoulder kinematics and potentially reduce injury risk in spin bowlers. Further studies should investigate longer-term effects and performance outcomes to optimize its application in cricket training.

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