Effect of Core Strengthening and Agility Training in Recreational Cricketers for Improving Balance

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Abstract

Background: Since cricket is one of the most widely practiced sports in India among all age groups, it is growing in significance globally. Bowling is one of many sports activity that demands intricate synchronization between the upper and lower extremities. Stability in this area is suggested to be necessary for both injury prevention and peak sports performance because the core serves as the connecting element between the upper and lower extremities. By preparing the body holistically, safely, and effectively, core strengthening promotes balance and postural control.

Hypothesis: It is hypothesized that there will be no effect of core strengthening and agility training on balance of cricketers.

Methodology: The study was a single group pre-test post-test quasi experimental design. The study recruited 12 participants, between the age of 21-26 years and were recreational cricket players. The study recruited both male and female recreational cricket players with the % of males being 57% and females being 43%. The pre-test and post-test analysis was done using the Y-balance test. The intervention was divided into three broad sections warm up phase, training phase and cool down phase.

Results: The normality testing of the data showed normal distribution. Thus, paired t-test was applied to obtain the difference between pre-test and post-test value scores. There was significant difference between the pre-test and post-test values (p-value<0.05).

Discussion: In sports, the core is especially crucial since it offers "proximal stability for distal mobility." Force is delivered from the core, sometimes referred to as the powerhouse, to the limbs via the muscles that span the upper and lower limbs. Maintaining a neutral spine is first necessary for stability, but going beyond the neutral zone needs to happen gradually. As depicted by the results of the study, core training, agility training are concomitantly related to the balance training strategies in athletes, this can be justified with the fact that the overall performance of an individual is subjective to the capacity to maintain balance is influenced by both the motor and sensory systems.

Conclusion: An overall training regime inclusive of core strengthening and agility training can improve core strength, agility and balance in sports persons

Keywords: Sports, Cricket, Training, Exercise, Agility, Core
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Introduction

Since cricket is one of the most widely practiced sports in India among all age groups, it is growing in significance globally. There's a chance that the players' higher physical demands will result in more injuries.[1] It is a stamina-based sport with sporadic power and speed spurts. When it comes to the physical

requirements, the majority of game-changing situations include rapid motion or intense action. Fast bowling, diving for a catch, running to score runs or stop a boundary, and tossing the ball for a chance to run out are a few instances of such actions.[2] Since the core serves as the link between the upper and lower limbs, beginners in cricket need to have strong adequate core muscles. Thus, it needs to be robust enough to shield cricket players from lower limb and low back problems. For professional cricket players to reduce their risk of injury, core muscle strength is crucial.[3]

Bowling is one of many sports activity that demands intricate synchronization between the upper and lower extremities. Stability in this area is suggested to be necessary for both injury prevention and peak sports performance because the core serves as the connecting element between the upper and lower extremities.[4] Athletes that have imbalances in their core muscles experience higher fatigue, lower endurance, and injury.[5] By preparing the body holistically, safely, and effectively, core strengthening promotes balance and postural control.[6] Stability in this area is suggested to be necessary for both injury prevention and peak sports performance because the core serves as the connecting element between the upper and lower extremities.[7] The basis for explosive motions and control (agility, balance, and coordination) is core stability.[8]

When it comes to bowling, having optimal balance is essential, particularly during the single limb support portion of the action when the bowler must keep his balance during this high-load activity.[8] Although these terms are frequently used in cricket, one essential term which marks the basis of optimal balance is the agility of an individual. Being the essential element of cricket, agility is a collective coordination skill that encompasses speed, balance, and coordination. It also has a significant impact on a player's performance.[9] There are many articles that suggest the physiotherapy exercises for pre training sessions which enhance agility, balance and core separately. But there is still lack of articles which estimate the effect of these exercises on balance maintenance of cricketers. Thus, we hypothesize that there will be no effect of core strengthening and agility training on balance of cricketers.

Methodology

The study was a single group pre test post test quasi experimental design. The study recruited 12 participants from Sports Complex. Participants were recruited if they were between the age of 21-26 years and were recreational cricket players. Participants were excluded if they had any recent Injury, trauma of lower limb, were not willing to participate, any Musculoskeletal injuries, needed any sort of Nutritional supplements in their diets or were psychological patient. The study recruited both male and female recreational cricket players with the % of males being 57% and females being 43%. The pre-test and post-test analysis was done using the Y-balance test.

