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RESEARCH ARTICLE

THE EFFECTIVENESS OF LOWER LIMB PLYOMETRIC EXERCISE TRAINING ON AGILITY AND SPRINT SPEED IN CLUB LEVEL CRICKETERS: A 6 WEEKS EXPERIMENTAL STUDY

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Key words:-
Plyometric exercise, agility, sprint performance, cricket, lower limb

Abstract

Background: Cricket demands high speed and agility. Plyometric training enhances muscle power through the stretch–shortening cycle, improving sprint and change of direction ability.
Objective: To assess the effect of a 6-week plyometric program on sprint speed and agility in club-level cricketers.
Methodology:Participants: 117 male cricketers (18–25 yrs).
Design: Pre–post experimental study.
Tests: 30 m Sprint Test & Agility T-Test.
Intervention: 6-week lower-limb plyometric training, twice weekly.
Analysis: Paired t-test.
Results:Agility: 11.50 → 9.98 sec ($p < 0.0001$)
Sprint: 4.59 → 4.30 sec ($p < 0.0001$)
Both parameters showed significant improvement.
Conclusion: Six weeks of plyometric training significantly improved sprint speed and agility in club-level cricketers. It is an effective method to enhance cricket-specific performance.

Introduction:-

People are naturally competitive and driven to achieve greatness in sports. Individuals and nations compete against each other to showcase their skills, drawing inspiration and motivation from this rivalry. This competitive spirit fuels athletes today to run faster, jump higher, throw farther, and demonstrate greater strength, endurance, and skill. [23]In particular, cricket has changed significantly in recent decades. The introduction of One-Day and T20 formats has transformed several key aspects of the game. The shorter formats require improved physical traits like agility, speed, and flexibility, which are vital in match situations such as batsmen running between wickets, bowlers delivering fast balls, and fielders responding quickly to unpredictable plays. [10]Among these traits, agility is crucial. It reflects the body's ability to change direction quickly and accurately. All movements rely on a level of agility, especially when actions must adapt to new or shifting conditions. For cricketers, agility is essential for good footwork, quick body adjustments, and maintaining coordination under pressure. [7]Success in athletics also relies heavily on explosive power and leg strength. In sports that involve sprinting, jumping, or throwing, athletes need to

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convert strength into force quickly and effectively. (25) The physical demands are particularly high in shorter formats of cricket, where players frequently perform maximum sprints while batting, bowling, or fielding. [19]
Plyometric training is recognized as an effective way to develop muscular power, enabling athletes to produce force at high speeds during dynamic movements. These exercises involve stretching a muscle and then contracting it forcefully without delay.[10] Sprinting ability is a critical factor in cricket, especially for fast bowlers and batters. Research on the mechanics of sprinting shows that senior international seam bowlers generally have a more force-driven sprinting profile than batters. Coaches can use this information to tailor physical conditioning strategies for cricketers at both youth and elite levels. [19]Another related technique, complex training, uses post-activation potentiation (PAP). PAP refers to a temporary increase in muscle performance following a preloading contraction—whether concentric, eccentric, or isometric—which can significantly enhance power output and reduce sprint times. [19]

Plyometric exercises feature the stretch-shortening cycle. Lower limb plyometric exercises include movements like box jumps, squat jumps, and lateral bounds that build explosive power by using the stretch shortening cycle. Other examples are tuck jumps, lunge jumps, depth jumps and single leg hops. These exercises involve a fast eccentric phase followed by a powerful concentric phase to improve power and athletic performance. This involves an eccentric contraction of the muscle-tendon unit, immediately followed by a concentric contraction. This sequence improves the muscles' ability to generate peak force quickly. Plyometrics leverage the elastic properties of muscle fibers and connective tissue, storing energy when slowing down and releasing it when speeding up, thereby boosting explosive performance. [25]Previous research suggests that preloading exercises, such as squats with moderate to heavy weights, can improve subsequent activities using the same muscle groups, even if the movements differ, such as cycling or sprinting. [20]Additionally, circuit training provides athletes with a structured way to combine various exercises that aim to improve speed, strength, and agility at the same time. Plyometric drills, with their rapid eccentric-concentric muscle actions, enhance athletes' ability to produce powerful movements, making them an essential part of cricket-specific conditioning programs. [18]

