



TO DETERMINE THE EFFECT OF BOSU BALL CORE STRENGTHENING PROGRAM VERSUS THROWER'S TEN SHOULDER STRENGTHENING PROGRAM TO INCREASE SPEED AND ACCURACY OF SPIN BOWLERS IN CRICKET

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ABSTRACT

Cricket as evolved as an global sports in the recent times, which shoes tremendous increase in no. of youngsters looking this sport as a full time professional thing, but this increase the prevalence of injuries simultaneously. Shoulder girdle becomes the most involved joint. Many studies have been conducted to determine the actual causes of soft-tissue injuries. Excessive external rotation (ER) in comparison to internal rotation (IR) is one risk factor. Spin bowlers are more prone to these shoulder conditions than rapid bowlers. In this study core strengthening using bosu ball is compared with thrower's ten shoulder strengthening exercise to increase accuracy and speed in spin blower's as there is increase in injury in shoulder girdle due to overuse.

Aim

The aim of the study is to compare the effect of bosu ball core strengthening exercises versus thrower's ten shoulder strengthening exercises to increase speed and accuracy of spin bowler in cricket.

Methodology

30 professional athletes (spin bowlers) from different academies of the Dehradun. Those athletes with experience of 2-5 years and age limit of 15 to 30 years is taken. These 30 subjects were divided into two groups of fifteen each (Group A and B) respectively, where Group "A" receives "Thrower's Ten Shoulder Strengthening Program" and Group "B" receives "Bosu Ball Core Strengthening Program" as an intervention protocol. The intervention was went for 8 weeks. Radar Gun and Bowlers Accuracy Test were use as an outcome measures to check speed and accuracy in spin bowlers.

Result

Thrower's Ten Shoulder Strengthening Program (Group A) shows better result in increasing speed and accuracy in spin bowlers. (P value is 0.0001)

Conclusion

In the Radar Gun and Bowler Accuracy Test the mean score was greater in Group A (Thrower's Ten Shoulder Strengthening Program) compared to Group B (Bosu Ball Core Strengthening Program), suggesting better outcomes (i.e., accuracy and speed) in Group A indicating that Group A performed better across all assessed parameters.

Keywords : Bosu Ball Core Strengthening Program, Thrower's Ten Shoulder Strengthening Program, Spin Bowlers, Speed and Accuracy.

INTRODUCTION

Cricket has gained popularity all throughout the world, and several teams attract devoted supporters. It began in England in the 16th century and is currently present in numerous locations, including new markets. The game is now adored by enthusiasts across the Pacific, Caribbean, and Indian subcontinent.

Cricket has gained popularity in new markets thanks to innovative formats like Twenty20 (T20) cricket. Players from all around the world come together in leagues like the Indian Premier League (IPL). This demonstrates the appeal of cricket worldwide. We'll witness more innovative teams and advancements as it expands. Millions of people watch cricket because of international competitions like the Cricket World Cup. Sportsmanship and fair play are valued in the "Spirit of Cricket." Because of this, cricket is a popular sport all around the world. Cricket will continue to expand with more teams and supporters because to its rich history, thrilling gameplay, and worldwide appeal.[Sawant, Y. et.al. 2022]

Muscle Strength was measured by Lutron Force Gauge. To analyze the difference in the Flexion, Abduction, External Rotation & Internal Rotation Muscle Strength within groups repeated measure ANOVA test was used.

The difference in Muscle Strength from Baseline (0 Week), 4 week & 8 week for Group C (MET), P-value are 0.001. [Niraj Kumar, Navneet Badoni, et al. 2023].

The frequency of injuries has also increased more than in the past due to the increased tempo of international cricket in all formats. In addition to the first attempts to document more extensive injury series, the first significant published series on cricket injuries occurred in the late 1980s and early 1990s. 1–4 and examining the risk factors for lumbar injuries in fast bowlers. 5–11 The primary injury concern for the game during this time (1980s–1990s) was definitely lumbar injuries among fast bowlers. Researchers studying cricket developed the first-ever consensus international injury definitions for a sport, which were co-published in 2005 by four prestigious sports medicine journals. Since the initial consensus guidelines were released, 2020, or 20 over, cricket has grown to be one of the most popular match formats.[Mane, A. et.al. 2020].

