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To Compare the Effects of Sprint and Plyometric Traning Program on Anaerobic Power and Agility in College Level Cricket Players

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ABSTRACT

Objective: Purpose: to compare the effects of sprint and Plyometric training program on anaerobic power and agility in college level cricket players. Material and Method: total number of 40 cricket players will be taken with a mean age of 21.5 with a standard deviation of one. They will be divided into two groups (GROUP A Plyometric training and GROUP B Sprint training). Each group consists of 20 players based on their inclusion criteria. The study will be conducted for 4 weeks (8 sessions) with both the groups. Result: The 2t Confidence level of all tests shows significant change observed i.e. Null hypothesis is rejected and alternate hypothesis is accepted, so that we observed significant improvement along with effectiveness of sprint training program on anaerobic power and agility in college level cricket players. Agility wise distribution of all study subjects of both groups i.e. Group-A: Plyometric training & Group-B: Sprint training. A finding shows Post mean Agility (±SD) is 15.759(±1.64) for group-A &, Post mean Agility (±SD) is 16.741 (±4.11) for Group-B, which represents significant difference between both group.

Conclusion: Hence we concluded that Overall, based on results of this study and previous research, it can be said that the study to find out significant improvement along with effectiveness of Plyometric training program on anaerobic power and agility in college level cricket players, so the null hypothesis is rejected and alternate hypothesis is accepted.

I. INTRODUCTION

Plyometric training is a very popular form of physical conditioning that involves performing body weight jumping type exercises using the stretch-shortening cycle (SSC) muscle action[1,2] Plyometric training – jumping, bounding, and hopping exercises that exploit the stretch-shortening cycle have been shown to enhance the performance of the concentric phase of movement [3] and increase power output[4]. Plyometric exercises have been shown to improve jump performance in many sports. These exercises combine strength with speed of movement to produce power. By using the myotatic stretch reflex of the muscle to produce an explosive reaction, plyometric is believed to be the link between speed and strength. The plyometric method is ranked among the most frequently used methods for conditioning in volleyball .[5]

During a plyometric exercise, the mechanical properties of the Achilles tendon, such as stiffness and dissipative properties, underlie the elastic energy storage-recoil process and the transmission of muscular tension.[6] these mechanical properties may also play a role in debilitating injuries, including Achilles tendon rupture or tendinopathy.[7]

According to Markovic and Mikulic, plyometric training has frequently been used for improving human neuromuscular function and improving performance in both explosive and endurance athletic events [8]

Most researchers and practitioners seem to agree that plyometric training represents a method of choice when aiming to improve athletes' explosiveness and dynamic performance, particularly those involving the stretch-shortening cycle (SSC) .[9]

Sprint running is also an explosive movement and is commonly used as a testing exercise in many individual and team sports. However, possible use of this potentially useful explosive exercise for the training purpose has been neglected within sports science literature.[10]

- All stated suggest that sprint running could be an effective training method for the development of leg extensor strength and power, as well as dynamic performance of athletes. In addition, due to concentric and SSC force production during sprinting[10]
- Cricket is a team game and cricketers have to performed different role as a bowler, fielder or as batsman in a same game which consists of intermittent activity during which players are required to repeatedly perform striding, sprinting, turning and jumping, which place considerable demands on the physiological neuromuscular system[11,12,13].
- Plyometrics are training techniques used by athletes in all types of sports to increase strength and explosiveness or power [14] and plyometric

is typically consists of rapid stretching of a muscle (eccentric action or lengthening phase) immediately followed by concentric or shortening (shortening phase) action of the same muscle and connective tissue this whole process called as stretch-shortening cycle [15]

II. STATEMENT OF QUESTION

Sprint and plyometric training program on anaerobic power and agility in college level cricket players are effective or not?

III. PURPOSE OF STUDY

- To compare the effects of Sprint and Plyometric training program on Anaerobic power and agility in college level cricket players.
- The result of this study would help the cricket players to decide and select more efficient Exercise protocol for the best performance of cricket game**.**

IV. HYPOTHESIS

NULL HYPOTHESIS (H0)

It states that there will be no significance difference in effects of sprint and plyometric training program on anaerobic power and agility in college level cricket players.

ALTERNATE HYPOTHESIS (H1)

It states that there will be significance effects of sprinttrainin program on anaerobic power and agility in college level cricket players

ALTERNATE HYPOTHESIS (H2)

It states that there will be significance effects of plyometric training program on anaerobic power and agility in college level cricket players.

