International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR |Volume 10 | Issue 3 | July - Sept - 2022
www.ijamscr.com

Research article Medical research

CORRELATION BETWEEN TRUNK ROTATORS STRENGTH, CORE STRENGTH AND LOWER LIMB STABILITY ON ACCURACY OF SPIN BOWLERS IN CRICKET

Joseph Santosh Phasge*, Dr. Ujwal Yeole

Tilak Maharashtra Vidyapeeth , Pune, Maharashtra, India

***Corresponding Author: Joseph Santosh Phasge**
Email: josephphasge12@gmail.com

ABSTRACT

Cricket is a sport widely played all over world. It is most loved and played Sport in India, and many children dream of representing their Nation. Many academies are working all over India where children can go and train/practice the game. Bowlers are an important part of the team. Thus, Spin bowlers are an important role in bowling against the opposite team. Hence, to improve team performance we need to focus on improving the performance of spin bowlers as much as others. To achieve this, we need to analyze the correlation between trunk rotators strength, core strength and lower limb stability on accuracy of spin bowlers in cricket.

Keywords: Cricket, Spin bowlers, bowling,

INTRODUCTION

Cricket is a sport of bat and ball played worldwide, between two teams with eleven players in each team organizes various world championship events. It is organized by the international cricket council (ICC) a world governing body which organizes various world championship events. Cricket is played in three established event formats Test match (approximately 100 overs per day with match lasting for 4-5 days) another event format is the ODI (One day international event with 50 overs per team) and Twenty-Twenty event format which has 20 overs per team (T20)[1].

Bowlers play an important role in any cricket team; they can be divided into two groups that is Fast bowlers and Spin bowlers. A Spin bowler drives the cricket ball in such a way that the ball diverges its direction from the original direction after it hits the ground spin bowler does it using rotational force while bowling and a fast bowler drives the ball towards the batsman. When there is a spin on the ball it affects the flight and bounce of the ball and it makes it tough for the batsman to play. Spin bowlers should be trained precisely to improve the performance of the team. Spin spinners, in comparison to fast bowlers, deliver the ball at a slower pace. Spin bowlers employ a variety of skills to trick batsmen, including controlling the ball. The ball's flight, including drift, dip, and side spin, among other things. Spin bowlers are classed as finger spin (off – on) or finger spin (on – off) depending on how they impart spin to the ball[1].

Bowlers who use their wrists to spin the ball and bowlers who use their legs to spin the ball. In finger spin bowling, the bowler grips the ball with his fingers. Position the ball firmly against the seam of the index finger's interphalangeal joints. As well as the middle fingers. It has been proven that the ball does not spin. Specifically rely on finger motion, but primarily on supination of the forearm. The kinetic chain mechanism of the forearm and the body. The wrist spin bowler grips the Cricket ball in the palms in between the index and middle finger with the seam of the ball parallel to palm. The index and middle finger are spread apart to firmly grip the ball[1].

South Asian bowlers have mastered the art of spin bowling. The main reason for this is that spin bowlers benefit more on pitches in the subcontinent. The earlier the spinners enter the scene, the faster the pitch degenerates. Fast bowlers benefit

more from Australian and South African surfaces, which are usually quite hard and bouncy[3]. During the match, they do not break up too often. Pitching on the subcontinent, on the other hand, is not as difficult. They are not held together as well by the grass, so they break apart more quickly and aid spin bowlers. In addition to this, spin bowling is considered to be less tiring than pace bowling. As it generally does not employ a lengthy run up. Therefore, spin bowling is more prevalent in the hot and humid conditions of the sub-continent as a form of energy conservation, especially in multi-day competitions. In general, leg-spin is considered to be one of the toughest types of bowling in which to keep control of the ball, but it is very effective in picking off wickets.

It is customary among cricket commentators to describe and judge the quality of spin bowling in terms of the characteristics flight, turn, bounce, drift, and dip. All these are arts to deceive the batsman and require much practice. The basic trajectory of spin bowling is two-lines-at-an-angle, but the above characteristics (described below) modify this 'normal' trajectory into more complex shapes.

Turn: How much the ball turns after pitching (e.g. 5 degree deviation after meeting the ground). It depends on the number and direction of revolutions of the ball. The movement and rotation of the ball varies, depending on the position of the wrist and the finger. An occasional unexpected straight ball can usefully be included in an attack, but spin variation is the main technique used to deceive the batsman and take wickets. A high rate of turn is above 33 rev/second, or 2000 Rpm, which Graeme Swann consistently spin over 2000 rpm, the most amongst English spinners until Liam Dawson also topped 35 rev/second, or 2100 rpm. Also, the slower the ball, it tends to deviate more. For an off spinner, you will have to bowl from a wider of off-stump to get the ball to turn into the right-handed batsman and force them to nick off the edge to a fielder or into the top of off stump.

