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EFFECT OF BOSU BALL VERSUS PLYOMETRICS TO IMPROVE AGILITY AND BALANCE AMONG ELITE CRICKET PLAYERS – A COMPARATIVE STUDY

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ABSTRACT

Background: Cricket is a dynamic sport that requires optimal dynamic balance and agility for efficient performance during activities such as running, sudden directional changes, bowling, and fielding. Impaired balance and agility may increase the risk of lower limb injuries and affect overall athletic performance. Training interventions such as BOSU ball training and plyometric exercises are commonly used to enhance neuromuscular control, balance, and agility in athletes.

Methodology: A comparative interventional study was conducted on elite cricketers aged between 18–25 years. Participants were randomly divided into two groups: Group A received BOSU ball training and Group B received plyometric training. Both groups underwent supervised exercise sessions for a duration of 4 weeks. Dynamic balance was assessed using the Modified Star Excursion Balance Test (MSEBT), and agility was measured using the Agility T-Test. Pre- and post-intervention data were analyzed using non parametric test. Statistical significance was set at $p < 0.05$.

Results: Both groups demonstrated statistically significant improvement in dynamic balance and agility following the intervention ($p < 0.05$). However, the plyometric training group showed comparatively greater improvement than the BOSU ball training group.

Conclusion: Both BOSU ball training and plyometric exercises are effective in improving dynamic balance and agility among elite cricketers. However, plyometric training was found to be more effective compared to BOSU ball training.

Keywords: BOSU ball, Plyometric training, Dynamic balance, Agility, Elite cricketers, Modified Star Excursion Balance Test

INTRODUCTION

Cricket is a global sport traditionally popular in the commonwealth nations but now being played in 105 member countries of the International Cricket Council. Cricket is the world's second-most popular spectator sport after football and has captivated people of every age, sex, background, and ability for more than 400 years. A bat-and-ball game with complex rules, cricket involves physical fitness, skill, and strategy. Cricket is played on a rectangular pitch centered on an oval field with 11 players on a team. Each side comprises batsmen, bowlers, fielders, and a wicket-keeper [1].

Elite cricketers demonstrate a unique blend of psychological resilience and specialized physical characteristics that contribute to their high-performance levels. Research on mental toughness in cricket shows that elite players consistently exhibit stronger self-belief, emotional control, attentional focus, and resilience compared to sub-elite players, allowing them to perform effectively under pressure and recover quickly from errors during competitive play [2].

Agility is defined as the ability to dynamic start, slack up, repeal, speed up again while controlling body position and minimizing speed reduction. Sudden movement or change of direction may be required either during chasing a participant of opposite team or chasing a moving ball while playing team sport. That's why constituent of performance of agility is defined as reaction to a specific impulse. Response time, sport specific performance, body communion during repeal and sprinting are the main properties of agility in sports and competition. Nowadays the agility has become one of the most important factors for any sports of the world. For a good performance, streamline sprinting is an important component of training [3]. Agility is one of the critical components of any sport. Cricket is one such sport where agility is an important aspect for a player to excel. It has relationships with teachable physical qualities like strength, power, and balance. Balance conditioning is a way to train the body to make better use of strength you already have. So, better you can balance,

less time you need to spend in increasing your strength. If an athlete is having a good balance, then it reduces the need for adding additional effort. Balance is both movement skill that enhances technique and a conditioning element that can be improved. Without stabilization of the spine and trunk during balance conditioning agility will be limited [4].

Dynamic balance training is facilitated by adding stimulus underfoot that is unstable. Both the static and dynamic training methods will implicate the athletes static and dynamic balance when tested [4].

In this study Star Excursion Balance Training (SEBT) among young men cricket players may be effective in improving the agility by increasing the balance and control of body positions during movements by neuromuscular conditioning and neural adaptation of the Proprioceptors. Four strips of white athletic tapes of 6 feet in length were cut. In order to form the star grid shape on the floor, two strip were pasted in the form of “+” and the other two strips pasted across on the top in the form of “x”. It has to be assured that the stripes pasted are arranged to each other from a center point at angle of 45 degrees with each other [6].