Need For Study:-
Short interval sprinting is a key part of performance in cricket. During One-Day Internationals and Test matches, players usually sprint around 15 to 18 meters while fielding.[16] Running between wickets often requires maximum effort over 17.68 meters, which is the length of the pitch.([16] Fast bowlers experience the highest physical workload. They complete nearly twice as many sprints, cover more than three times the sprint distance, and work with much lower work-to-rest ratios compared to other players.[25] When comparing match formats, sprinting needs differ significantly. One-Day and T20 cricket require 50 to 100% more sprint efforts per match than Test cricket. However, the longer duration of Test matches leads to overall daily sprinting volumes that can be 16 to 130% greater than in the shorter formats. [25] These findings emphasize the importance of sprinting ability in all forms of the game. To improve these performance traits, plyometric training is often used. This type of training boosts muscle power by taking advantage of the stretch-shortening cycle, usually through drills like hopping, bounding, and jumping.[26] By focusing on quick eccentric and concentric muscle actions, plyometrics aim to increase explosive force production, which supports sprinting and agility tasks in sports. Previous studies across different sports have shown that plyometric training can improve sprint speed and explosive performance. However, there is limited evidence specifically related to cricket. We still know little about how structured plyometric programs influence the sprint speed and agility of cricket players. Given that cricket is not just a sport but also a cultural phenomenon in India, more research in this area is necessary. This study aims to provide scientific evidence on the role of lower-limb plyometric training in enhancing speed, agility, and overall skill-related performance in cricketers.

Inclusion and Exclusion criteria:
Inclusion criteria :
Age – 18 to 25
Club level male cricketers
Players playing club level cricket less than 2 years.
Agility T test score ranging from poor to average (9.5 to 12.5 and more)

Exclusion criteria :
Any kind of Musculoskeletal and neurological impairment
Gym or any lower limb strengthing protocol undergoing
Any pathology like fracture, dislocation on spine, hip, knee and ankle

Any traumatic condition in past 6 months

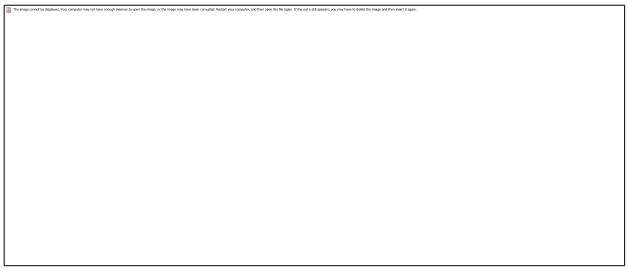
Withdrawal criteria :

- Subject's participation in this project is completely voluntary.
- Subject may withdraw from the project for any reason (or no reason at all), at any time, without penalty of any sort, or loss of benefit to which he would otherwise be entitled.
- Subjects were informed and explained about the right to 'withdrawal of participation' while obtaining consent.

Outcome Measure:

Agility T test

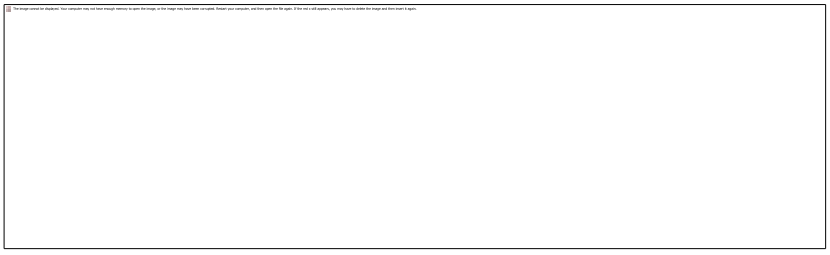
Agilityof each subject will checked using T-test for agility and the data will be collected. The athlete will run forward from point A to B, will shuffle to the left (point C), and then shuffle to right (point D), shuffle back to point B, and will run backward to the start position (point A). Reliability- 0.98



