

The Effect of Balance Training on Agility in Young Cricketers

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Abstract: *Studies of cricket injuries show an increasing incidence, varying from 2.6 to 333/10 000 athlete hours played, 2–4 with 28.4–71.6% of cricketers² sustaining between 1.61 and 1.91 injuries per season. The purpose of this study was to determine the effect of 6-week balance training on agility in young cricketers. 66 young cricket players between the age group of 12-16 yrs were selected and randomly assigned to an experimental group and a control group. T agility test, Hexagonal agility test, Single limb stance test, Multi-directional reach test were used as outcome measures. The experimental group underwent 6 week balance training in addition to regular routine exercises. Experimental group showed significant improvement in balance and agility. T agility test performance improved from 13.36± 1.34 sec to 12.5± 1.35 sec. Hexagonal agility test performance improved from 20.25 ±3.08 to 17.52± 2.26. Thus it can be concluded that 6 weeks balance training programme improves agility in young cricketers.*

Keywords: Balance training, Agility

1. Introduction

Studies of cricket injuries show an increasing incidence, varying from 2.6 to 333/10 000 athlete hours played, 2–4 with 28.4–71.6% of cricketers² sustaining between 1.61 and 1.91 injuries per season. Fast bowlers, slow bowlers and batters all had a similar injury prevalence of approximately 5%.¹

Neuromuscular training programs that include balance training are often implemented for optimizing performance, preventing injury, or providing rehabilitation. Emery CA, Cassidy JD and other authors³⁻⁵, have shown the effectiveness of neuromuscular training programs that include balance training in reducing sport-related injury risk as well as in enhancing functional performance after sport injury⁶. Most authors^{7,8} described balance and stabilization exercises, other authors defined neuromuscular training as multi-intervention programs with a combination of balance, strength, plyometric, agility, and sport-specific exercises. Thus, it is unclear whether a single intervention or the combination of various exercises is primarily responsible for the training effects. Because most investigators studied balance training, it is very likely that these exercises have a certain influence on neuromuscular control and functional performance. This view is supported by research proving that poor balance is a predictor of increased lower extremity injury risk in athletes. Any form of balance training assists in increase in proprioception, kinaesthetic awareness, and muscular strength.

Agility is defined as the ability to explosively start, decelerate, change direction, and accelerate again quickly while maintaining body control and minimizing a reduction in speed.^{9,10 11,12, 13, 14}. Unfortunately, because of the focus placed on physical attributes, the focus on off-season programs often revolves around strength training and conditioning. It takes athletes weeks and months to see improvements in speed and agility.^{15,16} Agility should be

trained as an important component of the annual training program.

The relationship between balance ability and sport injury risk has been established in many cases,¹⁷ the relationship between balance ability and athletic performance is less clear. There is evidence from randomized trials that multifaceted prevention programs, including proprioceptive balance training using a wobble board, are effective in reducing injuries to the lower extremities in specific sports.¹⁸⁻²⁵

The relationship between balance ability and sport injury risk as well as performance has been studied by many authors, but the relationship between balance ability and agility is less clear. This study focuses on the effect of balance training on agility in young cricketers.

2. Methodology

Eighty nine young male cricket players between the age group of 12-16 were screened; sixty six of them were selected on the basis of inclusion criteria. The need of the study and study procedure was explained to them. Once written informed consent was obtained, subjects were randomly assigned to either an Experimental group or Control group using random number table, (n =33) or a control group (n=33). All players were assessed for balance and agility using T agility test, Hexagonal agility test, single limb stance test, multi-directional reach test. The experimental group underwent 6 week balance training programme in addition to regular routine exercises. The training program was conducted on Tuesday, Thursday, and Saturday. Each training session lasted for approximately 45 minutes. Before each training session, an active warm-up that included jogging and upper and lower body stretching was used. Control group followed the regular routine exercises. After 6 weeks training players were reassessed. Improvement in the balance and agility was analysed using

the same tests. Details of balance training programme are given below.

Inclusion criteria

- 1) Young male Cricket players within the age group of 12-16 years.
- 2) Players who have undergone at least 2 years training.
- 3) Players who have no previous musculoskeletal injury.

Exclusion criteria

- 1) Players who had ankle sprain / ankle injury in last 6 month.
- 2) Lower limb soft tissues injuries and fractures in last 6-12 months.
- 3) Lower limb pain.