Bounce: Getting the ball to bounce more than normal, so that the ball meets the Batsman at a greater height than expected. Sometimes, if the ball spins horizontally (e.ga slider), the batsman will not be able to make contact with the ball and it may hit the stumps before the second bounce.

Drift: Getting the ball to move sideways while in air. Late drift causes the batsman to cover the wrong line and the ball may catch the edge of the bat. Dip: Getting the ball to pitch (meet the ground) at a shorter distance than normal. Late dip causes the batsman to misjudge the length of the ball. Flight: throwing the ball up a bit more than normal, so that its time in the air before pitching is longer[6]. A slow ball with extra flight may deceive the batsman into thinking it is slower than it is and therefore mistiming his shot. This is very effective for off spinners. Usually, a spin bowler relies on tricks during flight to produce turn, bounce, drift and dip, or combinations of them. The complete bowling action is broken into five distinct positions or phases;1. Back foot impact, 2. Delivery stride / Front Foot Impact, 3. Cradle position, 4. Ball release, 5. follow-through[1].

FFI/Delivery stride is characterized by side on bowling action which shows lateral flexion and hyperextension at the trunk. The rotational emphasis of them bowling action means that the training programs should focus on developing core musculature strength and stability. Therefore, core exercises predominantly training explosive trunk action through sagittal and transverse planes must be prescribed to the spin bowler. The front foot contact creates an impact force that is absorbed by soft tissues and Lower back[1].

This means that the FFI phase requires a spin bowler to have maximal strength to absorb ground reaction forces and effectively transfer closed chain exercise prescription which strengthens the knee joint and increases its stability[1].

MATERIAL AND METHODOLOGY

• STUDY DESIGN: Experimental
• STUDY SETTING: In cricket academies around Pune
• SAMPLE POPULATION: Spin Bowlers
• SAMPLING METHOD: Convenient Sampling
• SAMPLE SIZE: 60
• MATERIALS REQUIRED: Cone/ marker, measuring tape, Sticking Tape,
book, pen, 2 kg medicine ball, consent form.

INCLUSION CRITERIA

• Subject within age group of 18 to 25 years
• Male Cricket Spin Bowlers
• Playing Cricket since at least 1 Year at a Club level or district level

EXCLUSION CRITERIA

• Patients unwilling to participate in the study.
• Injured players.
• Involved in other Sports
• Intermittent Practice

OUTCOME MEASURES

- Y-Balance test for lower limb stability.
- Lateral Medicine Ball Toss test for trunk rotators strength.
- Dynamic Abdominal Endurance Test for core strength.
- Spot bowling for accuracy.
- Wicket-Hit ratio for accuracy.

PROCEDURE

Permissions were taken from institutional ethical committee of Tilak Maharashtra Vidyapeeth. Different centers were approached, and permission was obtained prior to the study. The patients willing to participate were given a consent form to fill. Sample size was selected on the basis of the inclusion and exclusion criteria. The willing Players were evaluated using Y- balance test for Lower limb Stability Lateral Medicine Ball Toss Test for Trunk Rotator Strength, Dynamic Abdominal Curl Test, Wicket Hit Ratio and Spot Bowling for Accuracy.

Y Balance Test: The player was explained the test and a demo was shown. Then a practice round was given to the subject. The subject was then asked to perform the test. 3 readings were taken in each of the 3 directions i.e. Anterior reach, Posterolateral reach and Posteromedial reach.

Lateral Medicine Ball Toss Test*:* The player was explained about the test and was given a demo. A practice round was performed. The test was performed.

Dynamic abdominal endurance test*:* The patient is in crook lying, hands by the sides of the body. 12 cm distance is marked from the fingertips of the patient. The patient is then asked to do abdominal curls.Timer is started for a minute and number of abdominal curls done by the patient are noted

in one minute. Timer is stopped if any wrong position is noted and the test is eliminated.

Spot Bowling: A marker was placed at a selected location on the pitch, the player was explained the procedure. The Player was then asked to bowl 2 overs i.e. 12 balls and try to keep the pitching on the marker. The test was conducted.

Wicket Hit Ratio: The player was explained the details of the test. The player was asked to bowl 1 over (6 balls) at Good length on the pitch and 1 over (6 balls) at the Short length. The target of the bowler was to hit the middle stump with pitching at his desired line in the given length of the pitch. The no of balls hitting the Middle Stump were then calculated.