V. METHODOLOGY

SUBJECTS

Total number of 40 subjects will be taken according to the inclusion and exclusion criteria. Those who satisfy the criteria will be allowed to participate in the study.

STUDY SETUP

All subjects will be taken from **GIC Cricket Ground, MIRZAPUR**

STUDY DESIGN

Comparative study

INCLUSION CRITERIA

- Involving only male cricket players
- The participants regular play cricket
- The number of the samples are 40
- Age group = 18-25 year

EXCLUSION CRITERIA

- Recent injury
- Trauma of lower leg
- Non regular player
- Not willing to participate
- Ligament reconstruction

VARIABLES

DEPENDENT VARIABLES

- Age
- Weight

- Height
- BMI

INDEPENDENT VARIABLES

- Warm up period
- Cool down period
- Deep breathing in resting period

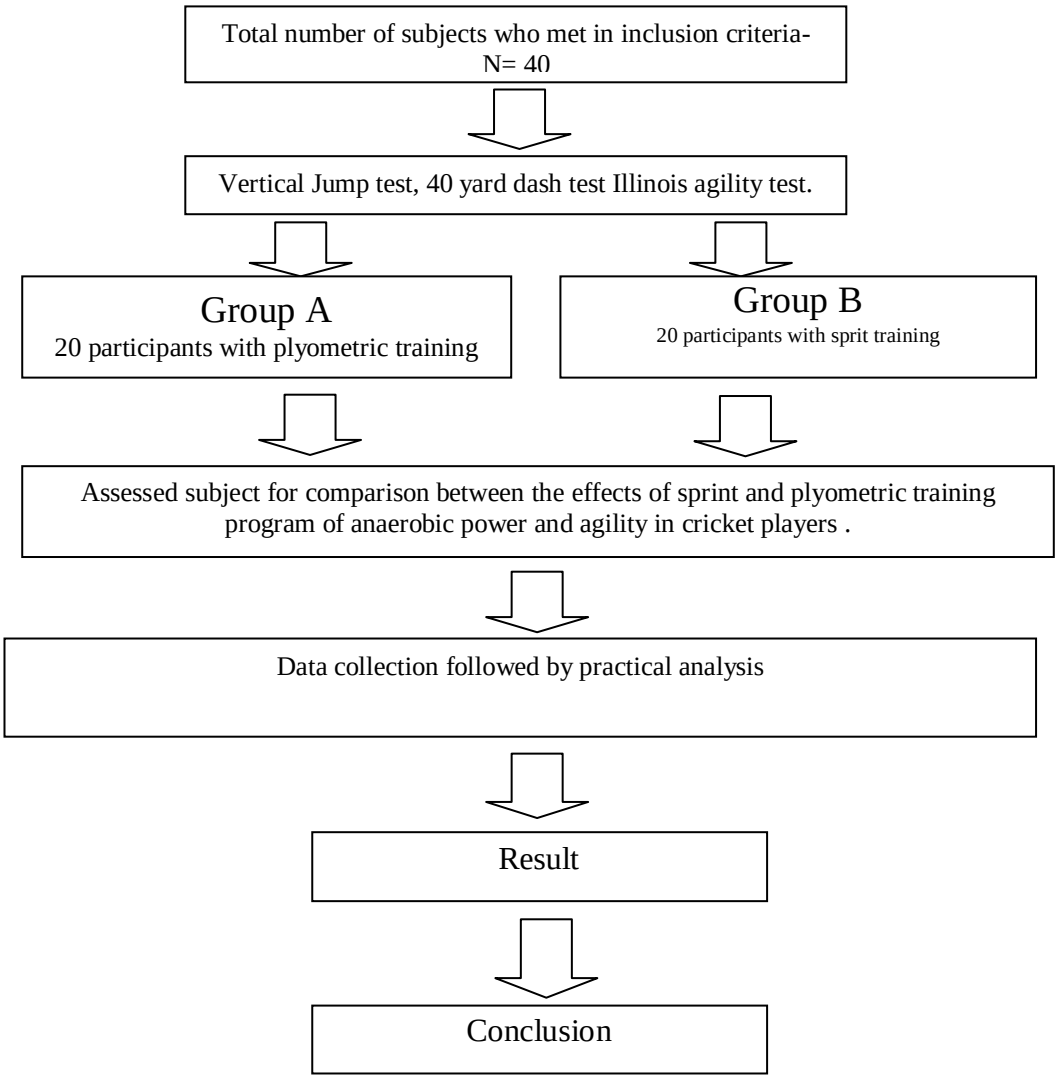
EQUIPMENTS AND TOOLS

- Stop watch
- Measuring tape
- Cones
- Pen
- Document sheet
- Weight machine
- Boxes
- Rope

OUTCOME MEASURE

Effects of sprint and plyometric training program on anaerobic power and agility in college level cricket players.

