Effect Of Isolated and Combined Weight and Plyometric Training and Detraining on Batting Skill

Mr. Dayananda[1], D.B, Dr. T. Prabakaran[2]
[1]*Ph.D., Research Scholar Department of Physical Education, Annamalai University*
[2]*Associate Professor & Research Guide, Department of Physical Education, Annamalai University.*

***Abstract*— The purpose of the study is to find out the effect of isolated and combined weight and plyometric training and detraining on batting skill. To achieve this purpose sixty male cricketers studying from M.S. Ramaiah Group of Institutions, Bangalore, Karnataka during the year 2019-2020 were selected as subjects. The age of the subjects was 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 isotonic 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 batting skill was assessed by administering the test was recommended by Cricket Australia Centre of Excellence (COE) 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 Scheffé 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 batting skill. It was also found that there was no significant difference occurred between the training groups on batting skill during the first, second and third cessation periods. The batting skill was decreased significantly at the time of all fourth cessation period for the training groups.**

***Index Terms*— isolated and combined weight and plyometric training, batting skill and dynamometer.**

I. INTRODUCTION

Cricket is a sport that needs a lot of ability. It includes things like strength, energy being able to move and being fast. Players need to hit the ball throw the ball and catch the ball well for a long time. This means they need both bodies and strong minds. For a time, cricket training has been about getting better at skills and building up the heart and lungs. More and more people are looking at how resistance training, especially high-intensity resistance training can make cricket players stronger [Habib, Khan and Khan, (2022)]. Using weights, resistance bands or just your own body weight can make muscles stronger. Make overall fitness better, during workout sessions. High-intensity resistance training is when you do very hard workouts and then take a short break.

Cricket is a game that two teams play. One team. The other team bats, as described by Bartlett in 2003 and by Noakes & Durandt in 2000. The batting team aims to collect as runs as possible. The bowling team aims to keep the runs low. In this game a bowler, from the bowling team throws the ball to the batting team at speeds and spins. These bowlers are either bowlers or spin bowlers. Fast bowlers try to throw the ball with the possible velocity. That means fast bowler must throw with velocity to succeed.

Isotonic workouts are very popular among athletes and people who stay active for fun. Isotonic exercise means the main muscle or agonist shortens while the opposing muscle or antagonist lengthens at the time. It can also work the way around. This kind of training helps use the stretch-shortening cycle. That is when a muscle stretches first and then quickly shortens. This

happens often in movements like jumping or throwing [Davies, Riemann and Manska, 2015]. Isotonic exercises involve muscle contractions where the muscle length changes. The tension remains steady. This steady tension helps to build muscle strength as shown by Rezaeimanesh and Farsani, 2011. Isokinetic exercises allow the muscle to use strength throughout the entire joint motion at a constant speed and various training methods, with isokinetic exercises can also improve muscle strength according to Lee SB, Kang 2013.

Many studies have shown that plyometric training helps make muscles stronger and more powerful [Markovich, 2007]. It also helps people run faster [Diallo et al., 2001; Impellizeri et al., 2008; Michailidis et al. 2013]. It also helps improve agility [Arazi, Coetzee and Asadi 2012; Ramirez-Campillo et al., 2014; Ramirez-Campillo et al., 2015]. Even though there is a need for ways to do plyometric training to improve both movement and physical fitness this method is not a new idea in competitive team sports [Chaouachi et al., 2009; Duncan, Woodfield, and al Nakeeb, 2006; Gabbett, 2000; Ostojic, Mazic, and Dikic 2006; Stolen et al., 2005]. Team sports like basketball, soccer and handball have activities that mix irregular movements, which are important, for doing well in games [Arazi, Coetze, and Asadi 2012; Chelly et al., 2014]. Doing plyometric training for 12 weeks three times a week helps amateur female soccer players jump higher jump from a height better and kick faster [Ccampo et al., 2009].