Wicket-Hit Ratio for accuracy



Spot Bowling for accuracy



Y balance test Posterolateral



Y balance test Anteriorly

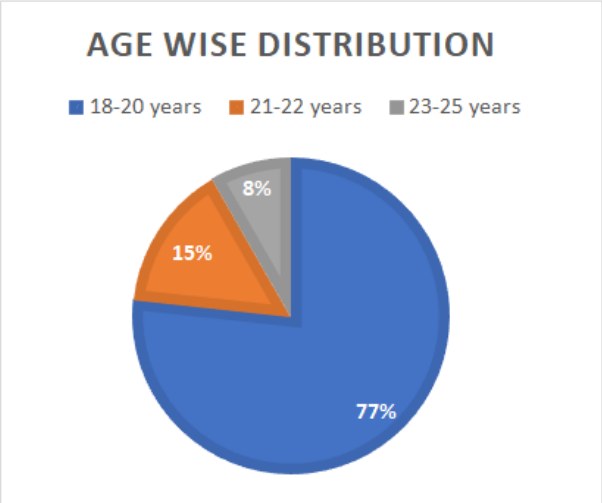


Y balance test Posteromedial

RESULTS

Demographic data

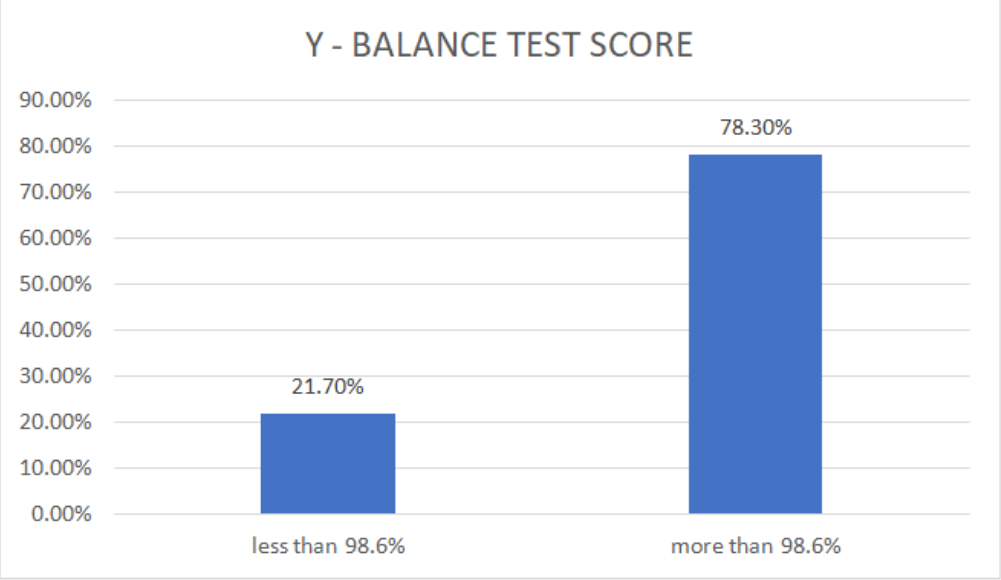
Age group	Percentage of subjects
18-20 years	46
21-22 years	9
23-25 years	5



Graph 1 shows that, 77% population belongs to the age group 18-20 years, 15% belongs to 21-22 years, 8% belongs to 23-25 years of age.

Y Balance Test

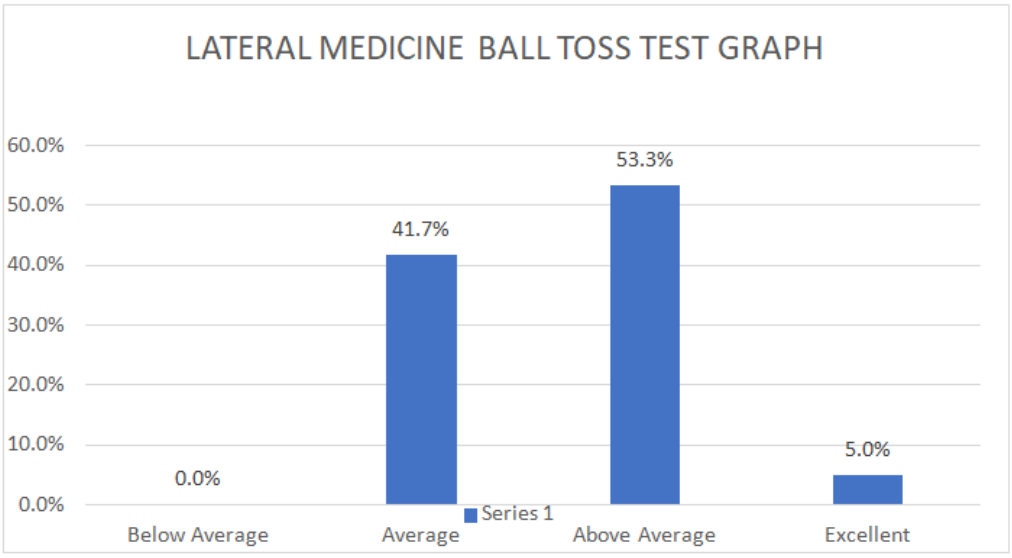
Y-Balance test score	Less than 98.6%	More than (98.6%)
Percentage of athletes	21.70%	78.30%



According to Graph no.2 21.70% of participants scored less than 98.6% indicating less stability in lower limbs and 78.30% of participants scored more than 98.6% indicating more stability in lower limbs.