Intervention

The intervention was divided into three broad sections warm up phase, training phase and cool down phase. The detailed intervention is mentioned in the Table 1. Figure 1 depicts the training of such athletes within the complex.

- WARM-UP Phase

EXERCISE NAME	Rep/ set /sec	ATHLETE POSITION	PROCEDURE
1.**Jumping Jacks**	10REP/1SET/3SEC	Stand straight with feet together and hands by his sides.	Athlete jumps up ,spread his feet and brings both hands together above his head . Then he jumps again and returns to his starting position
SWS2.**Bent over**	10REP/1SET/3SEC	Stand straight with feet	Athlete bends and

twist		slightly wider than shoulder and both shoulder abducted to 90 degree	rotates his torso to the right ,touching his right feet with his left hand and then returns to normal position .
3.Standing side crunches	10REP/1SET/3SEC	Athlete Stand with his knees slightly bend and feet apart along with his hand behind his head.	Athlete shifts his weight to the left leg , crunch to the right side and bring his right knee up towards his elbow . Lower his right leg and return to starting position
4.Mountain climber	10REP/1SET/3SEC	Athlete in plank position with both hands and knees in on the floor .	Athlete places his right foot near his right hand and extend his left leg behind him . In smooth motion , switch his legs keeping his arm in the same position .
5.High Knees	10REP/1SET/3SEC	Athlete stands with his feet hip width apart.	Athlete lifts his left knee to his chest. Switch to lift his right knee to his chest .Continue the movement, alternating legs and moving at a sprinting or running pace .

- Training Phase

Week 1:

EXERCISE	REP/SET/SEC	ATHLETE POSITION	PROCEDURE
1.SUPINE BRIDGE	10REP/2SET/3SEC	Supine position with knees bend and foot on the floor.	Athlete is asked to lift his hip off the ground while contracting his abdomen and squeezing gluteal muscle. Keeping spine in neutral position.
2. QUADRUPED ALTERNATE ARM LEG RAISE	10REP/2SET/3SEC	Quadruped position	The athlete simultaneously lifts his opposite limb from the ground while contracting his abdomen.
3.CROSSOVER CRUNCH	10REP/2SET/3SEC	Supine lying with right ankle crossover the left knee and vice versa.	Athlete slowly raises his upper body from the floor then twist his trunk and brings his right elbow towards the right knee

			and exhales as he contracts his abdominal muscle
4.SINGLE LEG STANCE	1SET/2MIN	STANDING	Athlete stands on one foot while his other leg is lift from the ground with knee and making a 90degree angle.

Week 2:

EXERCISE	**REP/SET/SEC**	**ATHLETE POSITION**	**PROCEDURE**
1.SUPINE BRIDGE	10REP/2SET/3SEC	Supine position with knees bend and foot on the floor.	Athlete is asked to lift his hip off the ground while contracting his abdomen and squeezing gluteal muscle . keeping spine in neutral position .
2. QUADRUPED ALTERNATE ARM LEG RAISE	10REP/2SET/3SEC	Quadruped position	The athlete simultaneously lifts his opposite limb from the ground while contracting his abdomen .
3.CROSSOVER CRUNCH	10REP/2SET/3SEC	Supine lying with right ankle crossover the left knee and vice versa.	Athlete slowly raises his upper body from the floor then twist his trunk and brings his right elbow towards the right knee and exhales as he contracts his abdominal muscle
4.SINGLE LEG STANCE	1SET/2MIN	STANDING	Athlete stands on one foot while his other leg is lift from the ground with knee and making a 90degree angle.

Week 3:

EXERCISE NAME	**REP/SET/SEC**	**ATHLETE POSITION**	**PROCEDURE**
1.LUNGES WITH MEDICINE BALL TWIST	10REP/3SET/5SEC	STANDING	Athlete lunges forward and then twist his trunk with the medicine ball in his hand and then returns to the normal standing position
2.PHYSIOBALL LUNGES	10REP/3SET/5SEC	Standing with his one knee flexed and the ankle lies on the physio-ball	The athlete lunges and pushes the ball away with his ankle, still maintaining contact and then comes back to normal position.