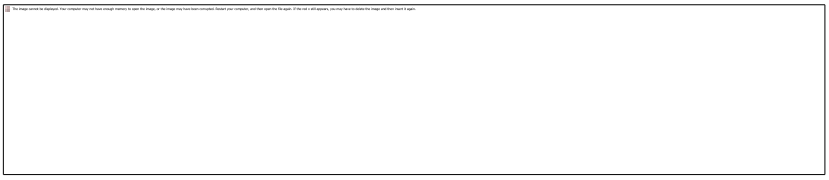
	Males (in seconds
Excellent	<9.5
Good	9.5 to 10.5
Average	10.5 to 11.5
Poor	>11.5

30 M Sprint Speed Test:-

Sprint speed of each subject will checked using 30 m Sprint Speed Test for speed and the data will be collected. The test requires completing a single maximum sprint over a distance of 30 meters, with the duration measured. A comprehensive warm-up must be performed, his initial position should be maintained for 2 seconds before beginning, and no swaying motions are permitted. The tester must offer tips for enhancing speed (like staying low and pushing hard with arms and legs) and motivate them to keep sprinting until they cross the finish line



Gender	Excellent	Above Average	Average	Below Average	Poor
Male	More than 4	4.0 – 4.2	4.3-4.4	4.5-4.6	Less than 4.6

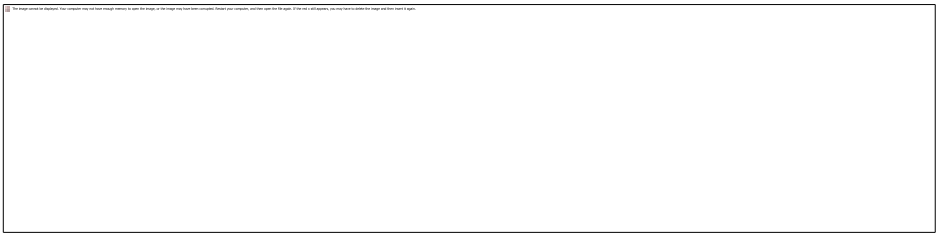


Procedure:

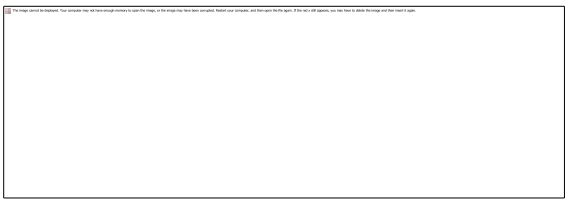
- Ethical Committee Clearance was taken.
- A written consent was taken from every subject in a language understood by the subject.
- Pre intervention agility and sprint was be recorded by Agility T test and 30m sprint speed test respectively.
- Protocol was explained and taken into practice for two days a week in six weeks.
- Post intervention (after 6 weeks) agility was be assessed by Agility T test and sprint speed was assessed by 30 M sprint speed test
- Pre and post data for speed and agility was be statically analyzed

Intervention:

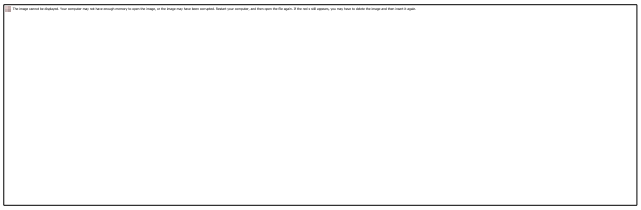
Plyometric 6 – week training protocol:



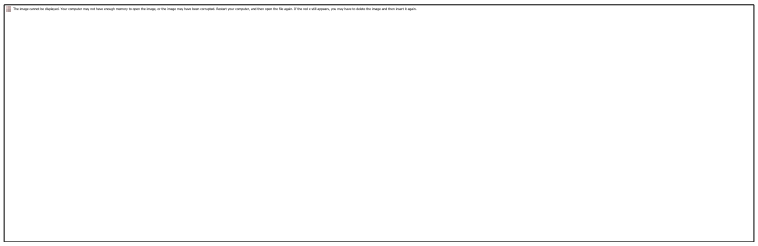
Side to side ankle hops



Standing jump and reach

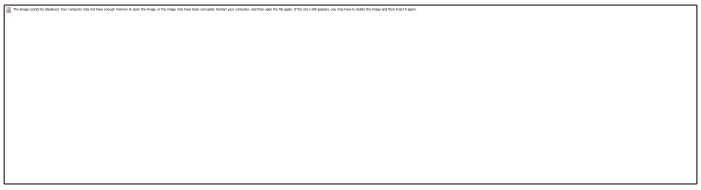


Cone hop with 180 degree turn

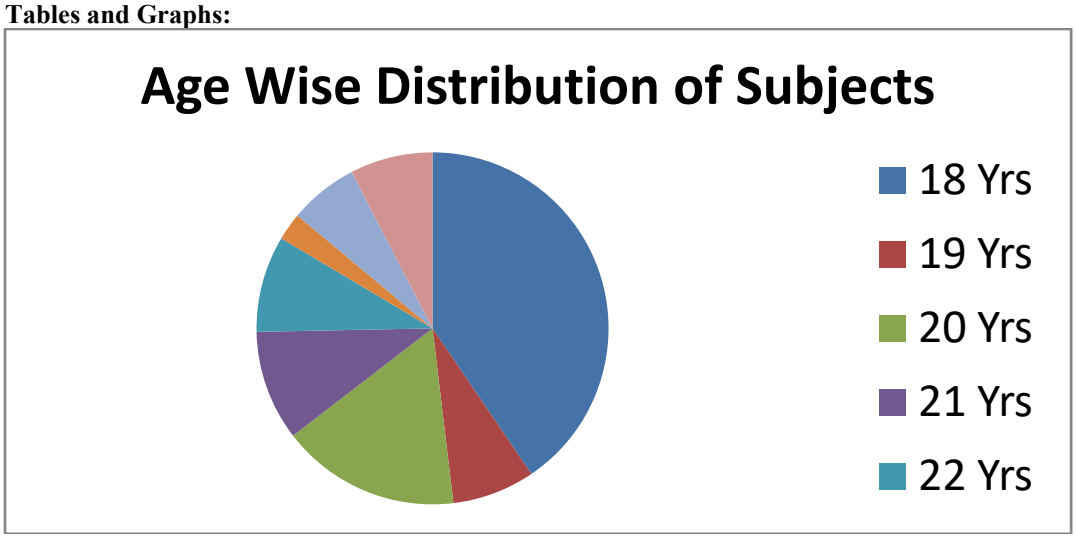


Front cone hops

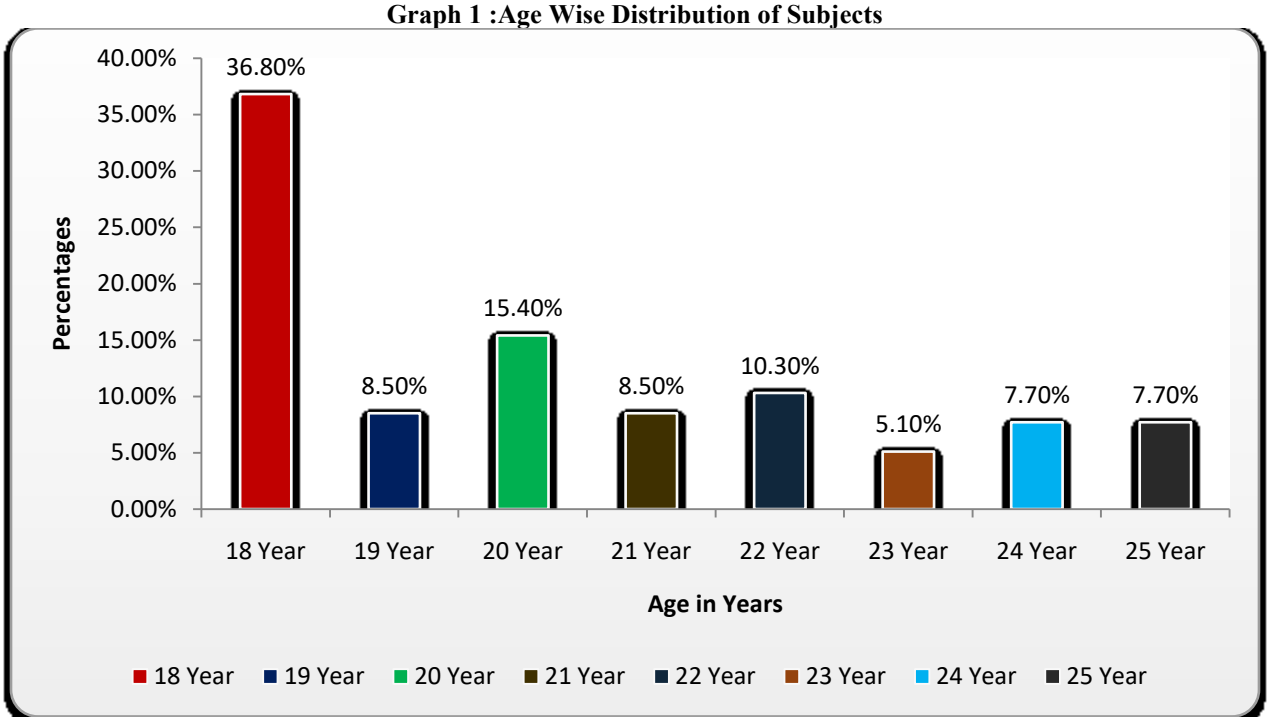
Lateral cone hops



Data Analysis And Interpretation:-