LMBTT	Percentage of athletes
Below average	0%
Average	41.7%
Above average	53.33%
Excellent	5%

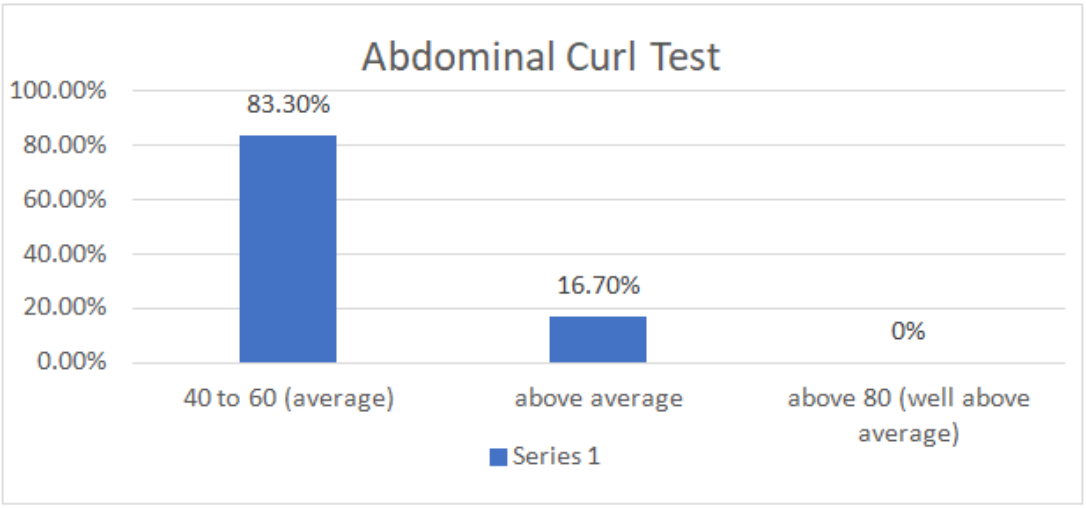
Lateral Medicine Ball Toss test



Most the athletes which participated in our study were Above Average (53.3%) followed by Average (41.7%) and Excellent (5%) respectively for the Lateral medicine ball toss test.

Dynamic Abdominal curl test

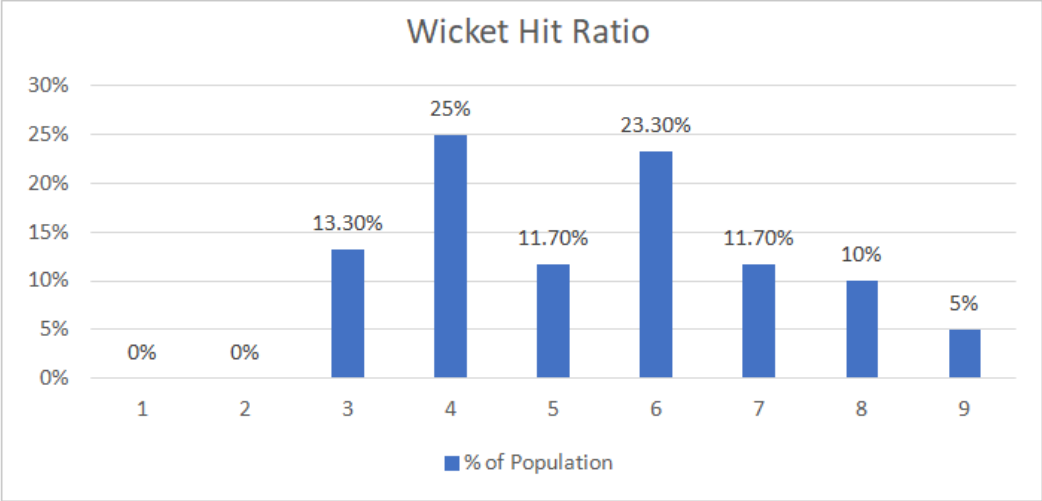
Abdominal curl test	Percentage of athletes
Well above average (Above 80)	0%
Above average (60-80)	16.70%
Average (40-60)	83.30%



The following graph interprets the data of dynamic abdominal endurance test in which 83.30% population is graded as average and 16.70% population is graded as above average.