If we discuss bowling's stages and biomechanics, The run-up, pre-delivery (or gather), delivery, and follow-through phases are the four stages of the bowling action, and each is influenced by distinct trunk movements. The trunk must hyperextend upon landing on the back foot during the pre-delivery period. The trunk rotates toward the non-delivery arm and enters flexion (lateral flexion) away from the delivery arm when the ball is being delivered. This specific pattern of muscular hypertrophy may be caused by the repetitive execution of the bowling action, which engages the trunk muscles in the same asymmetrical manner with each delivery. [Peat, M. et.al. 1986].

It is common to bring up trunk musculature while discussing athletics and performance. According to earlier studies, the transversus abdominis contracts before the trunk begins to move. This suggests that when power is generated by the extremities, the transversus abdominis stabilizes the trunk. Moreover, clarify that the thoraco-lumbar fascia is tense when the transversus abdominis, internal oblique, and external oblique contract, increasing intra-abdominal pressure. By combining the abdominal fascia anteriorly with the oblique muscles laterally, a corset is created around the abdomen, raising the intra-abdominal pressure. The thoraco-lumbar fascia links to the upper and lower limbs posteriorly.[McGill , SM et.al. 2004]

Aim of the Study

The aim of the study is to compare the effect of bosu ball core strengthening exercises versus thrower's ten shoulder strengthening exercises to increase speed and accuracy of spin bowler in cricket.

Objectives of the study

- To describe the proper principles and application of each technique used.
- To analyse the stages of muscle hypertrophy/strengthening of each muscle group.
- To evaluate increase in speed and accuracy of the spinner post interventions.

METHODOLOGY AND MATERIALS

Ethical consideration

Ethical approval was obtained from the Institutional Ethical Committee (IEC) to the commencement of the study (SGRR/IEC/22/25). It has also registered in **Clinical Trial Registry of India** registration (CTRI/2025/04/085963) and **Copyright Office Government of India (Registration No. LD-25623/2025-CO)** was done and lastly, written informed consent was obtained from all participants. The study was conducted in 22 Yards Cricket Academy, Dehradun and Suraj Rana Cricket Academy, Dehradun and taken NOC from the department.

Study design and settings

The comparative experimental study was conducted in the academies of Dehradun . The sample size was determined using G*Power. A total of 30 participants, aged between 15 and 30 years, were recruited using random sampling. Individuals were excluded if they had recent injury or surgery at shoulder and core level and not having 2 years of experience as spin bowler. After screening, eligible participants were randomly assigned into two groups using a computer-generated table: Group A (n=15) received Thrower's Ten Shoulder Strengthening Program and Group B (n=15) received Bosu Ball Core Strengthening Program.

Thrower's Ten Shoulder Strengthening Program

1A Diagonal Pattern Extension : The involved hand, grasp the tubing handle positioned overhead and slightly out to the side. Pull the tubing down and across your body toward the opposite leg, maintaining control throughout the movement. Ensure you lead the motion with your thumb pointing in the direction of the pull.

1B Diagonal Pattern Flexion : Gripping tubing handle in hand of involved arm, begin with arm out from side 45° and palm facing backward. After turning palm forward, proceed to flex elbow and bring arm up and over involved shoulder. Turn palm down and reverse to take arm to starting position.

2A External Rotation at Waist: Stand with involved elbow fixed at side, elbow at 90° and involved arm across front of body. Grip tubing handle while the other end of tubing is fixed. Pull out arm, keeping elbow at side. Return tubing slowly and controlled.



2B Internal Rotation at Waist: Standing with elbow at side fixed at 90° and shoulder rotated out. Grip tubing handle while other end of tubing is fixed. Pull arm across body keeping elbow at side. Return tubing slowly and controlled.



3A External Rotation at Shoulder Level: Stand with shoulder abducted 90°. Grip tubing handle while the other end is fixed straight ahead, slightly lower than the shoulder. Keeping shoulder abducted, rotate shoulder back keeping elbow at 90°. Return tubing and hand to start position.



3B Internal Rotation at Shoulder Level: Standing with elbow at side fixed at 90° and shoulder rotated out. Grip tubing handle while other end of tubing is fixed. Pull arm across body keeping elbow at side. Return tubing slowly and controlled.



4 Shoulder Abduction to Shoulder Level: Stand with arm at side, elbow straight, and palm against side. Raise arm to the side, palm down, until arm reaches 90° (shoulder level).