Tables and Graphs:



Graph 1 :Age Wise Distribution of Subjects

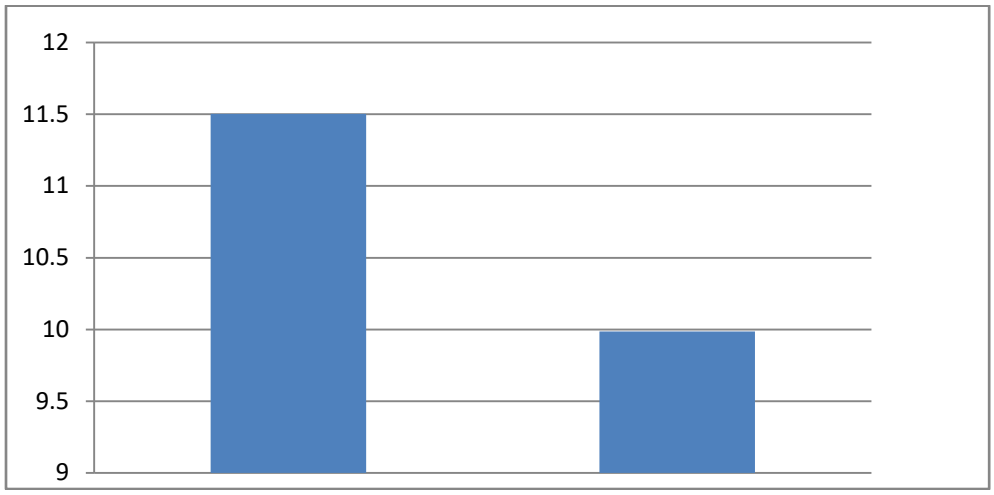


Graph 2: Distribution of Players with regards to age

Agility T Test:-

Outcome Measure (Agility T test)	Mean	t-value	p-value	Significance
Pre Post	11.50 9.98	19.213	<0.001	significant