This star shaped grid arrangement involves a series of single-leg squats with the stance limb and a dynamic maximal reach using the non-stance limb to touch a point as far as possible along eight designated lines

radiating from a central point at an angle of 45° [5]. The SEBT exhibits good-to-excellent test-retest reliability (intrater reliability = 0.89-0.93) for these three directions [6].

BOSU ball has gained attention in sports rehabilitation and conditioning because it challenges proprioceptive pathways, core musculature, and stabilizing muscles more effectively than traditional stable-surface exercises. Evidence supporting such interventions in cricket athletes was demonstrated by Dhamodharan and colleagues, who investigated the effect of BOSU-ball training on core stability and balance among university-level cricket players. Their study found that regular participation in BOSU-based exercises produced significant improvements in both static and dynamic balance, as assessed by the Flamingo Balance Test and Y Balance Test, indicating that unstable-surface training may enhance neuromuscular control and functional stability relevant to cricket-specific performance. The authors concluded that BOSU-ball training provides a practical and effective approach to improving balance capabilities that directly contribute to enhanced performance and reduced injury risk in cricket athletes [7].

Plyometric training has been widely adopted in sport to improve explosive power and change-of-direction ability, and Kakran & Yadav (2018) tested this approach

specifically in university-level cricket players with a controlled experimental design. In their study 30 male cricketers (age 18–25) were randomly assigned to an experimental or control group, and the experimental group performed a structured plyometric program — including squat jumps, split jumps (lunges), vertical depth jumps, box jumps, single-leg lateral jumps and lateral jumps over cones — three times per week for six weeks (one hour per session). Agility was measured pre- and post-intervention using the AAHPERD shuttle run test. Post-training results showed a clear and statistically significant improvement in the plyometric group compared with the control: post-test means were 10.2980 ± 0.266 (experimental) versus 10.5813 ± 0.212 (control), and the ANCOVA adjusted means were 10.265 (experimental) and 10.614 (control) with a mean difference of -0.348 ($p = 0.000$), indicating faster shuttle-run times after plyometric training [8].

Some studies have found that Bosu Ball improves agility and balance by improving core strength, other researchers found Plyometrics also improves agility and balance but there is lack of research directly comparing the effectiveness of Bosu Ball versus Plyometrics on agility and balance. So, this study is designed to find out the comparison of Bosu Ball versus Plyometrics

on agility and balance among elite cricket players.

MATERIALS AND METHODOLOGY

The study will be conducted after obtaining Institutional Ethical Approval. The study commences by taking a written consent form from all participants. A detail explanation of the purpose of the study will be explained and data was collected of elite cricket players.

INCLUSION CRITERIA [9-11]

- Subjects willing to participate.
- Age between 18 to 25 years.
- Male cricket players.
- Minimum 3 years playing experience.
- Subject with district or university level cricket playing experience from various academy, sport centres and university
- Free of pain or injury at time of testing.

Exclusion criteria [9, 10]

- Subjects with any recent Injury
- Subjects with trauma of lower limb
- Subjects with any Musculoskeletal injuries
- Subjects with any current episode of back pain
- Subjects with neuromuscular condition

Outcome measures

MODIFIED STAR EXCURSION BALANCE TEST: The modified SEBT was initially described with the individual standing in the centre with three lines (or directions, named according to the stance foot): anterior (ANT), posteromedial (PM), and posterolateral (PL). For the testing procedure, individuals stand barefoot in double limb stance (i.e., feet together) at the centre of the testing grid. Participants attempt to reach the maximal distance along each direction with the most distal portion of the reaching foot, touch the directional line, and return while keeping balance on the support. The obtained distance (typically measured in centimetres) reflects the dynamic postural performance of the stance limb. The intra and interrater reliability regarding all three directions (ICC intra = .85–.91 and ICC inter = .99–1). The validity of modified SEBT is a functional tool to evaluate dynamic postural control of the lower limb [11].

