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EFFECT OF ISOLATED AND COMBINED WEIGHT AND PLYOMETRIC TRAINING AND DETRAINING ON BOWLING SKILL

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Abstract

The purpose of the study is to find out the effect of isolated and combined weight and plyometric training and detraining on bowling skill. To achieve this purpose sixty male cricketers selected from M.S. Ramaiah Group of Institutions, Bangalore, Karnataka during the year 2025-2026 were selected as subjects. The age of the subjects were ranged from 19 to 25 years. They were divided into four equal groups of fifteen each as three experimental groups and one control group, in which the group – I (n = 15) underwent weight training, group – II (n = 15) underwent plyometric training and group – III (n = 15) underwent the combination training for three days per week for twelve weeks followed by detraining for four weeks of ten days interval and group - IV (n = 15) acted as control who did not participate any special training apart from the regular program of the curriculum. After the training sessions, the detraining effects have been assessed by way of every 10 days from the last session of the training. Like that 4 cessations have been followed. During the detraining sessions, the trainees had been suggested not to do any unique exercises other than regular routines. The bowling skill was assessed by using leg lift with dynamometer and the collected data was statistically analyzed by two way (3 x 6) factorial ANOVA with last factor repeated measures. Whenever F-ratio obtained for interaction effect was found to be significant, the simple effect test was applied as a follow up test. Since, four groups and six different stages of test were compared, whenever obtained F-ratio value in the simple effect was significant the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any and in all the cases 0.05 level of significance was fixed. The result of the study shows that there was a significant improvement for all the training groups on bowling skill. It was also found that there was no significant difference occurred between the training groups on bowling skill during the first, second and third cessation periods. The bowling skill was decreased significantly at the time of all fourth cessation period for the training groups.

Key Words: *isolated and combined weight and plyometric training, bowling skill.*

INTRODUCTION

Cricket is a game that requires significant skill. It encompasses aspects such as power, vitality, the ability to move, and speed. Players must strike the ball, throw it, and catch it effectively for an extended period. This indicates they require both physical strength and mental resilience. For a period, cricket practice has focused on improving skills and enhancing cardiovascular fitness. An increasing number of individuals are examining how resistance training, particularly high-intensity resistance training, can enhance the strength of cricket players [Habib, Khan & Khan, 2022]. Employing weights, resistance bands, or merely your own body weight can enhance muscle strength. Improve overall fitness during exercise sessions. High-intensity resistance training involves performing strenuous workouts followed by a brief rest period.

Cricket is a sport played by two teams. Single team. The opposing team bats, as detailed by Bartlett in 2003 and by Noakes & Durandt in 2000. The batting side strives to accumulate as many runs as they can. The bowling squad intends to restrict the runs. In this game, a bowler from the bowling side delivers the ball to the batting side with various speeds and spins. These bowlers are either pace bowlers or spin bowlers. Fast bowlers aim to deliver the ball at the highest speed. This implies that a fast bowler needs to deliver the ball with speed to achieve success.

Isotonic exercises are quite favored by athletes and individuals who engage in physical activities for enjoyment. Isotonic exercise involves the primary muscle or agonist contracting while the opposing muscle or antagonist elongates simultaneously. It can also function in the opposite manner. This type of training utilizes the stretch-shortening cycle. That's when a muscle extends initially and then rapidly contracts. This frequently occurs in actions such as jumping or throwing [Davies, Riemann & Manska, 2015]. Isotonic exercises consist of muscle contractions that result in changes to the muscle length. The pressure stays constant. This constant tension contributes to muscle strength development as demonstrated by Rezaeimanesh & Farsani, 2011. Isokinetic exercises enable muscles to engage forcefully during the complete movement of a joint at a steady pace and through different training techniques, as isokinetic exercises can also enhance muscle strength according to Lee & Kang 2013.

Numerous research efforts have demonstrated that plyometric training enhances muscle strength and power [Markovich, 2007]. It also assists individuals in increasing their speed [Diallo et al., 2001; Impellizzeri et al., 2008; Michailidis et al. 2013]. It additionally aids in enhancing agility [Arazi, Coetzee & Asadi 2012; Ramirez-Campillo et al., 2014; Ramirez-Campillo et al., 2015]. Despite the necessity for methods of plyometric training to enhance both movement and physical fitness, this approach is not a novel concept in competitive team sports [Chaouachi et al., 2009; Duncan, Woodfield, and al Nakeeb, 2006; Gabbett, 2000; Ostojic, Mazic, & Dikic 2006; Stolen et al., 2005]. Sports teams such as basketball, soccer, and handball involve activities that incorporate irregular movements, which are crucial for performing effectively in matches [Arazi, Coetze, & Asadi 2012; Chelly et al., 2014]. Engaging in plyometric exercises for 12 weeks, three times per week, improves amateur female soccer players' jumping ability, height, and kicking speed [Ccampo et al., 2009].