VI. PROTOCOL



VII. PROCEDURE

A total number of 40 cricket players will be taken with a mean age of 21.5 with a standard deviation of one. They will be divided into two groups (GROUP A Plyometric training and GROUP B Sprint training). Each group consists of 20 players based on their inclusion criteria. The subjects will be taken from **GICCricketGround, MIRZAPUR**. The study will be conducted for 4 weeks (8 sessions) with both the groups. Those who are having lower extremity fracture inflammation and hyper mobility of joints will be excluded from study

TEST PROCEDURE

Prior to Pre test measurement subjects from both groups undergo 10 minutes of warm up which includes 5 minutes of stretching and 5 minutes of jogging. Pre test will be conducted **in 4** session. The first session include an introduction of testing protocol to the **subjects.** The second **session includes** the measurement of Vertical jumping performance. In third session speed will be determined by the 40 yard dash test. During the fourths session Illinois agility performance will be **measured. There** will be a 24 hour pause between the testing session. Pre test measurement will be measure within a week for both groups. Post test measurement will be recorded after 2 days of 8th session.

MEASUREMENT OF VERTICAL JUMP TEST

- In this procedure the subject height was determined by having the subject standing by the side of wall with dominant hand over wall, and heels on the floor. The subject reaches upward as high as possible and marks the wall with chalked finger. The individual then assumes a position next to the wall. From this position the subject maintain a semi-squat position and jumps, making a chalk mark on the wall at the peak of the jump. Subjects were not allowed to hop up or off one foot.

- The jumped height is measured by distance between the standing reach height and the jumping height. Measurements were recorded in centimeters. Each subject had 3 trails jumps in, with approximately 10 to 20 seconds recovery between jumps and the best of the 3 jumps scores were recorded.

ANAEROBIC POWER CALCULATION

Measures of Peak Anaerobic Power Output were determined by the vertical jump test using equation developed and validated by Johnson & Bahamonde (1996). Peak anaerobic power (PAP) is a measure of the highest mechanical power generated during a single moment of push off phase during vertical jump. The highest Vertical Jump Height (cms) along with body mass and jump height was used to calculate Peak Anaerobic Power output in Watts. Where, VJ represents vertical jump, BM – body mass, CMs – centimeters, W – watts

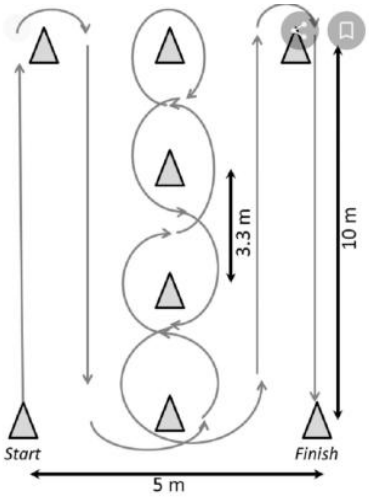
$$\text{Peak power (W)} = 78.6 \times \text{VJ (cm)} + 60.3 \times \text{BM (kg)} - 15.3 \times \text{height (cm)} - 1308$$

MEASUREMENT OF 40 YARD DASH:

The subject will start run on the sound of "whistle", 5 yards(4.5 meter) from the starting line and ended at 40 yard(36.5 meter) line consist of an end rope. Timing was measured using stopwatch which has operated in a 0.001 seconds mode. Each subject was given 3 trails of the 40 yard sprint, with rest recovery 2 minutes in between. The fastest of the three scores was recorded.

MEASUREMENT OF ILLINOIS AGILITY:

In this procedure ,4 cones are placed to form an agility area(10 meter long x 5 meter wide).Cone at point A, marking the start. Cone at B & C to mark the turning spots. Cone at point D to mark the finish. Place four cones in the center of the testing area 3.3 meters apart. Subject's starts running on the command "go" and timing is measured with stopwatch. Subject will touch the cones on the turning spots B and C. Test will be completed when subject crosses the finish line and no cones are knocked over. Each .subject was given 3 trials and fastest 3 scores was recorded.