Agility t-test: The directions adopted for this study were based on Miller *et al.* On the

“go” command, the participant (1) ran or moved as quickly as possible forward to the centre cone, (2) sidestepped to the right 5 m to the right cone, (3) sidestepped to the left 10 m to the far-left cone, and then (1) sidestepped back to the right to the center cone. The participant then ran or moved backward as quickly as possible to cross the finish line. The raters began the stop watch on “go” and stopped when the participant broke the plane of the finish line. The time to complete each trial was recorded in seconds. Disqualification was determined if the participant failed to run the course as instructed, failed to reach the finish line or complete the course, moved any cones, did not keep his trunk and feet pointed forward at all times, or crossed his legs more than once when sidestepping. If a participant did not complete a trial successfully, a score of 0 was given. The reliability of the agility T-Test is 0.83.[14] The validity of the T-test as an independent measure of agility, leg speed, and leg power [12]

GROUP A: Subjects will receive Bosu Ball exercises. Outcome measure will be taken pre and post intervention [13]

Exercises	week	sets	reps
Bosu Ball plank,	1 st week	3	15
Bosu Ball Crunch,	2 nd week	4	15
Bosu Ball Cross sit ups,	3 rd week and 4 th week	4	20
Bosu Ball One leg bridging,	5 th week and 6 th week	4	25
Bosu Ball Sit up.			

GROUP B: The subject will receive plyometric exercises. Outcome measure will be taken pre and post intervention [14].

week	Foot contacts	Plyometric drills	Sets, Reps	Intensity
1	90	Side to side ankle hops, Standing jump and reach, Front cone hops, Double leg and lateral cone hops.	2/15	Low
2	120	Diagonal cone hops, Standing long jump with lateral sprint, Lateral jump single leg, Cone hops with 180° turn, Hexagonal drill.	2/15	Low/Medium
3	120	Squat jump, Lateral squat jump, 90 squat jump, 180 squat jump, Split squat jump.	2/10	Medium
4	140	Single leg vertical jump, Single leg zig-zag hops, Jump over barrier, Double leg zig-zag hoops, Lateral barrier hops.	2/10	Medium/Low
5	140	Linear hops, Lateral hops, Kangaroo jumps, 90 rotation, 180 rotation	2/10	High
6	120	Single leg push off, Lateral push off, Jump to box, Squat box jump, Lateral box jump	2/10	High

Statistical analysis

In order to compare the Effect of Bosu Ball versus Plyometric to improve agility and balance among elite cricket players a comparative study was conducted. Statistical analysis was carried out using SPSS Version 22.0 software; Results were tested for normal distribution using a Shapiro-Wilk test. Confidence interval was set at 95% and any value <0.05 was

considered as significant and <0.001 as highly significant. The data was not normally distributed the within group analysis was done using Wilcoxon signed Rank test and between the group analysis was done using Mann Whitney U test and the p value should be less than 0.05 for statistically significance.

RESULTS

Table 1: Mean Values of Age Distribution In Both Groups

AGE	MEAN	P-VALUE
BOSU	21.5	0.001
PLYO	21.375	

Table 2: Illustrates The With-In Group Data Analysis of Agility (T-Test) And Balance (Modified Star Excursion) In Bosu Ball Group

VARIABLE	Mean	Std. Deviation	P-VALUE
PRE-T TEST	12.21	.779	0.0027
POST- T TEST	11.83	.963	
PRE-ANTERIOR	67.17	2.036	0.001*
POST-ANTERIOR	70.17	1.993	
PRE-POSTERO-LATERAL	98.88	2.525	0.001*
POST- POSTERO-LATERAL	103.33	2.823	
PRE-POSTERO-MEDIAL	95.96	2.820	0.001*
POST- POSTERO-MEDIAL	99.88	2.924	

The above **Table 2** describes that in the BOSU ball group, there were statistically significant improvements across all measured variables from pre-test to post-test ($p < 0.001$ for all). Agility T-test (Time):

Significant decrease (improvement) where p value was 0.002. ANTERIOR: Significant increase, POSTERO-LATERAL: Significant increase. POSTERO-MEDIAL: Significant increase.