Wicket-Hit ratio for accuracy

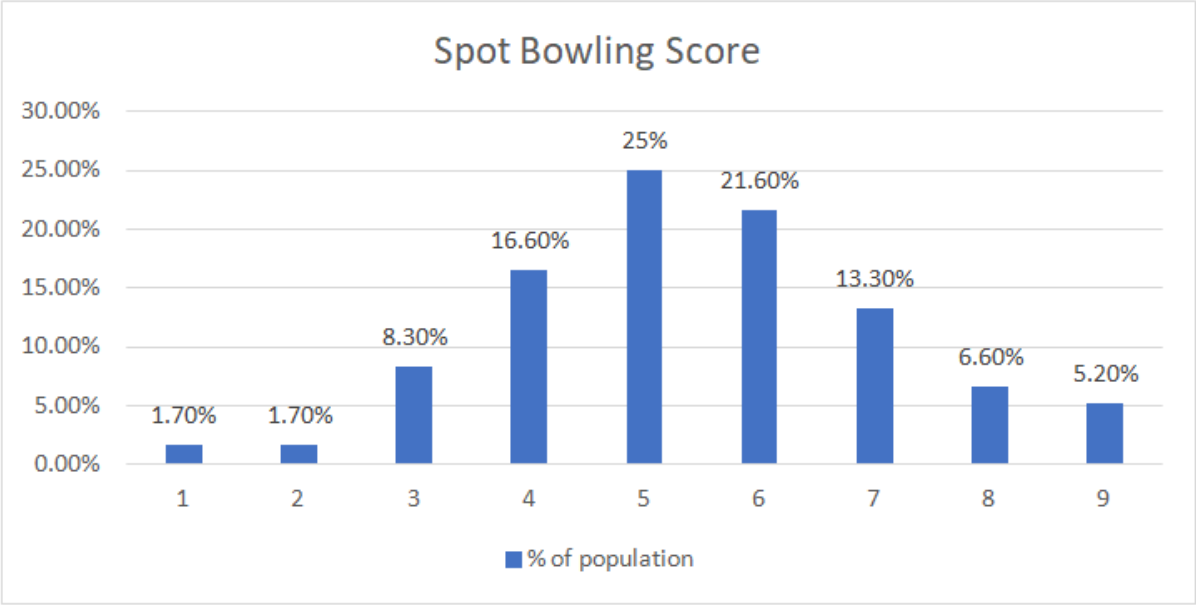
Wicket-Hit Ratio (/12)	**Percentage of population**
3	13.30%
4	25%
5	11.70%
6	23.30%
7	11.70%
8	10%
9	5%



Graph no.5 shows the percentage of wicket-hit in 12 balls by the bowler with the MEAN±SD of 5.45±1.7.

Spot Bowling for accuracy

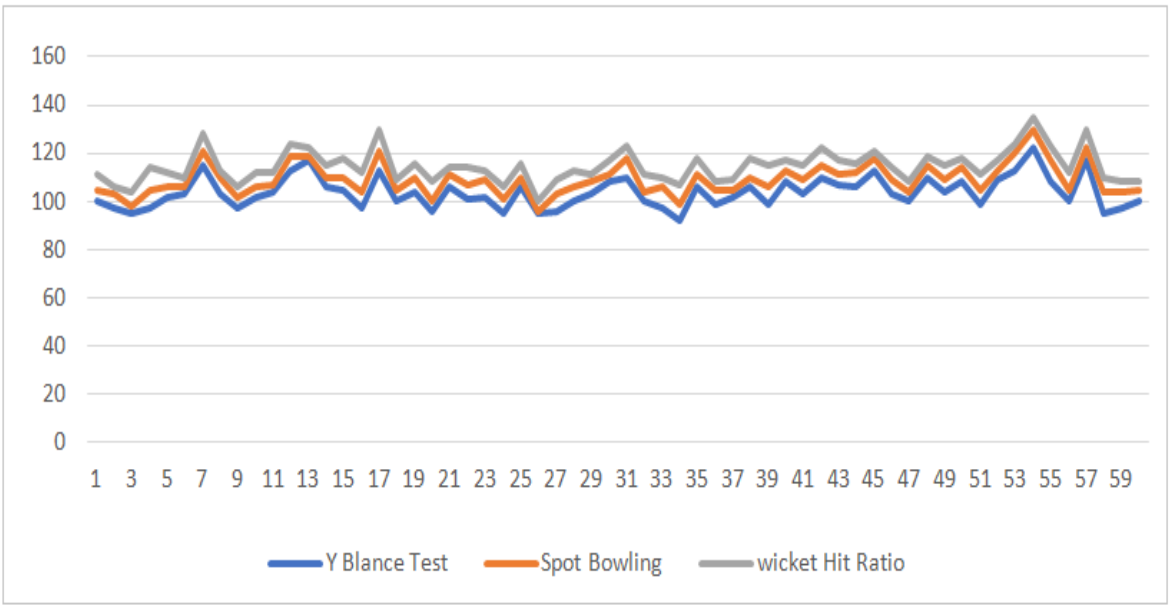
Spot Bowling (/12)	Percentage of population
1	1.70%
2	1.70%
3	8.30%
4	16.60%
5	25%
6	21.60%
7-9	25.1%