Cool Down Phase:

EXERCISE NAME	**REP/SET/SEC**	**ATHLETE POSITION**	**PROCEDURE**
1.CHILD POSE	10REP/1SET/3SEC	KNEEL SITTING	Sit down on your heel and stretch your arm in front of you.
2.OBLIQUES STRETCH	10REP/1SET/3SEC	STANDING	Stand upright, raise your left arm and lean your torso top the right

			until you feel the stretch in the obliques.
3.CAT CAMEL STRETCH	10REP/1SET/3SEC	QUADRUPED POSITION	Drop your head and round your back and neck by pulling your abs in. Hold and then lift your head and round your back down towards the floor.
4.KNEE TO CHEST	10REP/1SET/3SEC	SUPINE POSITION	Lie down on your back and then slowly pull your knees towards the chest.

Figure 3: Recreational Cricketers undergoing Training session in group

Statistical Analysis

The data was analysed using SPSS version 20.0. The data was collected after which the normality testing of the data was performed using Shapiro wilk test. The test scores were mentioned in the form of Mean, Standard Deviation and p-value. After this pre-test values and post-test values were evaluated for obtaining p-value. The p-value was considered significant if the p-value was obtained to be below 0.05

Results

Table 2 represents the normality testing of the demographics and the pre-test values. The normality testing of the data showed normal distribution. Thus, paired t-test was applied to obtain the difference between pre test and post test value scores. Table 4 represents the differentiation between pre-test and post-test values.

Table 2: Normality testing:

S. No	Variable	Mean ± SD	p-value
1.	Age	23.71 ± 0.47	0.43
2.	Height	5.43 ± 0.10	0.90
3.	Weight	55.29 ± 2.59	0.43
4.	BMI	20.94 ± 0.61	0.02
5.	LL	91.14 ± 4.03	0.07

6.	PRE_A	94.71 ± 5.11	0.96
7.	PRE_M	88.29 ± 6.34	0.74
8.	PRE_L	90.71 ± 5.03	0.91
9.	PRE_YB	3 ± 0.11	0.09

Abbreviations: LL- Limb length (Lower extremity), Pre_A: Distance covered in Anterior direction- Pre, Pre_M: Distance covered in Medial direction- Pre, Pre_L: Distance covered in Lateral direction- Pre, Pre_YB: Total Y-balance score

Table 3: Pre-test and Post-test analysis:

S.NO	VARIABLE	MEAN ± SD	t-value	p-value
1.	PRE_A	94.71 ±13.53	-0.819	0.04
2.	POST_A	97.57 ± 10.83		
3.	PRE_M	88.29 ± 16.77	-1.68	0.05
4.	POST_M	95.85 ± 15.13		
5.	PRE_L	90.71 ± 13.31	-1.9	0.01
6.	POST_L	95 ± 14.82		
7.	PRE_YB	3 ± .03	-1.59	0.032
8.	POST_YB	3.16 ± 0.21		

Abbreviations: LL- Limb length (Lower extremity), Pre_A: Distance covered in Anterior direction- Pre, Pre_M: Distance covered in Medial direction- Pre, Pre_L: Distance covered in Lateral direction- Pre, Pre_YB: Total Y-balance score

Discussion

In sports, the core is especially crucial since it offers "proximal stability for distal mobility." Force is delivered from the core, sometimes referred to as the powerhouse, to the limbs via the muscles that span the upper and lower limbs. Maintaining a neutral spine is first necessary for stability, but going beyond the neutral zone needs to happen gradually.[10] In sports such as running or sprinting or which require the athlete to run for a moderate distance, may experience increased fatigue, lower endurance, and injury as a result of imbalances or weaknesses in their core muscles.[11] Stability in this area is suggested to be necessary for both injury prevention and peak sports performance because the core serves as the connecting element between the upper and lower extremities.[7] Core stability is defined by the kinetic chain theory as the capacity to regulate the trunk's position and movement over the pelvis to permit the best possible force production, dissipation, and transmission to the extremities during movement. It is thought that a weak core alters the way energy is transferred, which lowers athletic performance and increases the chance of injury to a weak or underdeveloped muscle group.[4]

Dynamic joint stability is the result of neuromuscular training, optimal balance and most importantly appropriate agility which is characterized as training that improves unconscious motor responsiveness by activating cerebral processes and afferent signals.[12] Due to its high load, dynamic, and asymmetrical nature, bowling is likely to need neuromuscular control, and in particular, outstanding balance.[13] By strengthening performance and promoting neuromuscular control, balance training is beneficial in reducing static postural sway and increasing dynamic balance.[14] These fundamentals of technical skills—adaptive ability, balance, combinatory ability, differentiation, orientation, reactivates, and rhythm—are needed to carry out a range of motor tasks, from active gross activities to fine motor control tasks.[15] As depicted by the results of the study, core training, agility training are concomitantly related to the balance training strategies in athletes, this can be justified with the fact that the overall performance of an individual is subjective to the capacity to maintain balance is influenced by both the motor and sensory systems.[16]