Table 3: Illustrates The With-In Group Data Analysis of Agility (T-Test) And Balance (Modified Star Excursion) In Plyometric Group

VARIABLE	Mean	Std. Deviation	P-VALUE
PRE-T TEST	12.38	.875	0.001*
POST- T TEST	10.13	.992	
PRE-ANTERIOR	67.71	2.196	0.001*
POST-ANTERIOR	69.00	2.432	
PRE-POSTERO-LATERAL	97.71	2.789	0.001*
POST-POSTERO-LATERAL	98.71	2.820	
PRE-POSTERO-MEDIAL	96.46	3.189	0.0031
POST-POSTERO-MEDIAL	97.50	2.934	

And in the Plyometric group, several significant improvements were also observed: agility T-test (Time): Significant decrease (improvement) from 12.38 to 10.13 ($p = 0.001$) ANTERIOR: Significant

increase from 67.71 to 69 ($p < 0.05$). POSTERO-LATERAL: Significant increase from 97.71 to 98.71 ($p < 0.05$). POSTERO-MEDIAL: significant increase from 96.46 to 97.50 ($p < 0.05$).

Table 4: illustrates the between the group data analysis of agility (t-test) and balance (modified star excursion) in bosu ball group and in plyometric training group

VARIABLE	GROUPS		MEAN	SD	Z- VALUE	P-VALUE
T TEST	BOSU GROUP		10.97917	1.29	-4.61	0.001*
	PLYO GROUP					
STAR EXCURSION	BOSU GROUP	ANT	69.58	2.27	-1.56	.117
	PLYO GROUP	PL	101.02	3.64	- 4.50	.001*
		PM	98.69	3.14	- 2.47	.013

The above **Table 4** depicts that the agility (T-TEST) was proven to be significant with $p < 0.05$ in both the groups which means the both the exercise are effective in improving

agility While balance on the other hand also proven to be significant in both the group except the anterior component with the $p = 0.11$

DISCUSSION

The present comparative study was undertaken to evaluate and compare the effectiveness of Bosu Ball training and Plyometric training on agility and balance among elite cricket players. The hypotheses were formulated to assess within-group improvements and between-group differences using the Agility T-Test and Modified Star Excursion Balance Test (mSEBT). The findings analysis clearly demonstrates that both interventions were effective, but with distinct superiority patterns depending on the outcome measure.

Effect of Bosu Ball Training on Agility

The results of the present study revealed a statistically significant improvement in agility within the Bosu Ball group, as evidenced by a reduction in Agility T-Test time from pre-test to post-test ($p = 0.0027$). Hence, the null hypothesis (H_{01}) was rejected, and the alternate hypothesis (H_{11}) was accepted.

The improvement in agility following Bosu Ball training can be attributed to the unstable surface provided by the Bosu Ball, which increases proprioceptive demand, neuromuscular activation, and core muscle engagement during dynamic movements [21, 22]. Training on unstable surfaces enhances sensorimotor integration, resulting in improved coordination and

faster directional changes, which are key components of agility in cricket [16].

These findings are consistent with Dhamodharan *et al.*, who reported significant improvements in dynamic balance and neuromuscular control in cricket players following six weeks of Bosu Ball training, indirectly enhancing agility-related performance [25]. Similarly, Joseph *et al.* demonstrated that core-stability-based interventions significantly improved star excursion performance and functional movement efficiency, supporting the role of core activation in agility enhancement [18].

Effect of Bosu Ball Training on Balance

The Bosu Ball group showed highly significant improvements ($p < 0.001$) in all three components of the Modified Star Excursion Balance Test—anterior (ANT), posterolateral (PL), and posteromedial (PM). Thus, the null hypothesis (H_{02}) was rejected, and the alternate hypothesis (H_{12}) was accepted.

The superior balance gains in this group can be explained by the continuous postural adjustments required during Bosu Ball exercises, which stimulate joint mechanoreceptors, vestibular feedback, and muscle spindle sensitivity, leading to improved dynamic postural control [16]. These adaptations are particularly important for cricket-specific actions such as bowling delivery stride, batting stance, and rapid fielding movements [18].

Comparable findings were reported by Joseph *et al.*, who observed significant improvements in Star Excursion Balance Test performance following six weeks of core stabilization training in cricketers [17]. Dhamodharan *et al.* also concluded that Bosu Ball training was more effective than Pilates in enhancing both static and dynamic balance among university-level cricket players [25].