5 Scapular Plane Raises: Stand with elbow straight and thumb up. Raise arm to shoulder level at 30° angle in front of body. Do not go above shoulder height. Hold 2 seconds and lower slowly.

6 Side lying External Rotation: Lie on uninvolved side, with involved arm at side of body and elbow bent to 90° . Keeping the elbow of involved arm fixed to side, raise arm. Hold 2 seconds and lower slowly.



7A Prone Horizontal Abduction (Neutral): Lie on table, face down, with involved arm hanging straight to the floor, and palm facing down. Raise arm out to the side, parallel to the floor. Hold 2 seconds and lower slowly.

7B Prone Horizontal Abduction (Full ER, 100° ABD): Lie on table, face down, with involved arm hanging straight to the floor, and palm facing down. Raise arm out to the side, parallel to the floor. Hold 2 seconds and lower slowly.



7C Prone Rowing: Lying on your stomach with your involved arm hanging over the side of the table, dumbbell in hand and elbow straight. Slowly raise arm, bending elbow, and bring dumbbell as high as possible. Hold at the top for 2 seconds, and then slowly lower.

7D Prone Rowing into External Rotation: Lying on your stomach with your involved arm hanging over the side of the table, dumbbell in hand and elbow straight. Slowly raise arm, bending elbow, up to the level of the table. Pause one second. Then rotate shoulder upward until dumbbell is even with the table, keeping elbow at 90°. Hold at the top for 2 seconds, then slowly lower taking 2-3 seconds.

8 Press-ups: Seated on a chair or table, place both hands firmly on the sides of the chair or table, palm down and fingers pointed outward. Hands should be placed equal with shoulders. Slowly push downward through the hands to elevate your body. Hold the elevated position for 2 seconds and lower body slowly.



9 Push-ups: Start in the down position with arms in a comfortable position. Place hands no more than shoulder width apart. Push up as high as possible, rolling shoulders forward after elbows are straight. Start with a push-up into wall. Gradually progress to table top and eventually to floor as tolerable.



10A Elbow Flexion (Biceps curl): Standing with arm against side and palm facing inward, bend elbow upward turning palm up as you progress. Hold 2 seconds and lower slowly.

10B Elbow Extension (Triceps Press): Raise involved arm overhead. Provide support at elbow from uninvolvement hand. Straighten arm overhead. Hold 2 seconds and lower slowly.

11A Wrist Extension: Supporting the forearm and with palm facing downward, raise weight in hand as far as possible. Hold 2 seconds and lower slowly.

4.13.11.B Wrist Flexion : Supporting the forearm and with palm facing downward, raise weight in hand as far as possible. Hold 2 seconds and lower slowly.

12A Wrist Supination : Forearm supported on table with wrist in neutral position. Using a weight or hammer, roll wrist taking palm up. Hold for a 2 count and return to starting position.

12B Wrist Pronation : Forearm should be supported on a table with wrist in neutral position. Using a weight or hammer, roll wrist taking palm down. Hold for a 2 count and return to starting position.

BOSU BALL CORE STRENGTHENING PROGRAM

1 BOSU BALL PLANK

Place the grey side of the BOSU ball towards you. Bend down and keep your elbows on the rubber side of the ball. Extend your legs and rest your toes on the floor. Your body should be in one line from your shoulders to your heels. Squeeze your entire core, gluteus, and quads, and tuck your butt under a little to keep your lower back straight. Make sure you are not dropping your hips or hiking your butt up high toward the sky. Position the neck in neutral position and your focus is in between your hands. Hold this position for 30 seconds.



2 CRUNCH

Start seated on a BOSU ball with your hips near the floor. Interlace your hands behind your head and let your head fall weightless into your hands. Lie back arching your back over the BOSU ball. Press your feet into the floor and crunch both your hips and torso up off the BOSU ball. Make sure you aren't pulling on your head, keep it weightless in your hands.

3 BOSU BALL CROSS SIT UPS

Lie face up on the ball. Bend your knees so that your feet are fully in contact with the ground. Interlace your hands behind your head. Twist your body and bend your knee up (for e.g. your left knee) so that your right elbow crosses your and touches your left knee. Then switch and twist to the other side.

4 BOSU BALL ONE LEG BRIDGING

Lie on your back and place your hand on the floor, as you bend one leg and keep on the ball and lift your other leg towards sky. Pressing your heel on the ball lift your pelvis up keeping your body in stiff bridge position.