Illinois agility Diagram

TRAINING PROTOCOL

Plyometric Training

Protocols Group A

Exercise	Week 1	Week 2	Week 3	Week 4
	Number of sets (number of repetitions)			
Vertical jumping	2(10)	2(10)	3(10)	3(10)
Bounding	2(10)	2(10)	3(10)	3(10)
Broad jumping	2(10)	2(10)	3(10)	3(10)
Drop jump	2(10)	2(10)	3(10)	3(10)

REST INTERVAL BETWEEN SETS – 3 MINUTES

Sprint Training Protocol Group B

Weeks	Exercise	Sets	Repetitions
1	15 M sprint	3	3
2	25 M sprint	3	3
3	35 M sprint	3	3
4	45 M sprint	3	3

*M – Meters, Min - Minutes

*Rest interval between Repetitions – 1 min & Sets – 3 min respectively (1st & 2nd Week) 2 min & Sets – 3 min respectively (3rd & 4th Week)3 min

TRAINING PROCEDURE:

Subjects from both the groups undergo 10 minutes of warm up protocol includes 5 minutes of stretching & 5 minutes of jogging prior to training & ends up with 5 minutes of cool down protocol. All players were instructed to wear jogger shoes & players are under supervision during the training period. Both groups received the selected training protocols 2 days a week for 4 weeks (8 sessions) 72 hours will be a sufficient recovery period in between sessions.

DATA ANALYSIS

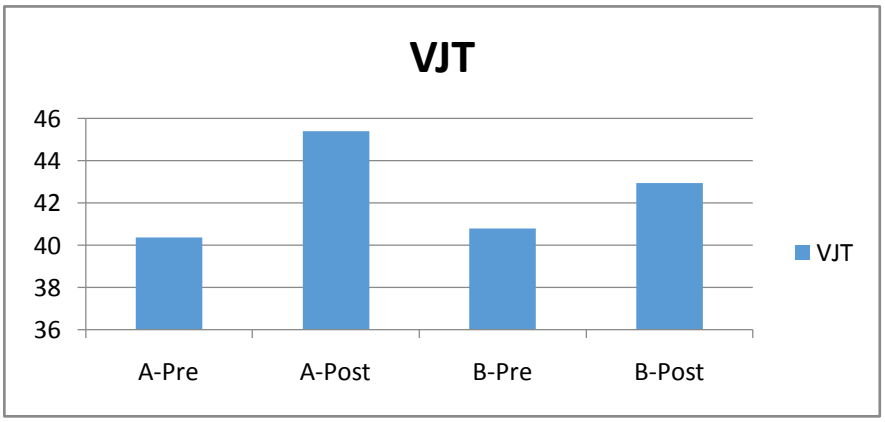
Data analysis was done using IBMSPSS Statistics (software package used for statistical analysis 2019 version-Rev.) Descriptive statistics was done to determine the demographic characteristics of the subjects recruited in this study, t-test used. P-value used in hypothesis tests to help you decide whether to reject or fail to reject a null hypothesis. The p-value is the probability of obtaining a test statistic that is at least as extreme as the actual calculated value, if the null hypothesis is true. A commonly used cut-off value for the p-value is 0.05

	Group-A	Group-B	ΣSD	C=(SD^2)/N	DF	t-Value	p-value
Σ Age	22.35	22.3	0.0025	3.12	28	0.323	0.32
Σ Weight	68.15	66.75	1.96	0.1921	28	0.023	0.085
Σ Height	175.7	170.7	25	31.25	28	0.481	0.433
Σ BMI	22.12	23.33	1.4641	0.1072	28	0.568	0.468
VJT	5.05	2.15	8.41	3.536	28	0.366	0.311
PAP	350.93	192.92	24967.16	311.679	28	0.245	0.511
40 Y-Dash	0.383	0.228	0.024025	2.886	28	0.577	0.465
I. Agility	1.937	0.973	0.929296	0.0431	28	0.472	0.433