The results of study showed significant difference within the balance parameters of athletes. However, this study has some

limitations. Firstly, this study was a single group study hence the effectiveness of the rehabilitation protocol could not be measured. Secondly, the training was implied to healthy recreational players which gave significant results both statistically and clinically but their overall game performance and the incidence of risk of injury was not evaluated after the end of protocol. Thus, it is suggested that the training protocol can be further utilised to perform randomized controlled trials not only on healthy individuals but also on cricketers or other sportsperson post injury. The fact that these athletes also attended their regular training sessions for cricket daily without any hinderance to their daily life routine could act as a confounder here. But since the p-value was obtained satisfactory, null hypothesis is rejected.

Conclusion

An overall training regime inclusive of core strengthening and agility training can improve core strength, agility and balance in sports persons.

References

1. Ajesh Jacob, (2019) Effectiveness of Swiss Ball Vs Floor Exercises on Core Muscles Strengthening in Elite Cricketers. 15 Sep 2019 17:11
2. Herridge, Ross1; Turner, Anthony2; Bishop, Chris2. Monitoring Changes in Power, Speed, Agility, and Endurance in Elite Cricketers During the Off-Season Period. Journal of Strength and Conditioning Research 34(8):p 2285-2293, August 2020. | DOI: 10.1519/JSC.0000000000002077
3. R. A. Stretch. The incidence and nature of injuries in first-league and provincial cricketers. S Air Med J. 1993; 83(5):339-42.
4. Sharrock C, Cropper J, Mostad J, Johnson M, Malone T. A pilot study of core stability and athletic performance: is there a relationship?. *Int J Sports Phys Ther*. 2011;6(2):63-74
5. Bliss LS, Teeple P. Core stability: the centerpiece of any training program. Curr Sports Med Rep. 2005 Jun;4(3):179-83. doi: 10.1007/s11932-005-0064-y. PMID: 15907272.
6. Carlos E Riveria , (2016) Core and Lumbopelvic Stabilization in Runners February 2016
7. Rivera CE. Core and Lumbopelvic Stabilization in Runners. *Phys Med Rehabil Clin N Am*. 2016;27(1):319-337. doi:10.1016/j.pmr.2015.09.003
8. Sneha Baa, Hani Patel (2021) Effects of neuromuscular training on agility, balance and functional performance in young cricketers 21-09-2021
9. Shloka Jayawant, Victoria Kuttan. Assessment and comparison of agility in cricketers depending on their playing position-an observational pilot study. International Journal of Science & Healthcare Research. 2022; 7(3): 61-65. DOI: https:// doi.org/10.52403/ijshr.20220711
10. Akuthota, Venu1; Ferreiro, Andrea1; Moore, Tamara2; Fredericson, Michael3. Core Stability Exercise Principles. Current Sports Medicine Reports 7(1):p 39-44, January 2008.
11. Hanan A, Asad U, Asghar N, et al. Effect of core muscle strengthening on throwing velocity in cricket players in Pakistan: a 6-week randomized controlled trial. *J Sports Med Phys Fitness*. 2022;62(9):1147-1152.
12. Martins HS, Lüdtke DD, César de Oliveira Araújo J, et al. Effects of core strengthening on balance in university judo athletes. *J Bodyw Mov Ther*. 2019;23(4):758-765.
13. Shanali Jain and Nipa Shah (2021) Correlation of balance, core endurance and power performance in male cricketers of different maturity status 09-06-2021
14. P Ratan Khuman, Thongam Kamlesh (2014) Comparison of static and dynamic balance among collegiate cricket, soccer and volleyball male players
15. Ruchi Srivastava, Atul Sharma, Dr. Rajendra Prasad Agility and its Impact on Performance of Cricketers with

Relation to Anthropometry April 26, 2017

16. Zech A, Hübscher M, Vogt L, Banzer W, Hänsel F, Pfeifer K. Balance training for neuromuscular control and performance enhancement: a systematic review. *J Athl Train*. 2010;45(4):392-403.