Outcome Measures

- 1) T agility test^{50, 52}
- 2) Hexagonal agility test⁵²
- 3) Single limb stance test^{51,53,54}
- 4) Multi-directional reach test^{55,57}

Six - Week Balance Training Programme

Week 1-2 (Eyes open)

<i>Exercise</i>	<i>Sets</i>	<i>Repetitions</i>
Standing in tandem and passing the ball	3	20
Walking in tandem	3 minutes	N.A.
Walking on toes	3 minutes	N.A.
Single limb stance and passing the ball	3	20
Heel raises	3	20
Toe raises	3	20

Week 3-4 (Eyes open)

<i>Exercise</i>	<i>Sets</i>	<i>Repetitions</i>
Standing on in tandem and passing the ball	3	20
Walking in tandem	3 minutes	N.A.
Walking on toes	3 minutes	N.A.
Single limb stance and passing the ball	3	20
Heel raises	3	20
Toe raises	3	20
Front kicks, Back kicks, side kicks	3 (each)	20 (each)
Single limb squats	2	20

Week 5-6 (Eyes closed)

<i>Exercise</i>	<i>Sets</i>	<i>Repetition</i>
Standing on in tandem	3 Minutes	N.A.
Single limb stance	3 Minutes	N.A.
Heel raises	3	20
Toe raises	3	20
Front kicks, Back kicks, side kicks	3 (each)	20 (each)
Single limb squats	2	20
Walking on bricks (Eyes open)	3 Minutes	N.A.
Wobble/ tilt board exercises (Eyes open)	3 Minutes	N.A.

Data Analysis

In total, 66 players were subjected to the training programme, 6 players dropped out of the study, 3 from the each group, out of 6 players 4 were injured, 1 did not report and 1 player did not participate due to personal reasons. Total 60 players completed the study. Experimental group (n=30) and Control group (n=30). The effect of 6 week balance training on agility was studied. Mean age of Experimental group was 14.40 +/- 1.25 yrs and mean age of control group was 13.90 +/- 1.06 yrs. Mean height of experimental group was 150.48 +/- 5.87 and mean height of control group was 148.87 +/- 4.21. The data obtained were entered using MS-Excel-2007 and statistically analysed using SPSS-16 software.

The data of agility tests and balance tests, which passed tests of normality, parametric tests were used to analyse and the data which did not pass the test of normality non parametric tests were used. Within the group comparison was done using Paired T test / Wilcoxon Signed Rank Test. Comparison in between the groups was done by using Unpaired T test / Whitney U Test.

3. Results and Tables

Table 1

Study Parameter	Experimental Group				Control Group				MannWhitney Test	P Value
	Mean	S.D	Median	IQR	Mean	S.D.	Median	IQR		
Age	14.40	1.25	14	1.00	13.90	1.06	14	2.00	1.655	0.098
Height	150.48	5.87	149	6.50	148.87	4.21	148	5.00	1.000	0.317

Table 2

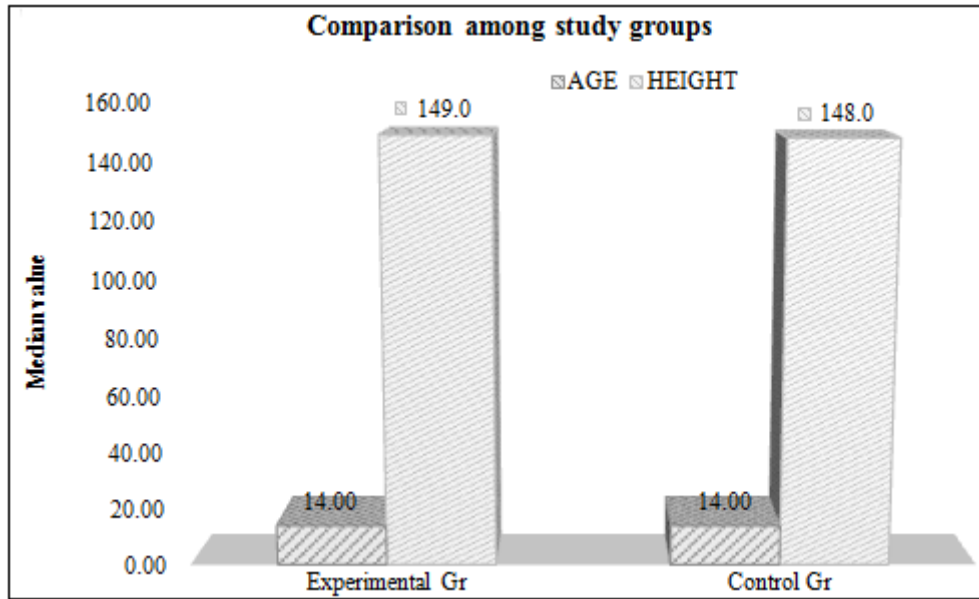
Agility Tests	Experimental Group				Control Group				Unpaired T test	P Value
	Mean	S.D	median	IQR	Mean	S.D	Median	IQR		
T PRE	13.36	1.34	13.18	1.83	13.90	1.11	13.64	1.50	1.694	0.096
T POST	12.50	1.35	12.27	1.48	14.88	1.06	14.78	1.20	7.626	0.000
T (PRE-Post)	0.86	0.43	0.86	0.60	-0.99	0.43	-0.90	0.52	16.625	0.000