5 SIT UPS

Lie flat on the ball with your fingers interlace before you, knees bend and feet flat on floor. Engage your core use your abs muscles to lift your back of the ball.

Statistical Analysis

Statistical analysis was carried out physically as well as with statistical software SPSS 23 version and Microsoft word, Excel has been used to generate graphs table etc. Various statistical measures such as mean, standard deviation, one way ANOVA were utilized for all the scores of participants included in the study.

RESULT

GROUP- ANALYSIS

Statistical software SPSS 23 version was used for analysis the data. To analyze the difference within groups, one way ANOVA test was used.

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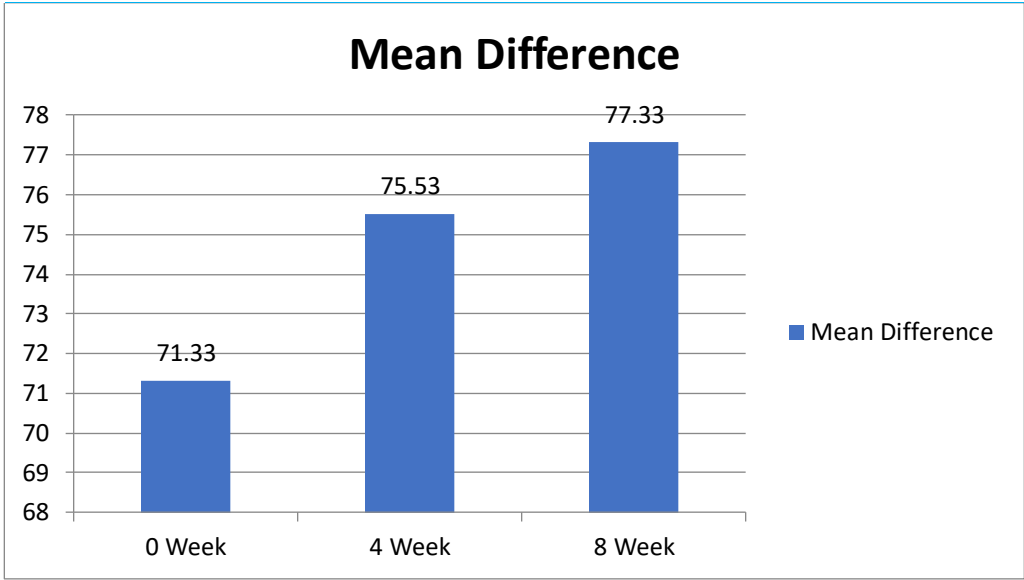
Table 1: To Analysis the difference within Radar Gun scale in Group A.

Duration		F-value	P- Value	Result
Group A	Mean ±SD			
0 week	71.33±3.06	10.326	0.0001	Significant
4 th week	75.53±.4.06			
8 th week	77.33±3.92			

Comparison within interventions showing Mean ± SD of **Radar Gun** at 0 week, 4th week and 8th week measurement.

To analyze the difference in the **Radar Gun** within interventions one Way ANOVA test was used. The difference in all the interventions in 0 week, 4th week and 8thweek measurement scores , 71.33 ± 3.06, 75.53 ± 4.06, 77.33 ± 3.92, for 0 week, 4th week and 8thweek measurement.

It was found that P value was less than 0.05 which implies statistical improvement in speed score of **Radar Gun** in 0 week, 4th week and 8thweek measurement. Thus, it says that there is statistical significant difference in **Radar Gun** participants from 0 week, 4th week and 8th week measurement i.e. accepting the alternative hypothesis (H₁) and rejecting the null hypothesis (H₀).