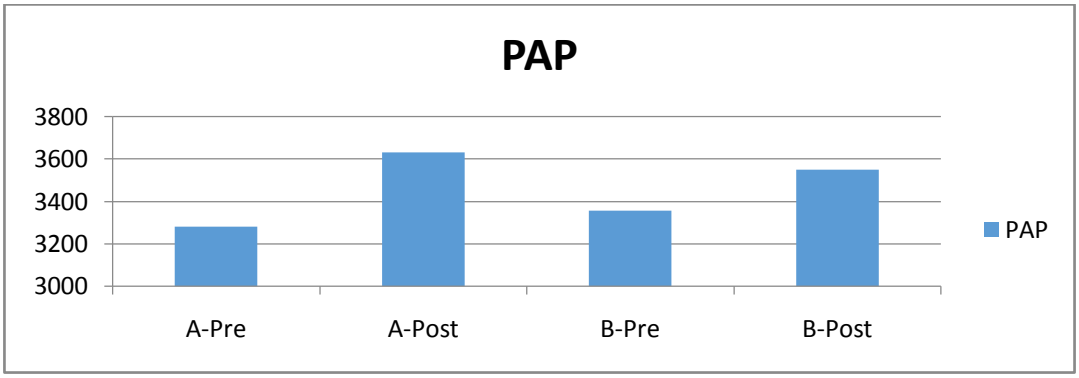
VIII. RESULT

Table-5: Calculation chart for final result

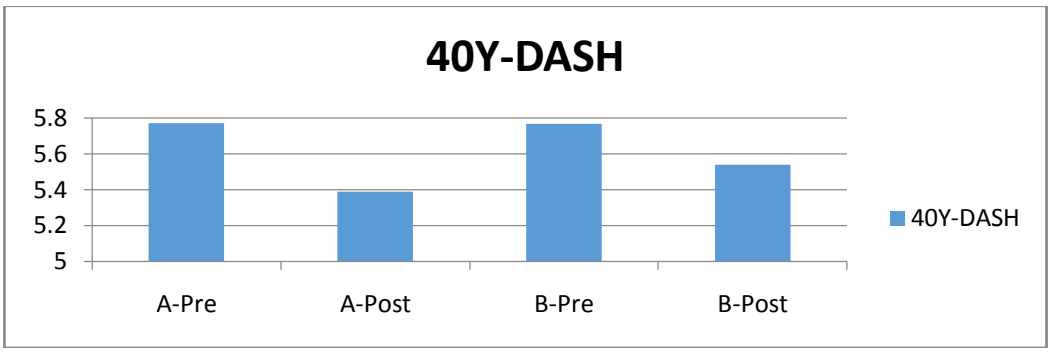
The 2t Confidence level of all tests shows significant change observed i.e. null hypothesis is rejected and alternate hypothesis is accepted, so that we observed significant improvement along with effectiveness of sprint training program on anaerobic power and agility in college level cricket players.



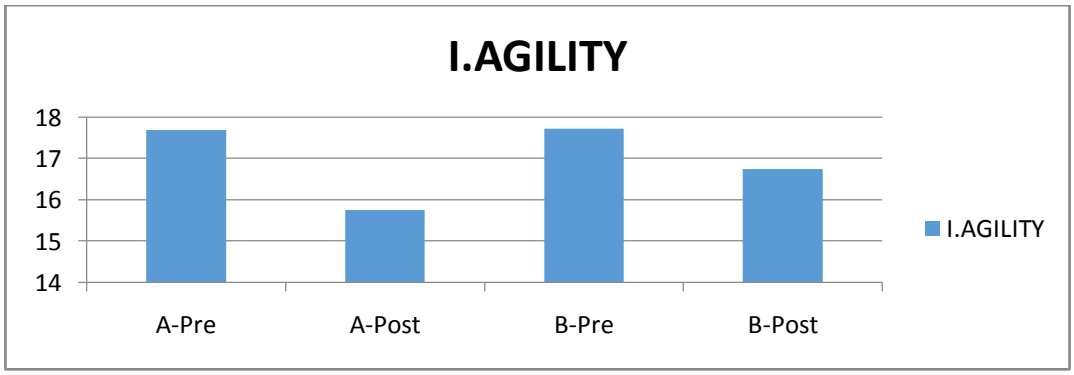
Graph-1: Represents the VJT wise distribution of all study subjects of both groups i.e. Group-A: Plyometric training & Group-B: Sprint training. A finding shows Post mean VJT (±SD) is 45.5(±4.64) for group-A & , Post mean VJT (±SD) is 42.95 (±4.11) for Group-B, which represents significant difference between both group.