Table 3

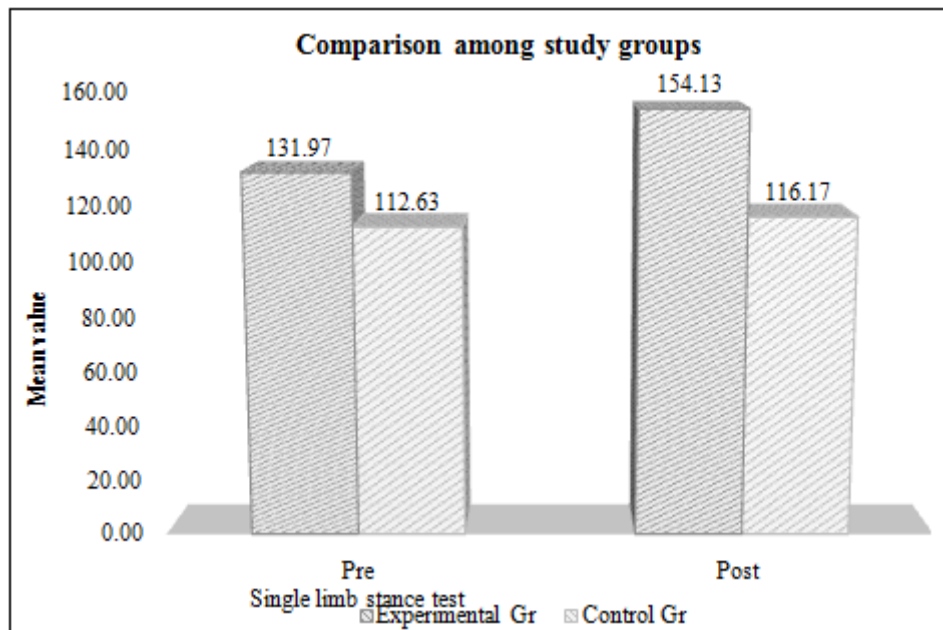
Agility Tests Hexagonal	Experimental Group				Control Group				Mann Whitney U	P Value
	Mean	S.D	Median	IQR	Mean	S.D	Median	IQR		
PRE	20.25	3.08	19.75	5.14	18.63	1.78	18.45	2.52	2.502	0.015
POST	17.52	2.26	16.91	4.29	19.71	1.81	19.51	2.69	4.144	0.000
PRE-POST	2.74	2.40	2.11	2.18	-1.08	0.66	-1.09	0.66	6.653	0.000

Table 4

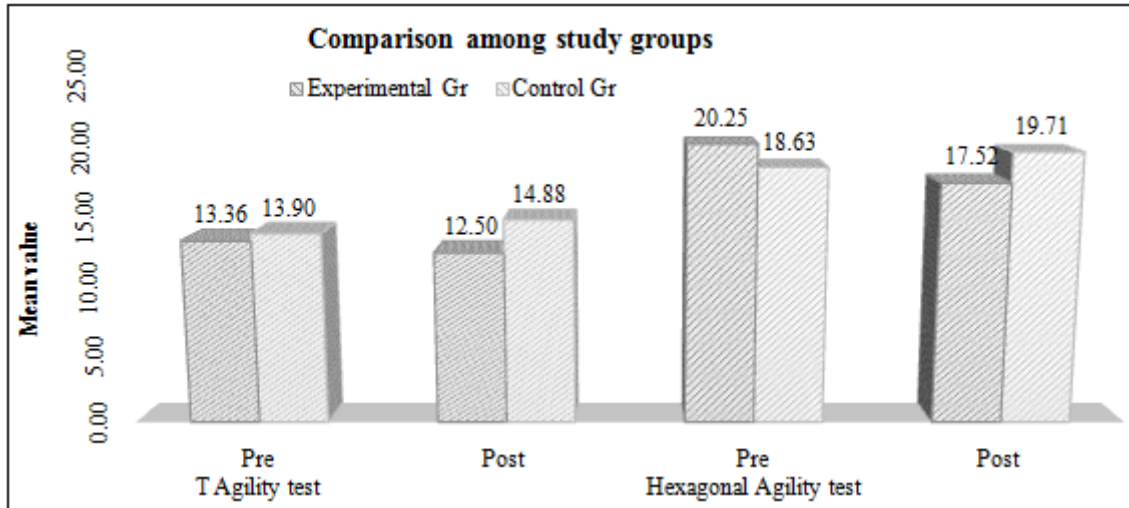
Single limb stance test	Experimental Group				Control Group				Unpaired T test	P Value
	Mean	S.D	Median	IQR	Mean	S.D	Median	IQR		
PRE (sec)	131.97	57.48	134	84	112.63	40.46	110	54	1.506	0.137
Post (sec)	154.13	50.74	155	76	116.17	39.77	103	69	3.226	0.002
(Post-Pre)	22.17	34.25	24	39	3.53	19.51	2.50	23	2.589	0.012