Effect of Plyometric Training on Agility

Within the plyometric group, the Agility T-Test scores showed a highly significant reduction from pre-test to post-test ($p = 0.001$), indicating a marked improvement in agility. Therefore, the null hypothesis (H_{03}) was rejected, and the alternate hypothesis (H_{13}) was accepted.

Plyometric training enhances agility primarily through the stretch-shortening cycle, which improves neuromuscular firing rate, explosive strength, and ground reaction force utilization [23, 24]. These neuromuscular adaptations facilitate faster acceleration, deceleration, and change-of-direction ability, which are critical elements of agility in cricket [20].

These results are in agreement with Kakran and Yadav, who reported significant improvements in agility among university-level cricket players following a six-week plyometric training program [22]. Bashir *et al.* also demonstrated superior gains in agility and explosive power in cricketers

undergoing plyometric training compared to resistance training [23].

Effect of Plyometric Training on Balance

The plyometric group demonstrated statistically significant improvements in all three directions of the Modified Star Excursion Balance Test (ANT $p < 0.001$, PL $p < 0.001$, PM $p = 0.0031$). Hence, the null hypothesis (H_{04}) was rejected, and the alternate hypothesis (H_{14}) was accepted.

The improvement in balance following plyometric training may be attributed to repeated landing mechanics, eccentric muscle control, and proprioceptive adaptations induced by jump-based activities [21]. However, the magnitude of balance improvement was less pronounced compared to the Bosu Ball group, suggesting that plyometric training enhances balance indirectly rather than targeting postural control as a primary objective [21].

This observation aligns with Joginder and Bansal, who reported that although plyometric training improved explosive performance in fast bowlers, its effect on dynamic balance was inconsistent when compared to neuromuscular-focused interventions [21].

Comparison of Bosu Ball and Plyometric Training on Agility

Between-group analysis revealed that both Bosu Ball and Plyometric training significantly improved agility, with a

greater reduction in T-Test time observed in the plyometric group ($p = 0.001$). Therefore, the null hypothesis (H_{05}) was rejected, and the alternate hypothesis (H_{15}) was accepted. The superior improvement in agility seen in the plyometric group may be explained by the high-velocity and explosive nature of plyometric exercises, which closely replicate sport-specific sprinting and rapid directional changes encountered during cricket performance [18]. These findings are supported by Dave *et al.*, who reported significant improvements in agility following plyometric training in under-19 cricket players, although ladder training showed marginal superiority [24].

Comparison of Bosu Ball and Plyometric Training on Balance

Between-group analysis of balance outcomes demonstrated that the Bosu Ball group achieved significantly higher scores in the PL ($p = 0.000$) and PM ($p = 0.013$) directions, while the anterior direction did not show a statistically significant difference ($p = 0.117$). Thus, the null hypothesis (H_{06}) was partially rejected, and the alternate hypothesis (H_{16}) was accepted for PL and PM directions.

The enhanced balance performance observed in the Bosu Ball group highlights the specific effectiveness of unstable-surface training in improving multi-directional postural control and

neuromuscular stability [25]. The absence of a significant difference in the anterior direction may be due to similar sagittal-plane demands present in both training protocols.

CONCLUSION

Based on the findings of the present study, it can be concluded that both Bosu Ball training and Plyometric training are effective interventions for improving agility and balance among elite cricket players.

Bosu Ball training showed superior effectiveness in enhancing dynamic balance, especially in the posteromedial and posterolateral components of the Modified Star Excursion Balance Test. This improvement can be attributed to increased proprioceptive input, core muscle activation, and neuromuscular control induced by unstable surface training.

Plyometric training demonstrated greater improvement in agility as measured by the Agility T-Test. The rapid stretch-shortening cycle, explosive movements, and frequent changes in direction inherent in plyometric exercises likely contributed to enhanced neuromuscular efficiency and speed.

Thus, the null hypotheses were rejected, and the alternate hypotheses were accepted, indicating significant within-group improvements and meaningful differences between the two interventions. Both

training methods can be effectively incorporated into cricket conditioning programs depending on performance goals

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