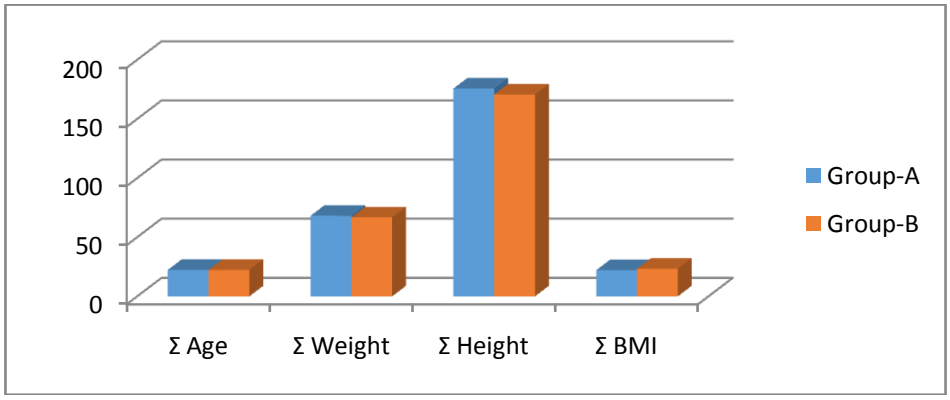
Graph-2: Represents the PAP wise distribution of all study subjects of both groups i.e. Group-A: Plyometric training & Group-B: Sprint training. A finding shows Post mean PAP (±SD) is 3631.73(±3.61) for group-A & , Post mean PAP (±SD) is 35.49.77(±4.43) for Group-B, which represents significant difference between both group.



Graph-3: Represents the 40y-dash wise distribution of all study subjects of both groups i.e. Group-A: Plyometric training & Group-B: Sprint training. A finding shows Post mean 40Y-dash (±SD) is 5.388(±1.64) for group-A & , Post mean 40Y-dash (±SD) is 5.541 (±1.37) for Group-B, which represents significant difference between both group.



Graph-4: Represents the Agility wise distribution of all study subjects of both groups i.e. Group-A: Plyometric training & Group-B: Sprint training. A finding shows Post mean Agility (±SD) is 15.759(±1.64) for group-A & , Post mean Agility (±SD) is 16.741 (±4.11) for Group-B, which represents significant difference between both group.



Graph-5: Represents the compare wise distribution on Age, Weight, Height & BMI of all study subjects of both groups i.e. Group-A: Plyometric training & Group-B: Sprint training. A finding shows no significant difference in all four parameters among both groups.

IX. DISCUSSION

Total 40 subjects (20 subjects in each two groups) were taken according to the inclusion & exclusion criteria, those who satisfied the criteria were allowed to perform the study, All total 40 subjects successfully completed the study. All the subjects were taken from GIC Cricket ground, Mirzapur on inclusion criteria such as gender male only, young aged (Age 18-25years) with cricket player who regularly play cricket. We excluded the subjects with recent injury at beginning or during study. We also found same conclusion of K. Vadivelan 7 S. Sudhakar IJPT Vol.2 (3) June 2015 that

Superiority of Plyometric training group over sprint training group is particularly evident for improvements in anaerobic power &agility. We also found the same conclusion of Goran Markovicet that sprint running also can be used effectively as a training method for improving explosive leg power and dynamic athletic performance. Therefore, in addition to the well-known training methods such as resistance training and plyometric training, strength and conditioning professionals may well incorporate sprint training into an overall conditioning program of athletes striving to achieve a high level of explosive leg power and dynamic athletic performance.

CLINICAL IMPLICATIONS

These data & its conclusion suggest that the study is to compare the effectiveness of Plyometric training program in compare with Sprint training program on anaerobic power & agility in college level cricket players. The result of this study would help the cricket players to decide and select more efficient Exercise protocol for the best performance of cricket game.

FUTURE RESEARCH

This study was conducted for a short period only; future research involving a longer time period & comparing the effects of the two intervention program is possible.

LIMITATION OF THE STUDY

A small sample size was one of the major limitations of the study. Many participants quit during study due to multiple sessions follow-up.

X.CONCLUSION

Hence we concluded that Overall, based on results of this study and previous research, it can be said that the study to find out significant improvement along with effectiveness of plyometric training program on anaerobic power and agility in college level cricket players, so the null hypothesis is rejected and alternate hypothesis is accepted.