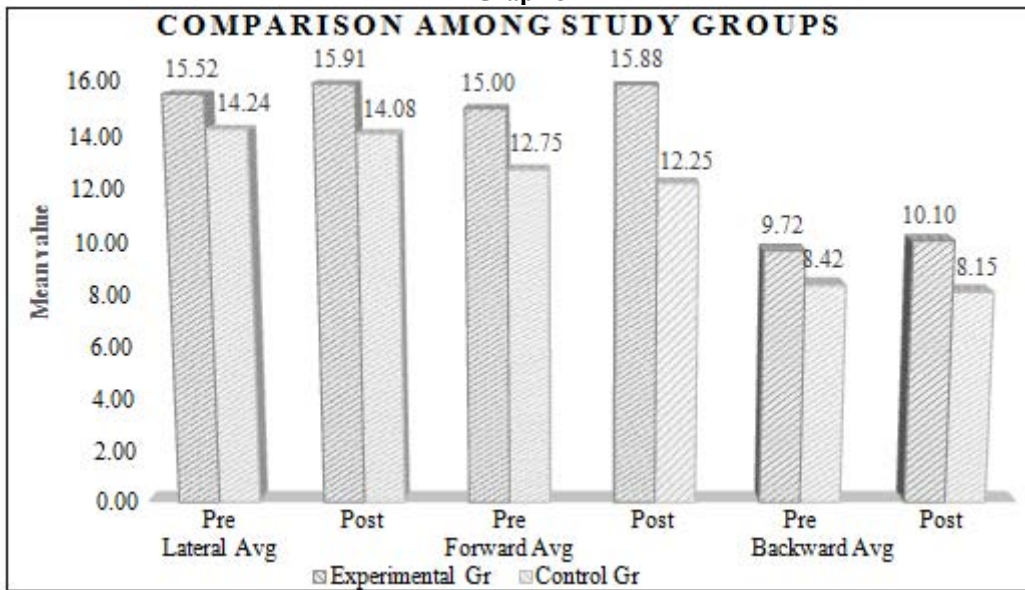
Graph 1



Graph 2



Graph 3



Graph 4

Table 5

Multi-directional reach test	Experimental Group				Control Group			
	Mean	S.D.	Median	IQR	Mean	S.D.	Median	IQR
Lateral PRE Avg	15.52	2.41	15.40	2.85	14.24	1.93	14.40	3.85
Lateral Post Avg	15.91	2.40	15.95	2.75	14.08	1.82	14.45	3.45
Backward PRE Avg	9.72	2.07	10.25	3.35	8.42	1.01	8.33	1.05
Backward Post Avg	10.10	1.83	9.90	2.65	8.15	1.06	8.05	1.50

Table 6

Multi-directional reach test	Unpaired T test	P Value
Lateral PRE Avg	2.275	0.027
Lateral Post Avg	3.326	0.002
Backward PRE Avg	3.102	0.003
Backward Post Avg	5.029	0.000

Table 7

Multi-directional reach test	Experimental Group				Control Group			
	Mean	S.D.	Median	IQR	Mean	S.D.	Median	IQR
Lateral (Post-Pre) *	0.39	1.14	0.53	0.60	-0.16	0.39	-0.18	0.60
Forward PRE Avg *	15.75	2.53	15.00	3.65	12.77	1.43	12.75	2.15
Forward Post Avg *	16.76	2.90	15.88	3.75	12.48	1.41	12.25	1.75
Forward Reach (Post-Pre) *	1.01	1.31	0.75	0.95	-0.29	0.51	-0.28	0.50
Backward Avg (Post-Pre) *	0.37	1.52	0.50	1.05	-0.27	0.46	-0.27	0.45

Table 8

Multi-directional reach test	MannWhitney Test	P Value
Lateral (Post-Pre) *	4.764	0.000
Forward PRE Avg *	4.771	0.000
Forward Post Avg *	5.649	0.000
Forward Reach (Post-Pre) *	5.683	0.000
Backward Avg (Post-Pre) *	4.167	0.000

4. Discussion

The primary objective of this study was to find out the effect of 6 week balance training programme on agility. Experimental group underwent 6 week balance training programme in addition to regular routine exercises.