Tapering involves decreasing the intensity of training for a period leading up to a competition. This approach has gained significant popularity. A tapering phase that spans several days before a major event is often observed [Shepley, et al., 1992]. Numerous individuals believe that reducing training intensity or volume right before a competition may negatively impact performance due to detraining. That notion is inaccurate. Athletes, trainers, and coaches who implement a tapering phase following weeks of intense training frequently achieve improved outcomes in both endurance and strength competitions [Powers & Howley 2011]. Tapering can enhance certain aspects of physical performance. In a tapering phase, levels of muscle glycogen may rise. Strength and power can improve. VO2max may increase. Endurance and maximum power output may also enhance [Neary, Martin & Quinney, 2003]. Each of these modifications enhances athletes' performance. The aim of tapering is to maintain the advantages gained from all the previous training. It gives the body the opportunity to recuperate from the strain of exercise. This implies the athlete can experience being invigorated and prepared for competition. A scheduled tapering plan is essential to ensure optimal performance occurs at the appropriate time during the competition [Mujika & Padilla 2001].

Materials and Methods

To achieve the purpose of present study, sixty male cricketers studying from M.S. Ramaiah Group of Institutions, Bangalore, Karnataka during the year 2025-2026 were selected as subjects. The age of the subjects were ranged from 19 to 25 years. They were divided into four equal groups of fifteen each as three experimental groups and one control group, in which the group – I (n = 15) underwent weight training, group – II (n = 15) underwent plyometric training and group – III (n = 15) underwent the combination training for three days per week for twelve weeks followed by detraining for four weeks of ten days interval and group - IV (n = 15) acted as control who did not participate any special training apart from the regular program of the curriculum. After the training sessions, the detraining effects have been assessed by way of every 10 days from the last session of the training. Like that 4 cessations have been followed. During the detraining sessions, the trainees had been suggested not to do any unique

exercises other than regular routines. The bowling skill was assessed by using leg lift with dynamometer and the collected data was statistically analyzed by two way (3 x 6) factorial ANOVA with last factor repeated measures. Whenever F-ratio obtained for interaction effect was found to be significant, the simple effect test was applied as a follow up test. Since, four groups and six different stages of test were compared, whenever obtained F-ratio value in the simple effect was significant the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any and in all the cases 0.05 level of significance was fixed.

Analysis of Data

The mean values of bowling skill of weight training group and control group at different stages of tests have been analyzed and presented in Table – I.

Table - I

THE MEAN VALUES OF BOWLING SKILL OF PRE TEST POST TEST AND FOUR CESSATION PERIOD DATA OF TRAINING GROUPS AND CONTROL GROUP

Group		Pre-Test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation
Weight Training Group	Mean	5.53	8.07	7.20	6.33	5.83	5.33
Plyometric Training Group	Mean	5.54	7.80	7.53	6.87	6.27	5.60
Combined Training Group	Mean	5.40	7.73	7.60	7.33	6.60	5.87
Control Group	Mean	5.41	5.53	5.60	5.67	5.53	5.27

(Bowling skill Scores in Kg.)

Table - I shows that pre-test, post-test, first cessation, second cessation, third cessation and fourth cessation mean values of bowling skill for weight training, plyometric training, combined weight and plyometric training and control groups.

TABLE – I – A

THE TWO WAY ANALYSIS OF VARIANCE ON BOWLING SKILL OF WEIGHT TRAINING, PLYOMETRIC TRAINING, COMBINED WEIGHT AND PLYOMETRIC TRAINING AND CONTROL GROUPS AT SIX DIFFERENT STAGES OF TESTING PERIODS

Source of Variance	Sum of Squares	df	Mean Squares	F - ratio
A – Factor Groups	100.52	3	33.506	24.688*
Error – I	76.00	56	1.357	--
B – Factor Tests	119.33	4	29.833	145.70*
AB factor (interaction) Groups and Tests	37.20	12	3.10	15.14*
Error II	45.87	224	0.21	--

* Significant at 0.05 level of confidence.
(The table value required for significant at 0.05 level of confidence with df 3 and 56, 4 and 12, and 4 and 224 were 2.78, 3.26 and 2.41 respectively).