Graph 1 : Mean Difference Group A

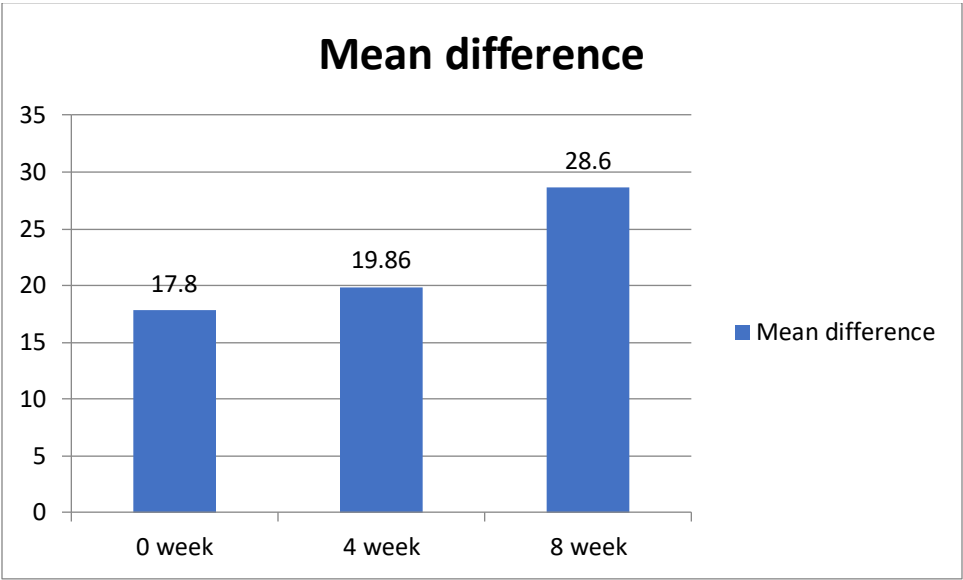
\Table 2: To Analysis the difference within Bowler Accuracy Test in Group A

Duration		F-value	P- Value	Result
Group A	Mean ±SD			
0 Week	17.80±3.46	34.989	0.0001	Significant
4 th week	19.86±3.44			
8 th week	28.60±4.28			

Comparison within intervention showing Mean ± SD of **Bowler Accuracy Test** 0 week, 4th week and 8th week measurement.

To analyze the difference in the **Bowler Accuracy Test** One Way ANOVA test was used. The difference in all the interventions in 0 week, 4th week and 8thweek measurement of all scores are 44.00 ± 3.78, 30.60 ± 2.96, 18.65 ± 2.83, for 0 week, 4th week and 8th week.

It was found that P value was less than 0.05 which implies statistical improvement in accuracy score of **Bowler Accuracy Test** in 0 week, 4th week and 8thweek measurement. Thus, it says that there is statistical significant difference in **Bowler Accuracy Test** participants from 0 week, 4th week and 8thweek measurement i.e. accepting the alternative hypothesis (H₁) and rejecting the null hypothesis (H₀).



Graph 2 : Mean Difference Group A

Conclusion :

As the p-value is less than 0.05 across all scale of **Radar Gun** and **Bowler Accuracy Test**, it indicates a statistically significant difference in all measures, suggesting that each intervention was effective in group A.

GROUP- B ANALYSIS

Statistical software SPSS 23 version was used for analysis the data. To analyze the difference within groups one way ANOVA test was used.

Table 3: To Analysis the difference within Radar Gun function scale in Group B.

Duration		F-value	P- Value	Result
Group B	Mean ±SD			
0 week	67.7± 2.86	8.03	0.003	Significant
4 th week	68.46±.2.92			
8 th week	71.8± 3.15			

Comparison within interventions showing Mean ±SD of **Radar Gun** at 0 week, 4th week and 8th week measurement.

To analyze the difference in the **Radar Gun** within interventions one Way ANOVA test was used. The difference in all the interventions0 week, 4th week and 8thweek measurement. Scores 67.7 ± 2.86, 68.46 ± 2.92, 71.8 ± 3.15, 0 week, 4th week and 8thweekmeasurement.

It was found that P value was less than 0.05 which implies statistical improvement in speed score of **Radar Gun** in 0 week, 4th week and 8th week measurement. Thus, it says that there is statistical significant difference

in **Radar Gun** participants from 0 week, 4th week and 8thweek measurement i.e. accepting the alternative hypothesis (H_1) and rejecting the null hypothesis (H_0).