Balance tests

Results of Single limb stance test show mean improvement in stance time in the experimental group was 22.17 secs and the difference in the mean stance time in control group was 3.53 secs, which was statistically significant ($p < 0.05$). This suggests there was a significant improvement in single leg stance duration, post 6 weeks of balance training. In the experimental group significant improvement of reach distances in lateral and backward directions was seen ($P < 0.05$) (unpaired T test 3.326 for lateral and 5.029 for backward).

In the experimental group, difference in mean reach distance for lateral, forward and backward was 0.39, 1.01 and 0.37 respectively, and in control group difference in mean reach distance for lateral, forward and backward was -0.16,-0.29 and -0.27 respectively, which was statistically significant ($p < 0.05$) This suggests that there was a significant improvement in reach distances in experimental group.

This study showed that, there was significant improvement in static and dynamic balance in experimental group as compared to control group. Many studies regarding balance training have discussed the mechanism as task-specific neural adaptations at the spinal and supraspinal levels. It may suppress spinal reflex excitability such as the muscle stretch reflex during postural tasks, which leads to less destabilizing movements⁵⁸ and improved balance as required in sports during the activities such as running, jumping changing direction.

The inhibition of muscle stretch reflexes may enhance agonist-antagonist muscle co-contraction, which increases joint stiffness, stabilizing the joints against perturbations and therefore may improve balance.⁵⁸Task specific reduced cortical excitability has also been associated with improved balance from training. It is postulated that balance training promotes a shift in movement control from cortical to subcortical and cerebellar structures⁵⁹, making it an automatic response thereby improving feed forward mechanism.

The results of this study are supported by several authors.

Carolyn A. Emery et al 2005⁵¹ conducted a randomized controlled trial, to study the effectiveness of a home-based balance-training program in reducing sports-related injuries among healthy adolescents in high school students in 2001.

They found an improvement in static and dynamic balance at 6 weeks post training in the intervention group but not in the control group (difference in static balance 20.7 seconds, 95% confidence interval [CI] 10.8 to 30.6 seconds; difference in dynamic balance 2.3 seconds, 95% CI 0.7 to 4.0 seconds). There was evidence of a protective effect of balance training in over 6 months (relative risk of injury 0.2, 95% CI 0.05 to 0.88).

A Systematic Review conducted by **Astrid Zechet al⁶⁰, 2010**, Balance training for neuromuscular control and performance enhancement. They concluded that, balance training is an effective intervention to improve static postural sway and dynamic balance in both athletes and non athletes. Although controversial findings have been reported for jumping performance and agility, balance training may have some effect in improving these outcomes.

Patrick Mckeon⁶¹ et al, found that 4 weeks of balance training significantly improved self-reported function, static postural control as detected by TTB measures, and dynamic postural control as assessed with the SEBT.

Agility Tests

As evident from table 2, the experimental group showed significant improvement in performance on T agility test, difference in the mean time in the experimental group was 0.86 seconds which was statistically significant ($p < 0.05$), (unpaired T test 16.625). The experimental group also showed improvement in performance on Hexagonal agility Test (Table 3), the difference in the mean time in the experimental group was 2.74 seconds, which was statistically significant ($p < 0.05$). This suggests there was a significant improvement in the agility post 6 weeks of balance training. Our results show that there was significant improvement in agility in experimental group. Thus rejecting null hypothesis and accepting the alternative hypothesis.

Agility is a complex ability which depends on coordination, mobility of the joint system, dynamic balance, strength and speed⁶². Since static and dynamic balances are vital for agility, the improvement in agility can be attributed to improvement in balance. The control group showed deterioration in agility which can be attributed to the fact that control group underwent conventional exercise programme which players carried out unsupervised.

The results of this study are supported by, **Sanja simeksalaj⁴⁶ (2007) et al**, they studied the effect of proprioceptive training on jumping and agility performance. They found changes in performance on some agility tests (20Yard agility test, HOPS agility test) post training, but not in the LAT test. In the 20 Yard shuttle test there were minor numerical changes (0.01 seconds), but the C group had much poorer results compared to the initial status (0.07 seconds).

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6. Conclusion

The results of this study showed that, six week balance training was effective in improving balance and agility in young cricketers.

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