Graph no.6 shows the percentage of Spot bowling ratio by the bowler with the MEAN±SD of 5.43±1.7

Correlation between Y balance test with spot bowling and wicket-hit ratio for accuracy

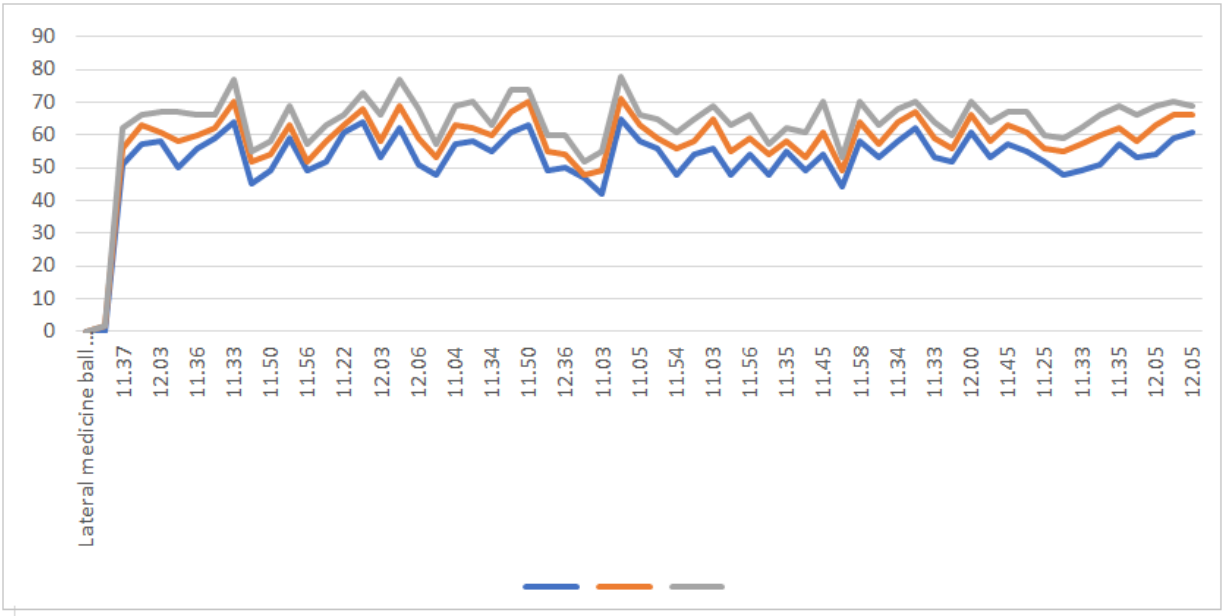
	YBT	Spot bowling	WHR
Mean ± SD	103.5±6.3	5.42±1.7	5.45±1.7
R value	-0.055		
P value	0.5497		



The following results shows the correlation coefficient (r=-0.055) and p value = 0.54 which states that there is no significant correlation in this result.

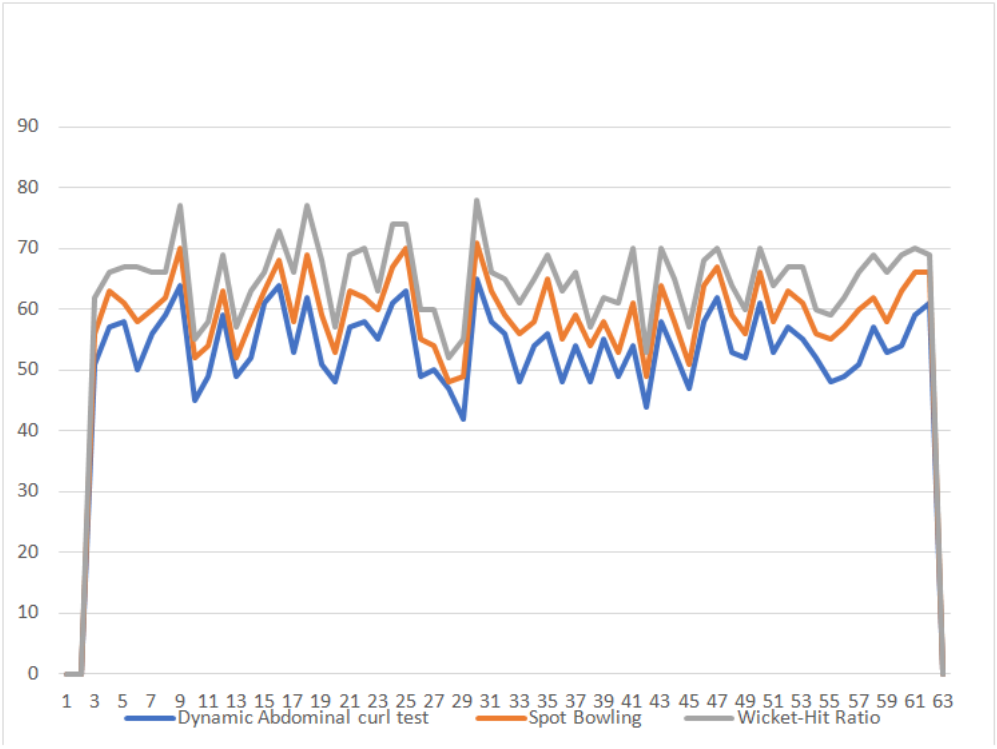
Correlation between Lateral medicine ball toss test with spot bowling and wicket-hit ratio for accuracy