REFERENCES

1. Markovic, G and Mikulic, P. Neuro-musculoskeletal and performance adaptations to lower extremity plyometric training.Sports Med 40: 859–895, 2010.
2. Meylan, C and Malatesta, D. Effects of in-season plyometric training within soccer practice on explosive actions of young players.J Strength Cond Res 23: 2605–2613, 2009.
3. ADAMS K, O'SHEA JP, O'SHEA KL, CLIMSTEIN M. The effect of six weeks of squat, plyometrics and squatplyometric training on power production. Journal of Applied Sport Science Research. 1996; 6:36-41
4. GEHRI DJ, RICARD MD, KLEINER DM, KIRKENDALL DT. A comparison of plyometric training techniques for improving vertical jump ability and energy production. Journal of Strength and Conditioning Research. 1998; 12:8589.
5. LEHNERT M, LAMROVA I, ELFMARK M. Changes in speed and strength in female volleyball players during and after a plyometric training program. ActaUniversitatisPalackianaeOlomucensisGymnica. 2009; 39(1):59-66
6. Bosco C, Tihanyi J, Komi PV, Fekete G, Apor P. Store and recoil of elastic energy in slow and fast types of human skeletal muscles. ActaPhysiolScand 116: 343–349 , 1982.
7. Witvrouw E, Mahieu N, Danneels L, McNair P. Stretching and injury prevention: an obscure relationship. Sports Med 34: 443–449 , 2004.
8. Markovic, G and Mikulic, P. Neuro-musculoskeletal and performance adaptations to lower extremity plyometric training.Sports Med 40: 859–895 , 2010.
9. FATOUROS, I.G., A.Z. JAMURTAS, D. LEONTSINI, K. TAXSILDARIS, N. AGGELOUSIS, N. KOSTOPOULOS, AND P. BUCKENMEYER. Evaluation of plyometric exercise training, weight training, and their combination on vertical jumping performance and leg strength. J. Strength Cond. Res. 14:470–476. 2000
10. MERO, A., P.V. KOMI, AND R.J. GREGOR. Biomechanics of sprint running. A review. Sports Med. 13:376–392. 1992.
11. Davies, R., du-Randt, R., Venter, D., Stretch, R. Cricket: Nature and incidence of fast-bowling injuries at an elite, junior level and associated risk factors. South African Journal of Sports Medicine, 2008; 20(4), 115-119.
12. Noakes, T.D. &Durandt, J.J. Physiological requirements of cricket. Journal of Sports Sciences, 2000; 18, 919-929.
13. Bartlett, R.M. The science and medicine of cricket: An overview and update. Journal of Sports Science, 2003; 21, 733–752.
14. Chu, D. Jumping into Plyometrics Exercises for Power and Strength. Champaign, IL: Human Kinetics, 1998
15. Baechle, T.R. and Earle, R.W. Essentials of strength training and conditioning. 2nd edition. Champaign, IL: National Strength and Conditioning Association. 2000
16. Ichrak Bouteraa,1 Yassine Negra,1 Roy J. Shephard,2 And Mohamed Souhaiel Chelly1,3, EFFECTS OF COMBINED BALANCE AND PLYOMETRIC TRAINING ON ATHLETIC PERFORMANCE IN FEMALE BASKETBALL PLAYERS, 34(7)/1967–1973 Journal of Strength and Conditioning Research 2018 National Strength and Conditioning Association.
17. Nobuaki Tottori 1 and Satoshi Fujita, Effects of Plyometric Training on Sprint Running Performance in Boys Aged 9–12 Years, Sports 2019, 7, 219; doi:10.3390/sports7100219.
18. AnaFilipa Silva 1, Filipe Manuel Clemente 2, Ricardo Lima 3, Pantelis T. Nikolaidis4,ThomasRosemann 5 and Beat Knechtle,:The Effect

of Plyometric Training in Volleyball Players: A Systematic Review., Int. J. Environ. Res. Public Health 2019, 16, 2960; doi:10.3390/ijerph16162960.

19. MALCOLM T. WHITEHEAD,1 TIMOTHY P. SCHEETT,2 MICHAEL R. MCGUIGAN,2 AND ANGEL V. MARTIN3, A COMPARISON OF THE EFFECTS OF SHORT-TERM PLYOMETRIC AND RESISTANCE TRAINING ON LOWER-BODYMUSCULAR PERFORMANCE, 32(10)/2743–2749 Journal of Strength and Conditioning Research 2017 National Strength and Conditioning Association.

20. MARCO BEATO,1 MATTIA BIANCHI,2 GIUSEPPE CORATELLA,3 MICHELE MERLINI,4 AND BARRY DRUST5,EFFECTS OF PLYOMETRIC AND DIRECTIONAL TRAINING ON SPEED AND JUMP PERFORMANCE IN ELITE YOUTH SOCCER PLAYERS, 32(2)/289–296 Journal of Strength and Conditioning Research 2017 National Strength and Conditioning Association.