Table I - A shows that the obtained 'F' ratio values 24.688, for row (groups) on bowling skill is greater than the required table vale 2.78 for significance with df 3 and 56. It further shows that the obtained 'F'- ratio value 145.70 for column (tests) on bowling skill is greater than the required table value 3.26, for significance with df 4 and 12. It also shows the obtained 'F'- ratio value of 15.14 for interaction effect (groups x tests) on bowling skill is also greater than the required table value 2.41 for significance with df 4 and 224. From the table I - A, the obtained F value of Interaction A X B (Groups x Different stages of Tests) show that there is a significant difference existing among the paired means of interaction A x B on bowling skill ($P < 0.05$). The results of the study indicated that there was a significant difference in the interaction effect between rows (Groups and columns (Tests) on bowling skill. Since the interaction effect was significant, the simple effect test was applied as follow up test and they are presented in Table I - B.

TABLE - I-B
THE SIMPLE EFFECT SCORES OF GROUPS (ROWS) AT SIX DIFFERENT STAGES OF TESTS (COLUMNS) ON BOWLING SKILL

Source of Variance	Sum of Squares	df	Mean Squares	F-ratio
Groups within Pre-tests	0.267	3	0.09	0.27
Groups within Post-tests	62.18	3	20.73	44.64*
Groups within First Cessation Period	39.65	3	13.22	29.22*
Groups within Second Cessation Period	23.12	3	7.71	16.79*
Groups within Third Cessation Period	9.38	3	3.13	6.44*
Groups within Fourth Cessation Period	3.38	3	1.12	3.60*
Tests and Weight Training Group	71.82	5	14.36	68.38*
Tests and Plyometric Training Group	48.86	5	9.77	46.52*
Tests and Combined Weight and Plyometric Training Group	36.53	5	7.31	34.81*
Tests and Control Group	1.37	5	0.274	1.30
Error II	45.87	224	0.21	

* Significant at 0.05 level of confidence.
(The table value required for significant at 0.05 level of confidence with df 3 and 56 and 5 and 224 were 2.78 and 2.25 respectively).

Table I - B shows that the obtained F-ratio for groups within post test, first cessation period, second cessation period and third cessation period and fourth cessation period on bowling skill were 44.64, 26.22, 16.79, 6.44 and 3.60indicating that there was a significant difference between the paired means of groups on bowling skill. But there was no significant difference was exists between groups during fourth cessation with F-ratio of 1.172.

Table I - B shows that F-ratio values obtained for tests within weight training group, plyometric training group and combined training group on bowling skill was 68.38, 46.52, and 34.81 indicating that there was a significant difference that exists among the paired means on bowling skill. But table III – B shows that F-ratio value obtained for tests within control group was 1.30 indicating that there was no significant difference exists among paired means of tests within control group on bowling skill.

Since, four groups and six different levels of examinations on bowling skill were compared, whenever the 'F' ratio value obtained, to be significant in the simple effect, the Scheffe *S* test was applied as post-hoc test to find out the paired mean difference, if any and it has been presented in Table – I –C, Table – I –D, Table – I –E, Table – I –F, Table – I –G, Table – I –H and Table – I –I.

TABLE – I – C
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF POST TEST WITH DIFFERENT GROUPS ON BOWLING SKILL

Weight Training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
8.07	7.80			0.27	0.48
8.07		7.73		0.34	0.48
8.07			5.53	2.54*	0.48
	7.80	7.73		0.07	0.48
	7.80		5.53	2.27*	0.48
		7.73	5.53	2.20*	0.48

* Significant at 0.05 level of confidence.

It may be concluded from the above table-I-C of the study that there was a significant difference occurred between the weight training and combined weight and plyometric training groups, weight training and control groups, plyometric training and control groups and combined weight and plyometric training and control groups on bowling skill at post-test session.

TABLE – I – D
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF FIRST CESSATION WITH DIFFERENT GROUPS ON BOWLING SKILL

Weight Training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
7.20	7.53			0.33	0.48
7.20		7.60		0.40	0.48
7.20			5.60	2.40*	0.48
	7.53	7.60		0.07	0.48
	7.53		5.60	1.93*	0.48
		7.60	5.60	2.00*	0.48

* Significant at 0.05 level of confidence.

It may be concluded from the above table-I-D, that there was a significant difference occurred between the weight training and combined weight and plyometric training groups, weight training and control groups, plyometric training and control groups and combined weight and plyometric training and control groups on bowling skill at first cession period.