	Lateral medicine ball toss test	**Spot bowling**	**WHR**
Mean ± SD	11.48 ±0.36	5.42±1.7	5.45±1.7
R value	0.019		
P value	0.82		



The following results show the correlation coefficient of (r=0.019) and the p value (p=0.82) which states that there is no significant correlation between trunk rotator strength and accuracy.

Correlation between Dynamic abdominal curl test with spot bowling and wicket-hit ratio for accuracy



	DACT	Spot bowling	WHR
Mean ± SD	54.33±5.48	5.42±1.7	5.45±1.7
R value	-0.067		
P value	0.46		

The following graph shows the correlation coefficient (r=-0.067) And the p value (p=0.46) which states that there is no significant correlation between core strength and accuracy.

DISCUSSION

The present study was conducted to find the correlation between trunk rotators strength, core strength and lower limb stability on accuracy of spin bowlers. In cricket in the present study 60 cricket players (males=60) within the age group of 18-25 years were taken, the mean age was 19.2±1.7. The mean years of experience was 4.6±1.5. The Accuracy was tested using Spot bowling, the analysis of spot bowling test had Mean as 5.42±1.7 Out of 60 people 25% subjects had a bowling score of 5, 21.6% had a score of 6, 16.60% of subjects had a score of 4, 13.30% people had a score of 7 in spot bowling, 8.30% subjects had a score of 3, 6.60% of subjects had a score of 8 in their spot bowling, 5.20% had a score of 9, 1.70% had a score of 2 and 1.70% of subjects had 1 score in their spot bowling. Another outcome measure for accuracy is Wicket-Hit Ratio. The players were explained about the test, 25% subjects got a wicket hit ratio of 4, 23.30 had a wicket hit ratio score of 6, 13.30% had a wicket hit ratio of 3, 11.70% had a wicket hit ratio of 7 also again 11.70 subjects had a wicket hit ratio of 5, 10% had a wicket hit ratio of 8, 5% subjects had a wicket hit ratio of 9. It was found that no subjects had a wicket hit ratio of 1 and 2. The Trunk muscle strength was measured with the help lateral medicine ball toss test. In this test 41.67% of the total population had the score of average, 53.33% population had the score above average, 5% had the score as Excellent and 0% population had a score below average. The Trunk rotators act a binder to the lower and upper body kinematic. Their role is to stabilize the trunk, during the ball release phase. As spinners have a shorter run up, the pace required for the ball to travel is generated by these muscles. As these muscles are strengthened it will reduce the excessive pressure from the rest of the body. These muscles strengthen the kinematic chain and thus help in some pace. During bowling there is hyper extension of the trunk. It will be a good delivery if the ball is released at an ideal position. When there is a disturbance in the trunk position the arm also moves accordingly. To keep an erect posture the trunk rotator strength is important. The stable the bowler's trunk is better the releasing position. In the follow through phase the back foot impact leg rotates along the front foot impact leg this needs to be a controlled motion as there is a kinetic chain in progression. If the follow through is not in control it may cause an injury to the player. The next test was Dynamic abdominal curl test in which the player was informed about how to perform the test and the results were taken accordingly. In this test 0% of the population had a score of well above average, 16.70% of population had a score of above average and 83.30% of the population had a score of average. Core strength plays an important role in stabilization of the body, it minimizes joint loads in all the activities.

For the assessment of lower limb stability Y balance test was used, in this test 21.70% of the population has less than 98.6% which indicates less stability and there are more chances of injury in this population and 78.30% of the population has the score more than 98.6% which indicates

more stability. The Lower Limb Stability of the front foot impact leg is important as it determined the posture of the bowler during the ball release. It is seen that the posture of the bowler is disturbed when he lands on the leg abnormally. This causes the loss of balance and the ball release position is disturbed. It may also cause a disturbance in the players performance. Lower limb stability also has an important role in the wellbeing of the bowler. As there is a follow through there are chances that the sudden loss of motion can cause an injury to the bowler. After the tests were performed correlation of the obtained data was done and with the help of correlation coefficient conclusion was made whether the trunk rotator strength, core strength and lower limb stability are correlated with accuracy in the spin bowlers. Firstly, correlation between lower limb stability and accuracy was taken with the help of Y balance test with the SD±6.3, Spot bowling and Wicket-hit ratio in graph no.7 it shows the correlation coefficient of (r=-0.055) and the p value = 0.54 which shows that there is no significant correlation between lower limb stability and accuracy of spin bowlers in cricket.