21. ABBAS ASADI,1 HAMID ARAZI,2 RODRIGO RAMIREZ-CAMPILLO,3,4JASON MORAN,5 AND MIKEL IZQUIERDO6, INFLUENCE OF MATURATION STAGE ON AGILITY PERFORMANCE GAINS AFTER PLYOMETRIC TRAINING: A SYSTEMATIC REVIEW AND META-ANALYSIS, 31(9)/2609–2617 Journal of Strength and Conditioning Research 2017 National Strength and Conditioning Association.

22. BahriGjinovci 1 Kemal Idrizovic 2 OgnjenUljevic 3 and DamirSekulic, Plyometric Training Improves Sprinting, Jumping and Throwing Capacities of High Level Female Volleyball Players Better Than Skill-Based Conditioning, Journal of Sports Science and Medicine (2017) 16, 527-535.

23. Maamer Slimani1,2, Karim Chamari3, Bianca Miarka4, Fabricio B. Del Vecchio4, Foued Chéour5, Effects of Plyometric Training on Physical Fitness in Team Sport Athletes: A Systematic Review, Journal of Human Kinetics volume 53/2016, 231-247 DOI:10.1515/hukin-2016-0026.

24. JASON J. MORAN,1 GAVIN R.H. SANDERCOCK,1 RODRIGO RAMI´REZ-CAMPILLO,2CE´ SAR M.P. MEYLAN,3 JAY COLLISON,1 AND DAVE A. PARRY1, AGE-RELATED VARIATION IN MALE YOUTH ATHLETES'COUNTERMOVEMENT JUMP AFTER PLYOMETRIC TRAINING:AMETA-ANALYSIS OF CONTROLLED TRIALS, 31(2)/552–565 Journal of Strength and Conditioning Research 2016 National Strength and Conditioning Association.

25. Bedoya, Abigail A.1; Miltenberger, Matthew R.2; Lopez, RebeccaM.,:Plyometric Training Effects on Athletic Performance in Youth Soccer Athletes A Systematic Review, Journal of Strength and Conditioning Research: August 2015 - Volume 29 - Issue 8 - p 2351-2360.

26. López Ochoa, S.; Fernández Gonzalo R. y De Paz Fernández, J.A. (201x). Effect of plyometric training on sprint performance. RevistaInternacional de Medicina y Ciencias de la ActividadFísica y elDeporte vol. 14 (53) pp. 89-104.

27. Moazzam Hussain Khan, Kamran Ali,The effects of grass and clay plyometric training on jumping, sprinting and agility in collegiate cricketers., International Journal of Biomedical and Advance Research · December 2013 DOI: 10.7439/ijbar.v4i12.575.

28. KARIN VASSIL, BORIS BAZANOVK:The effect of plyometric training program on young volleyball players in their usual training Period, 6th INSHS International Christmas Sport Scientific Conference, 11-14 December 2011. International Network of Sport and Health Science. Szombathely, Hungary. JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

29. HAMID ARAZI 1 , ABBAS ASADI:The effect of aquatic and land plyometric training on strength, sprint, and balance in young basketball players, JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202 © Faculty of Education. University of Alicante doi:10.4100/jhse.2011.61.12.

30. AlexandreFouré, Antoine Nordez, and Christophe Cornu,: Plyometric training effects on Achilles tendon stiffness and dissipative Properties, 8750-7587/10 Copyright © 2010 the American Physiological Society.

31. GORAN MARKOVIC, IGOR JUKIC, DRAGAN MILANOVIC, AND DUSAN METIKOS:EFFECTS OF SPRINT AND PLYOMETRIC TRAINING ON MUSCLE FUNCTION AND ATHLETIC PERFORMANCE, Journal of Strength and Conditioning Research, 2007, 21(2), 543–549- 2007 National Strength & Conditioning Association.

32. Zearei H, Ramezanpourb MR, Pakdelanc S, J Basic ApplSci Res, 2013, 3, 343.

33. EDWIN RIMMER AND GORDON SLEIVERT: Effects of a Plyometrics Intervention Program on Sprint Performance, Zearei H, Ramezanpourb MR, Pakdelanc S, J Basic ApplSci Res, 2013, 3, 343.

34. Bloomfield, J., Ackland, T. R., & Elliot, B. C. (1994). Applied anatomy and biomechanics in sport. Melbourne, VIC: Blackwell Scientific.

35. Barrow, H., & McGee, R. (1971). A practical approach to measurement in physical education. Philadelphia, PA: Lea &Febige.

36. Fleck SJ, Kraemer WJ. Fundamentos do treinamento de força muscular. ArtMed. 1999:247.