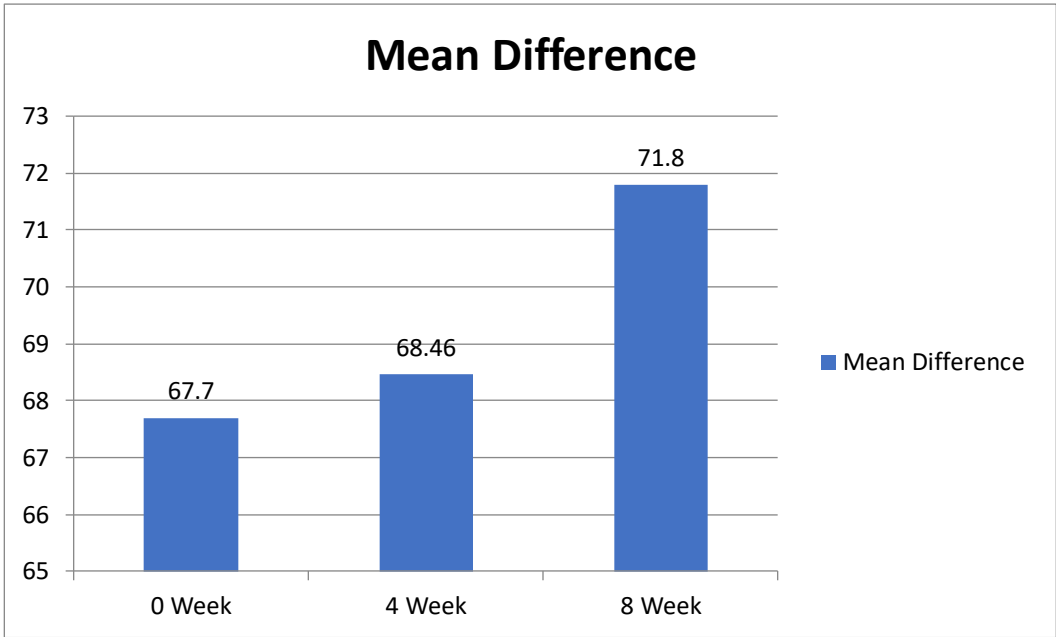


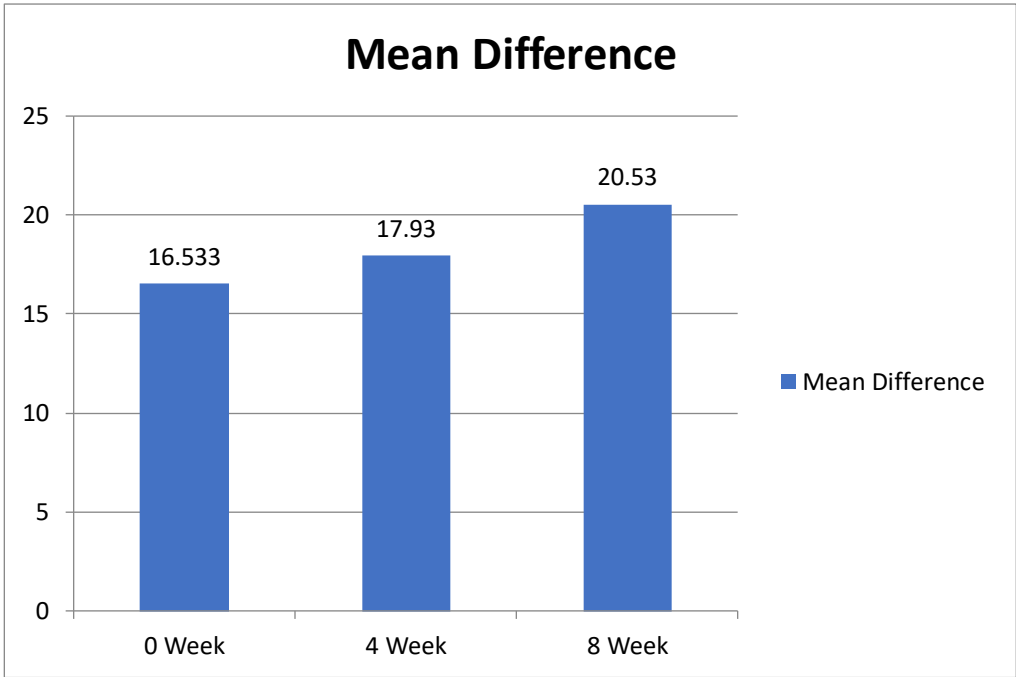
Table 2: To Analysis the difference within Bowler Accuracy Test in Group B.

Duration		F-value	P- Value	Result
Group A	Mean ±SD			
0 Week	16.533±2.41	8.101	0.001	Significant
4 Week	17.93±2.78			
8 Week	20.53±3.04			

Comparison within intervention showing Mean ±SD of **Bowler Accuracy Test**0 week, 4th week and 8thweek measurement.