In this study, we were trying to find correlation between trunk rotator strength and accuracy the lateral medicine ball toss test showed the SD± 0.36 in graph no.8 it shows the correlation coefficient (r=0.019) and the p value = 0.82 which showed that there is no significant correlation between trunk rotator strength and accuracy of the following population. In this study, we were trying to find correlation between core strength and accuracy, the Dynamic abdominal curl test showed the SD±5.48 in graph no.9 it shows that the correlation coefficient (r=-0.067) and the p value = 0.46 which stated that there is no significant correlation between core strength and accuracy of the following population. Thus, from our study we did not find any correlation between trunk rotator strength, core strength and lower limb stability on accuracy of spin bowlers in cricket.

CONCLUSION

This study concluded that there is no significant correlation between Trunk rotators strength, Core strength and Lower limb stability in accuracy of spin bowlers in cricket.

REFERENCES

1. Mathankar A. Overview of biomechanics and movement patterns of cricket spin bowlers. JSIP. 2020;4(2):65-9. doi: 10.18231/j.jsip.2020.009.
2. Kibler WB, Press J, Sciascia A. The role of core stability in athletic function. Sports Med. 2006 Mar;36(3):189-98. doi: 10.2165/00007256-200636030-00001, PMID 16526831.
3. Johnstone JA, Ford PA. Physiologic profile of professional cricketers. J Strength Cond Res. 2010 Nov 1;24(11):2900-7. doi: 10.1519/JSC.0b013e3181bac3a7, PMID 20975368.
4. Hilligan BK. The relationship between core stability and bowling speed in asymptomatic male indoor action cricket bowlers [doctoral dissertation].2008.
   Available from: https://openscholar.dut.ac.za/bitstream/10321/342/1/Hilligan_2008.pdf
5. Feros SA, Young WB, O'Brien BJ. Relationship between selected physical qualities, bowling kinematics, and pace bowling skill in club-standard cricketers. J Strength Cond Res. 2019 Oct 1;33(10):2812-25. doi: 10.1519/JSC.0000000000002587, PMID 29702520.
6. Middleton KJ, Mills PM, Elliott BC, Alderson JA. The association between lower limb biomechanics and ball release speed in cricket fast bowlers: a comparison of high-performance and amateur competitors. Sports Biomech. 2016 Jul 2;15(3):357-69. doi: 10.1080/14763141.2016.1163413, PMID 27088598.
7. Beach AJ, Ferdinands RED, Sinclair PJ. Three-dimensional linear and angular kinematics of a spinning cricket ball. Sports Technol. 2014 Apr 3;7(1-2):12-25. doi: 10.1080/19346182.2014.968163.
8. Davies G, Riemann BL, Manske R. Current concepts of plyometric exercise. Int J Sports Phys Ther. 2015 Nov;10(6):760-86. PMID 26618058.
9. Sell M. The development and assessment of core strength clinical measures: validity and reliability of medicine ball toss tests ([doctoral dissertation]. University of Pittsburgh). 2013. Available from: http://d-scholarship.pitt.edu/19345/
10. Orchard J, James T, Alcott E, Carter S, Farhart P. Injuries in Australian cricket at first class level 1995/1996 to 2000/2001. Br J Sports Med. 2002 Aug 1;36(4):270-4; discussion 275. doi: 10.1136/bjsm.36.4.270, PMID 12145117.
11. Chin A, Elliott B, Alderson J, Lloyd D, Foster D. The off-break and "doosra": kinematic variations of elite and sub-elite bowlers in creating ball spin in cricket bowling. Sports Biomech. 2009 Sep 1;8(3):187-98. doi: 10.1080/14763140903229476, PMID 19891197.
12. Thomas JR, Nelson JK, Silverman SJ. Research methods in physical activity. J Hum Kinet. 2015 Jul 17.
13. Knudson DU. The validity of recent curl-up tests in young adults. J Strength Cond Res. 2001 Feb 1;15(1):81-5. doi: 10.1519/00124278-200102000-00014, PMID 11708712.
14. Abdelkader N, Brown SHM, Beach TAC, Howarth SJ. Dynamic balance is similar between lower extremities in elite fencers. Int J Sports Phys Ther. 2021;16(6):1426-33. doi: 10.26603/001c.29852, PMID 34909249.