Tapering means reducing training intensity for a time before a competition. This method has become very popular. It is common to have a tapering period that lasts days before a big event [Shepley, et al. 1992). Many people think that cutting back on training intensity or volume just before a competition could hurt performance because of detraining. That belief is not correct. Coaches, trainers and athletes who use a tapering phase after weeks of heavy training often see better results in both strength and endurance events [Powers and Howley 2011]. Tapering can improve parts of physical performance. During a tapering phase muscle glycogen level can increase. Strength and power can get better. VO2max can rise. Endurance and peak power output can also improve [Neary, Martin and Quinney, 2003]. All of these changes help athletes perform better. The goal of tapering is to keep the benefits from all the training done earlier. At the time it allows the body to recover from the stress of training. This means the athlete can feel fresh and ready, for competition. A planned tapering schedule is necessary to make sure peak performance happens at the right time during the event [Mujika and Padilla 2001].

II. MATERIALS AND METHODS

To achieve the purpose of present study, sixty male cricketers from M.S. Ramaiah Group of Institutions, Bangalore, Karnataka, during the year 2024-2025 were selected as subjects. The age of the subjects was 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 isotonic 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 batting skill was assessed by administering the test was recommended by Cricket Australia Centre of Excellence (COE) [Portus, et al., 2010)] 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.

III. ANALYSIS OF DATA

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

Table - I
The Mean Values of Batting 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
Isotonic Training Group	Mean	28.67	33.33	32.47	31.47	30.40	29.27
Plyometric Training Group	Mean	28.80	33.63	32.40	31.67	30.27	29.47
Combined Training Group	Mean	28.57	33.00	31.93	31.33	27.73	28.20
Control Group	Mean	28.13	27.80	27.60	27.47	27.73	28.19

(Batting skill Scores in Kg.)

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

Table – I – A
The Two-Way Analysis of Variance on Batting Skill of Isotonic 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	729.027	3	243.009	16.698*
Error – I	814.96	56	14.55	
B – Factor Tests	320.287	4	80.72	147.37*
AB factor (interaction) Groups and Tests	154.41	12	12.87	23.68*
Error II	121.787	224	0.543	

* 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 16.698, for row (groups) on batting 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 147.37 for column (tests) on batting 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 23.68 for interaction effect (groups x tests) on batting skill is also greater than the required table value 2.41 for significance with df 4 and 224. From the table - VI - 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 batting 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 batting 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 Batting Skill

Source of Variance	Sum of Squares	df	Mean Squares	F-ratio
Groups within Pre-tests	3.93	3	1.311	0.42
Groups within Post-tests	366.27	3	122.01	32.77*
Groups within First Cessation Period	247.53	3	82.61	25.41*
Groups within Second Cessation Period	182.85	3	60.95	18.34*
Groups within Third Cessation Period	72.73	3	24.24	7.49*
Groups within Fourth Cessation Period	14.05	3	4.68	1.47
Tests and Isotonic Training Group	156.16	5	31.232	57.52*
Tests and Plyometric Training Group	165.133	5	33.03	60.82*
Tests and Combined Weight and Plyometric Training Group	328.91	5	65.78	121.15*
Tests and Control Group	4.59	5	0.92	1.69

Error II	121.787	224	0.543	

* 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 were 32.77, 25.41, 18.34, and 7.49indicating that there was a significant difference between the paired means of groups on batting skill. But there was no significant difference was existed between groups during fourth cessation with F-ratio of 2.35.

Table - I - B shows that F-ratio values obtained for tests within isotonic training group, plyometric training group and combined training group was 57.52, 60.82, and 121.15 indicating that there was a significant difference that exists among the paired means on batting skill. But table - VII – B shows that F-ratio value obtained for tests within control group was 1.69 indicating that there was no significant difference exists among paired means of tests within control group on batting skill.

Since, four groups and six different levels of examinations 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 Batting Skill

Isotonic Training Group	Plyometric Training Group	Combined Isotonic and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
33.33	33.53			0.20	0.78
33.33		33.00		0.33	0.78
33.33			27.60	5.73*	0.78
	33.53	33.00		0.53	0.78
	33.53		27.60	5.93*	0.78
		33.00	27.60	5.40*	0.78

* 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 was occurred between 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 on batting 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 Batting Skill

Isotonic Training Group	Plyometric Training Group	Combined Isotonic and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
32.47	32.40			0.47	0.78
32.47		31.93		0.54	0.78
32.47			27.60	4.87*	0.78
	32.40	31.93		0.47	0.78
	32.40		27.60	4.80*	0.78
		31.93	27.60	4.33*	0.78

* Significant at 0.05 level of confidence.