To analyze the difference in the **Bowler Accuracy Test** One Way ANOVA test was used. The difference in all the interventions 0 week, 4th week and 8thweek measurement of all Scores 16.533 ± 2.41 , 17.93 ± 2.78 , 20.53 ± 20.53 , for 0 week, 4th week and 8th week.

It was found that P value was less than 0.05 which implies statistical improvement in accuracy score of **Bowler Accuracy Test** in 0 week, 4th week and 8thweek measurement. Thus, it says that there is statistical significant difference in **Bowler Accuracy Test** participants from 0 week, 4th week and 8thweekmeasurement i.e. accepting the alternative hypothesis (H_1) and rejecting the null hypothesis (H_0).



Conclusion

As the p-value is less than 0.05 across all scale of Radar Gun and Bowler Accuracy Test indicates a statistically significant difference in all measures, suggesting that each intervention was effective in group B.

Group Comparison

An Independent t-test was used to compare the effects of Radar Gun and Bowler Accuracy Test between Groups A and B, in order to determine which group performed better based on the results.

Table 1: To Analysis the difference between Radar Gun in Group A and Group B

Duration		Duration		t-value	P- Value	Result
Group A	Mean ±SD	Group B	Mean ±SD			
0 week	71.33 ± 3.06	Baseline	67.7 ± 2.86	9.036	0.002	Significant
4 week	75.53 ±4.06	3 week	68.46 ±2.92			
8 week	77.33 ± 3.92	6 week	71.8 ± 3.15			

Comparison between Group A and B showing Mean ± SD of Radar Gun at 0 week, 4th week and 8th week measurement.

To analyze the difference in the **Radar Gun** between groups A and B independent t test was used. The difference in all the intervention in group A at 0 week, 4th week and 8th week scores 7.2 ± 1.23, 4.3 ± 1.08, 2.10 ± 0.788 and group B are 7.15 ± 1.08, 5.10 ± 0.852, 3.00 ± 0.917 for 0 week, 4th week and 8th week measurement.

It was found that P value was less than 0.05 which implies statistical improvement in speed of spin bowler’s in 0 week, 4th week and 8th week measurement. Thus, it says that there is statistical significant difference in **Radar Gun** participants from 0 week, 4th week and 8th week measurement between groups A and B i.e. accepting the alternative hypothesis (H₁) and rejecting the null hypothesis (H₀).

Table 2: To Analysis the difference between Bowler Accuracy Test in Group A and Group B