Table 1 :Represent pre and post Agility T test values



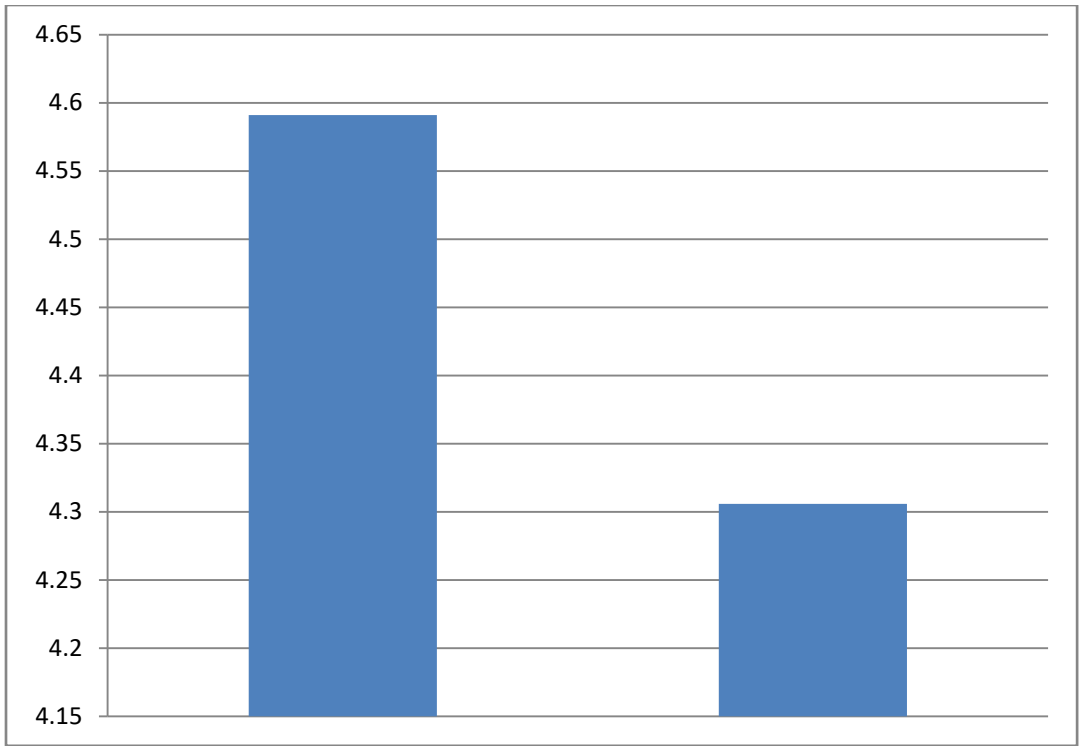
Graph 3: Represents Mean difference in pre and post Agility T test values

Interpretation : The above table depicts that in the pre test the mean of the Agility T test score obtained by the sample was 11.50 and in the post test it reduced to 9.98. The Agility T Test score of the sample shows marked reduction after giving plyometric exercises. From the above table, it is evident that the calculated 't' value is greater than the table value of 't'.
Hence it is statistically interpreted that the Plyometric Exercise among Players was highly effective.

30 m Sprint Test Pre

Outcome Measure (sit reach test)	**Mean**	**t-value**	**p-value**	**Significance**
Pre Post	4.59 4.30	13.958	<0.0001	significant

Table 2 : Represent pre and post 30 m sprint speed values



Graph 4: Represents Mean difference in pre and post 30 m sprint speed values

Interpretation: The above table depicts that in the pretest the mean of the 30 meter sprint Test score obtained by the sample was 4.59 and in the post test it reduced to 4.30. The Sprint Test score of the sample shows marked reduction after giving plyometric exercises. From the above table, it is evident that the calculated't' value is greater than the table value of 't'. Hence it is statistically interpreted that the Plyometric Exercise on 30 Meter Sprint Test among Players was effective.

Results:-

The study includes a total of 117 participants (males) by simple random sampling. Pre intervention Agility T test and 30 m sprint speed was recorded. Lower limb plyometric intervention was given two days a week for six weeks. Post intervention Agility T test and 30 m sprint speed was recorded and data was analyzed.There was significant difference pre mean (11.50) and post mean (9.98) of scores of agility t test. Even, There was significant difference pre mean (4.59) and post mean (4.30) of scores of 30 m sprit speed test.The data was analyzed by using paired T test. A statistically significant decrease were observed for scores of agility t test ($p<0.0001$) and 30 m sprint speed test ($p<0.0001$). Thus, lower limb plyometric are effective to improve agility and sprint speed in club level cricketers.