It may be concluded from the above table-I-D, that there was a significant difference was occurred between 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 on batting 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 Batting Skill

Isotonic training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
31.47	31.87			0.40	0.78
31.47		31.33		0.14	0.78
31.47			27.47	4.00*	0.78
	31.87	31.33		0.54	0.78
	31.87		27.47	4.40*	0.78
		31.33	27.47	3.86*	0.78

* Significant at 0.05 level of confidence.

It may be concluded from the table–I–E, that there was a significant difference was occurred between 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 and combined weight and plyometric training group and control group on batting 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 Batting Skill

Isotonic training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
30.40	30.27			0.13	0.78
30.40		30.13		0.27	0.78
30.40			27.73	2.67*	0.78
	30.27	30.13		0.14	0.78
	30.27		27.73	2.54*	0.78
		30.13	27.73	2.40*	0.78

* Significant at 0.05 level of confidence.

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

Table – I – G

The Scheffe S Test for the Difference Between Paired Means of Third Cessation with Different Groups on Batting Skill

Isotonic training Group	Plyometric Training Group	Combined Weight and Plyometric Training Group	Control Group	Mean Difference	Confidence Interval
29.27	29.47			0.20	0.78
29.27		28.20		1.07	0.78
29.27			28.19	1.08*	0.78
	29.47	28.20		1.27*	0.78
	29.47		28.19	1.28*	0.78

		28.20	28.19	0.01	0.78

* Significant at 0.05 level of confidence.

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

Table – I – H

The Scheffe S Test for The Difference Between Paired Means of Tests on Batting Skill (Isotonic Training Group)

Pre –test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation	Mean Difference	Confidence Interval
28.67	33.33					4.66*	0.902
28.67		32.47				3.80*	0.902
28.67			31.47			2.80*	0.902
28.67				30.40		1.73*	0.902
28.67					29.27	0.60	0.902
	33.33	32.47				0.86	0.902
	33.33		31.47			1.86*	0.902
	33.33			30.40		2.93*	0.902
	33.33				29.27	4.06*	0.902
		32.47	31.47			1.00*	0.902
		32.47		30.40		2.07*	0.902
		32.47			29.27	3.20*	0.902
			31.47	30.40		1.07*	0.902
			31.47		29.27	2.20*	0.902
				30.40	29.27	1.13*	0.902

* Significant at 0.05 level of confidence.

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

Table – I – I

The Scheffe S Test for The Difference Between Paired Means of Tests on Batting Skill (Plyometric Training Group)

Pre -test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation	Mean Difference	Confidence Interval
28.80	33.53					4.73*	0.902
28.80		32.40				3.60*	0.902
28.80			31.67			2.87*	0.902
28.80				30.27		1.47*	0.902
28.80					29.47	0.67	0.902
	33.53	32.40				0.93*	0.902
	33.53		31.67			1.86*	0.902
	33.53			30.27		3.26*	0.902
	33.53				29.47	4.06*	0.902
		32.40	31.67			0.73	0.902
		32.40		30.27		2.13*	0.902
		32.40			29.47	2.93*	0.902

			31.67	30.27		1.40*	0.902
			31.67		29.47	2.20*	0.902
				30.27	29.47	0.80	0.902

* Significant at 0.05 level of confidence.

The above table-I-H, shows that there was a significant difference and reduction on batting skill for plyometric training group after post-test development.

Table – I – J

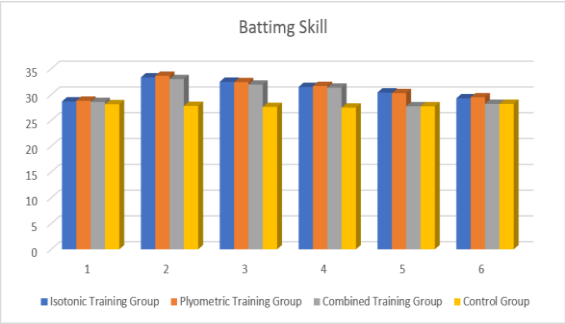
The Scheffe S Test for The Difference Between Paired Means of Tests on Batting Skill (Cobined Weight and PlCCCCCyometric Training Group)