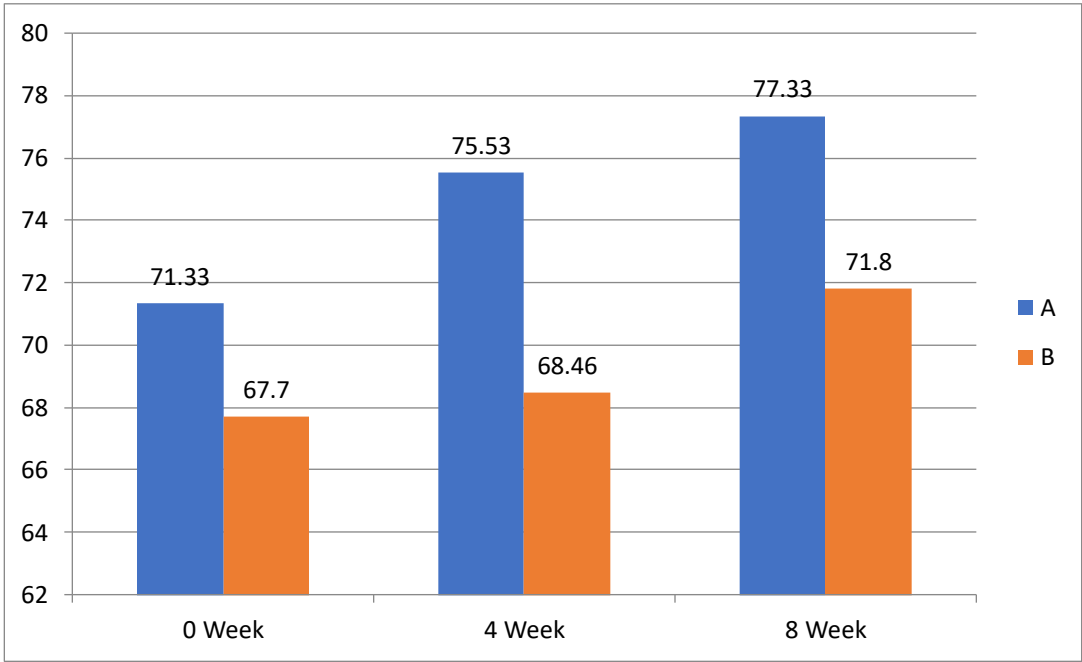
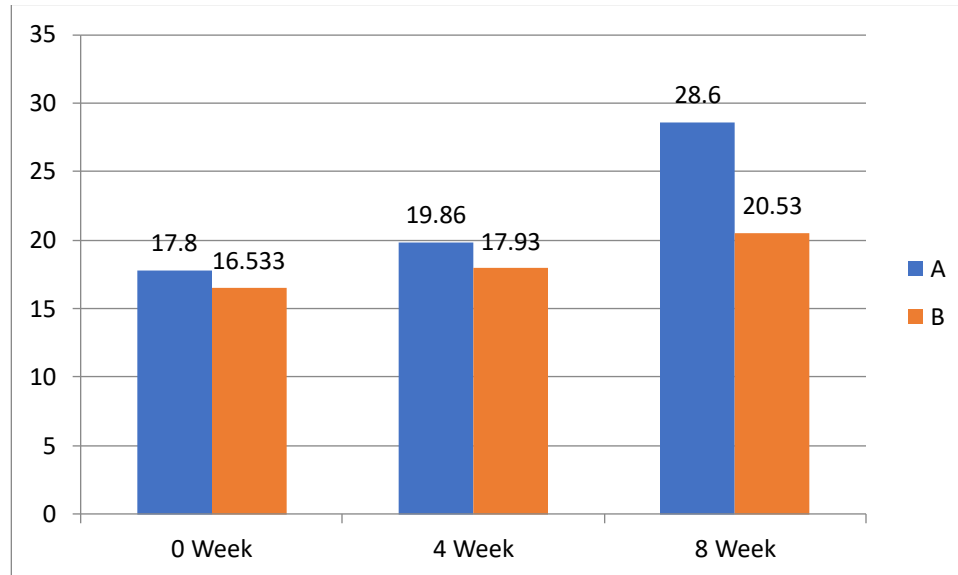


Table-1: Comparison between Group A and B showing Mean ± SD of Bowler Accuracy Test at 0 week, 4th week and 8th week measurement.

Duration		Duration		t-value	P- Value	Result
Group A	Mean ±SD	Group B	Mean ±SD			
Baseline	17.80 ± 3.46	Baseline	16.533 ±2.41	11.012	0.002	Significant
4 week	19.86 ± 3.44	4 week	17.93 ± 2.78			
8 week	28.60 ± 4.28	8 week	20.53 ± 3.04			

To analyze the difference in the Bowler Accuracy Test between groups A and B independent t test was used. The difference in all the intervention in group A at 0 week, 4th week and 8th week Scores 44.00 ± 3.78, 30.60 ± 2.96, 18.65 ± 2.83 and group B are 44.15 ± 3.43, 36.65 ± 3.74, 28.20 ± 3.57 for 0 week, 4th week and 8th week measurement.

It was found that P value was less than 0.05 which implies statistical improvement in accuracy of spin bowler's in 0 week, 4th week and 8th week. Thus, it says that there is statistical significant difference in **Bowlers Accuracy Test** participants from 0 week, 4th week and 8th week measurement between groups A and B i.e. accepting the alternative hypothesis (H_1) and rejecting the null hypothesis (H_0).



CONCLUSION

When comparing the effectiveness between Group A and Group B, the p-value was found to be less than 0.05 across both the outcomes Radar Gun and Bowler Accuracy Test indicating a statistically significant difference between the groups. In the Radar Gun and Bowler Accuracy Test the mean score was greater in Group A compared to Group B, suggesting better outcomes (i.e., accuracy and speed) in Group A indicating that Group A performed better across all assessed parameters.

ACKNOWLEDGEMENT

The author is highly thankful to all the study participants who took part in this study.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil

CONFLICT OF INTEREST

Conflicting Interest (If present, give more details): - Nil

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