TABLE – I – E
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF SECOND CESSATION WITH DIFFERENT GROUPS ON BOWLING SKILL

Weight Training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
6.33	6.87			0.54*	0.48
6.33		7.33		1.00*	0.48
6.33			5.67	0.66*	0.48
	6.87	7.33		0.46	0.48
	6.87		5.67	1.20*	0.48
		7.33	5.67	1.66*	0.48

* Significant at 0.05 level of confidence.

It may be concluded from the table–I–E, that there was a significant difference occurred between the weight training and combined weight and plyometric training groups, weight training and control group, plyometric training and control groups and combined weight and plyometric training and control groups on bowling skill at second cession period.

TABLE – I – F
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF THIRD CESSATION WITH DIFFERENT GROUPS ON BOWLING SKILL

Weight Training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
5.83	6.27			0.44	0.48
5.83		6.60		0.77*	0.48
5.83			5.53	0.30	0.48
	6.27	6.60		0.33	0.48
	6.27		5.53	0.74*	0.48
		6.60	5.53	1.07*	0.48

* Significant at 0.05 level of confidence.

It may be concluded from the table-I-F, that there was a significant difference occurred between the weight training group and control groups, plyometric training group and control group and combined weight and plyometric training group and control groups on bowling skill at third cession period.

TABLE – I – G
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF TESTS ON BOWLING SKILL (WEIGHT TRAINING GROUP)

Pre –test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation	Mean Difference	Confidence Interval
5.53	8.07					2.54*	0.56
5.53		7.20				1.67*	0.56
5.53			6.33			0.80*	0.56
5.53				5.83		0.30	0.56
5.53					5.33	0.20	0.56
	8.07	7.20				0.87*	0.56
	8.07		6.33			1.74*	0.56
	8.07			5.83		2.24*	0.56
	8.07				5.33	2.74*	0.56
		7.20	6.33			0.87*	0.56
		7.20		5.83		1.37*	0.56
		7.20			5.33	1.87*	0.56
			6.33	5.83		0.50	0.56
			6.33		5.33	1.00*	0.56
5.53	8.07					2.54*	0.56

* Significant at 0.05 level of confidence.

The above table-I-G, shows that there was a significant difference and reduction on bowling skill for weight training group after post-test development. But there was no significant difference was found between the second and third cessation period.

TABLE – I – H
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF TESTS ON BOWLING SKILL (PLYOMETRIC TRAINING GROUP)

Pre -test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation	Mean Difference	Confidence Interval
5.54	7.80					2.26*	0.56
5.54		7.53				1.99*	0.56
5.54			6.80			1.26*	0.56
5.54				6.27		0.73*	0.56
5.54					5.60	0.06	0.56
	7.80	7.53				0.27	0.56
	7.80		6.80			1.00*	0.56
	7.80			6.27		1.53*	0.56
	7.80				5.60	2.20*	0.56
		7.53	6.80			0.73*	0.56
		7.53		6.27		1.26*	0.56
		7.53			5.60	1.93*	0.56
			6.80	6.27		0.53	0.56
			6.80		5.60	1.20*	0.56
				6.27	5.60	0.67*	0.56

* Significant at 0.05 level of confidence.

The above table-I-H, shows that there was a significant difference and reduction on bowling skill for plyometric training group after post-test development. But there was no significant difference was found between the second and third cessation period.

TABLE – I – I

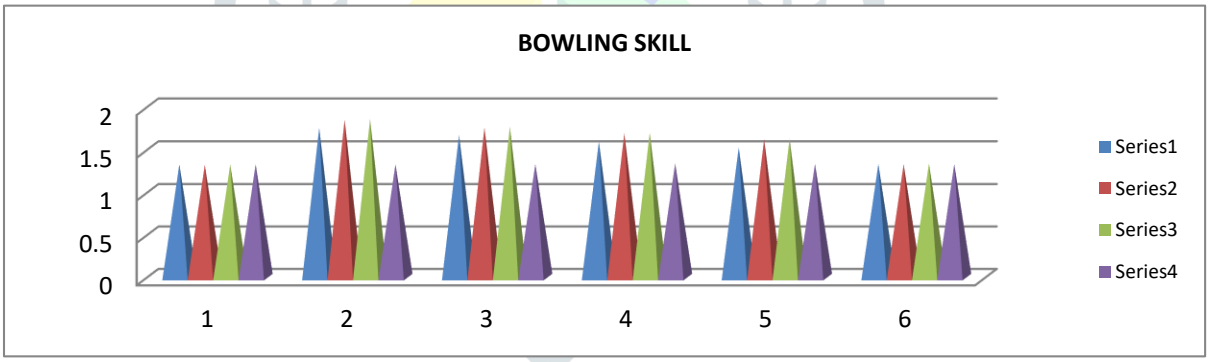
THE SCHEFFE *S* TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS OF TESTS ON BOWLING SKILL (COMBINED WEIGHT AND PLYOMETRIC TRAINING GROUP)