Discussion:-

This study aimed to evaluate the effect of lower-limb plyometric training on agility and sprint performance among club-level cricketers aged 18–25 years, over a six-week period. A total of 117 male players participated in the program, completing structured plyometric exercises throughout the intervention. Statistical analysis revealed highly significant results, with a p-value of <0.001 considered extremely significant.

Agility:

The present study confirmed that six weeks of plyometric training significantly enhanced agility in club-level cricketers.

Comparable findings have been reported previously. Miller et al. (2006) demonstrated that after a six-week plyometric training program, participants exhibited reduced ground contact time and better agility performance than

controls, confirming the effectiveness of such drills for agility development. [28] Similarly, Francesco F. et al. reported that a 12-week plyometric program for elite female soccer players produced significant gains in the Agility T-Test (P=0.001), along with improvements in explosive strength, sprint speed, and vertical jump. [8]

Hazman Shamshuddin et al. also observed that six weeks of plyometric training in recreational football players significantly improved agility performance (t=2.54, p=0.001), suggesting that plyometric exercises can enhance competitive outcomes. [32] Mohata et al. (2020) found that both circuit and plyometric training improved lower-limb strength, running speed, and agility in lawn tennis players, with plyometric training proving especially effective (18). Likewise, Rameshannan et al. (2014) confirmed that eight weeks of plyometric drills significantly enhanced agility in male handball players, further reinforcing its value in team-based sports. [11]

Plyometric training utilizes the stretch–shortening cycle (SSC), producing rapid eccentric–concentric muscle actions that enhance power output and movement efficiency. Earlier studies confirm that such training improves sprinting, jumping, and agility through exercises demanding quick directional changes and explosive lower-limb actions. [19] When applied systematically, plyometric training enhances strength, proprioception, acceleration, and agility — all of which are crucial for cricket. The current findings therefore support the effectiveness of lower-limb plyometric drills in improving agility among club-level cricketers. [8]

Sprint Speed:
Sprint speed also improved significantly after six weeks of plyometric training in the current study.
These findings are consistent with prior evidence across multiple sports. Francesco F. et al. (2018) showed that an eight-week plyometric program added to regular training significantly improved sprinting ability and lower-limb explosive strength in young athletes. [19] Nikola Aksoviv et al. (2021) demonstrated that plyometric exercises positively influenced explosive power, sprinting speed, and change-of-direction ability in basketball players, confirming their short-term benefits. [3] Similarly, a systematic review by Elena Pardos Mainer et al. (2021) concluded that plyometric training resulted in greater improvements in sprint performance, vertical jump, and agility compared with traditional strength training in female soccer players.

Chelly et al. (2010) reported that an eight-week in-season plyometric program, performed twice weekly, significantly improved sprint times and jump performance in soccer players compared with standard training . [19] Bogdanis et al. (2023) also highlighted that sprint-specific plyometric drills, such as horizontal bounding, enhanced 5 m and 10 m sprint times by increasing horizontal impulse, especially during the initial acceleration phase. [28]

Plyometric training is widely regarded as one of the most effective methods to improve short-term maximal performance such as sprinting. [7] Its effectiveness lies in the stretch–shortening cycle (SSC), where an eccentric muscle action is immediately followed by a concentric contraction. This mechanism allows the musculoskeletal system to generate force rapidly, leading to improvements in sprinting ability. [12]The present study therefore supports the use of lower-limb plyometric training as an effective intervention for enhancing sprint speed in club-level cricketers.

Limitations:-

This studies considered only club level cricketers, further studies could emphasize on elite players also.

Clinical Implications:-
In modern era of cricket where running in between the wickets, fielding fast to save runs or bowl quick , good agility and sprint speed in need. Plyometric are often taken into practice in contact sports. They can also help in non-contact sport such as cricket too.

Future Scope:-

1. Further studies can see combined effects of upper limb and lower limb plyometric exercise to improve shot selection and batting ability of a batsman.
2. Further studies can be done to see effect of plyometric exercise in Frisbee players as it has very limited research.

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