Pre -test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation	Mean Difference	Confidence Interval
5.40	7.73					2.33*	0.56
5.40		7.60				2.20*	0.56
5.40			7.33			1.93*	0.56
5.40				6.60		1.20*	0.56
5.40					5.87	0.47	0.56
	7.73	7.60				0.13	0.56
	7.73		7.33			0.40	0.56
	7.73			6.60		1.13*	0.56
	7.73				5.87	1.86*	0.56
		7.60	7.33			0.27	0.56
		7.60		6.60		1.00*	0.56
		7.60			5.87	1.73*	0.56
			7.33	6.60		0.73*	0.56
			7.33		5.87	1.46*	0.56
				6.60	5.87	0.73*	0.56

* Significant at 0.05 level of confidence.

The above table-I-I, shows that there was a significant difference and reduction on bowling skill for combination of weight and plyometric training group after post-test development. But there was no significant difference was found between the pre-test and fourth cessation period.

The pre and post tests, first, second, third, and fourth cessation periods mean values of weight training, plyometric training, combined weight and plyometric training groups and control group on bowling skill were graphically represented in Figure - I.



Discussion

The study's outcome indicates that the bowling column (tests) is greater for significant differences, while the groups (rows) related to bowling skill also show higher significant values. The bowling ability is higher for important groups when the interaction effect (groups x tests) is meaningful. This research showed that significant variations existed in the interaction effects of rows (Groups) and columns (Tests) on bowling performance. In the post-test, first tapering phase, second tapering phase, third tapering phase, and fourth tapering phase, notable differences were observed in the paired averages of the groups regarding bowling ability. Notable outcomes were achieved in the assessments conducted for the combined training group, the plyometric training group, and the isotonic training group. A significant mean difference was observed during the post-test, first, and third tapering period among the isotonic training group and the combined isotonic and plyometric training group, the isotonic training group and the control group, the plyometric training group and the control group, and the combined isotonic and plyometric training group and the control group. Nonetheless, in the second tapering phase, there was a notable average difference among the groups that underwent isotonic training and plyometric training, combined isotonic and plyometric training, isotonic training versus control, plyometric training versus control, and the combined isotonic and plyometric training and control. The mean discrepancy between the merged isotonic and plyometric training group and the isotonic training group in the fourth tapering phase. At the 0.05 level of confidence, there was no notable difference observed between the pre-test and the third tapering mean, the pre-test and the fourth tapering mean, or the post-test and the first tapering mean. The average difference in bowling ability between the pre-test and post-test, pre-test and first tapering, pre-test and second tapering, pre-test and third tapering, post-test

and first tapering, post-test and second tapering, post-test and third tapering, post-test and fourth tapering, first tapering and third tapering, first tapering and fourth tapering, second tapering and third tapering, second tapering and fourth tapering, third tapering and fourth tapering, third tapering and fourth tapering, third tapering and fourth tapering, third tapering and fourth tapering. It was not significant at the 0.05 confidence level for the fourth tapering mean and pre-test, first and second tapering mean, second and third tapering mean, and third and fourth tapering mean. The average difference in bowling ability between the pre-test and post-test, pre-test and initial tapering, pre-test and second tapering, pre-test and third tapering, post-test and third tapering, post-test and fourth tapering, first tapering and third tapering, first tapering and fourth tapering, second tapering and fourth tapering, third tapering and fourth tapering, and pre-test and initial tapering was found to be significant in the group undergoing combined isotonic and plyometric training. First tapering and second tapering signified, second tapering and third tapering signified, third tapering and fourth tapering period signified, post-test and first tapering signified, post-test and second tapering signified, and pre-test and fourth tapering signified were not significant at the 0.05 confidence level. **Joshi and Sisodia** (2013) discovered that male school and college cricket players showed notable enhancement in bowling skills following isotonic and isometric training phases. **Callaghan** et al., (2021) discovered a notable enhancement in pace bowling ability following the lower body strength training regimen. The capability for length bowling and full-length bowling showed enhancement post the plyometric training program in male cricket players [**Qureshi**, 2015].

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