Pre -test	Post-test	First Cessation	Second Cessation	Third Cessation	Fourth Cessation	Mean Difference	Confidence Interval
28.67	33.00					4.33*	0.902
28.67		31.93				3.26*	0.902
28.67			31.33			2.66*	0.902
28.67				27.73		0.94*	0.902
28.67					28.87	0.20	0.902
	33.00	31.93				1.07*	0.902
	33.00		31.33			1.67*	0.902
	33.00			27.73		5.27*	0.902
	33.00				28.87	4.13*	0.902
		31.93	31.33			0.60	0.902
		31.93		27.73		4.20*	0.902
		31.93			28.87	3.06*	0.902
			31.33	27.73		3.60*	0.902
			31.33		28.87	2.46*	0.902
				27.73	28.87	1.14*	0.902

* Significant at 0.05 level of confidence.

The above table-I-I, shows that there was a significant difference and reduction on batting skill for combination of weight and plyometric training group after post-test development.

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



IV. DISCUSSION

The result of the study showing that the batting column (tests) is greater for significant, the groups (rows) on batting are higher for significant. The batting skill is greater for significant groups when the interaction effect (groups x tests) is significant. The results of the study demonstrated that there were substantial differences in the interaction influence of rows (Groups) and columns (Tests) on batting talent. The post-test, first cessation period, second cessation period, and third cessation period showed significant differences in the paired averages of the groups on batting skill. The paired averages on batting skill, however, varied significantly, and there was no appreciable change between the groups during the fourth cessation. The results of the study indicate that there was a significant difference in batting skill between the groups that received isotonic training and

control, plyometric training and control, and combined isotonic and plyometric training and control at the post-test, first, second, and third cessation sessions. However, there was a significant difference in batting ability between the isotonic training group and the control group, the plyometric training group and the combined isotonic and plyometric training group, the plyometric training group and the control group, and the isotonic training group and the combined isotonic and plyometric training group at the fourth cessation period. A substantial difference was seen in batting skill of isotonic training group, between the pre-test and post-test, pre-test and first cessation, pre-test and second cessation, pre-test and third cessation, post-test and second cessation, post-test and third cessation, post-test and fourth cessation, first cessation and second cessation, first cessation and third cessation, first cessation and fourth cessation, second cessation and third cessation, second cessation and third cessation, second cessation and fourth cessation, second cessation and third cessation, second cessation and fourth cessation, third cessation and fourth cessation period. At the 0.05 level of confidence, the mean values for the pre-test, fourth cessation, post-test, and first cessation were not statistically significant. Pre-test and post-test, pre-test and first cessation, pre-test and second cessation, pre-test and third cessation, post-test and first cessation, post-test and second cessation, post-test and third cessation, post-test and fourth cessation, first cessation and third cessation, first cessation and fourth cessation, second cessation and third cessation, second cessation and fourth cessation, and post-test and first cessation were all significantly different in terms of batting skill for the plyometric training group. However, at the 0.05 level of confidence, there was no significant difference between the pre-test and fourth cessation, first and second cessation, and third and fourth cessation. The mean difference in batting skill between the pre-test and post-test, pre-test and first cessation, pre-test and second cessation, pre-test and third cessation, post-test and first cessation, post-test and second cessation, post-test and third cessation, post-test and fourth cessation, first cessation and third cessation, second cessation and fourth cessation, and third cessation and fourth cessation was discovered in the combined isotonic and plyometric training group. However, there was no discernible difference between the first and second cessation periods and the pre-test and fourth cessation period. Joshi and Sisodia (2013) found that isotonic and isometric exercise improves cricket playing abilities such as, batting and bowling performances. Qureshi (2015) found that there was a significant improvement in off side batting ability, defend batting ability, length bowling ability, full length bowling ability and overall playing ability after the plyometric training.

REFERENCES

[1] H. Arazi, B. Coetzee, and A. Asadi, "Comparative effect of land- and aquatic-based plyometric training on jumping ability and agility of young basketball players," South African Journal for Research in Sport, Physical Education and Recreation, vol. 34, pp. 1–14, Jan. 2012.

[2] R. M. Bartlett, "The science and medicine of cricket: An overview and update," Journal of Sports Sciences, vol. 21, no. 9, pp. 733–752, 2003.

[3] S. C. Ccampo, R. Vaeyens, R. M. Philippaerts, J. C. Redondo, A. M. De Benito, and G. Cuadrado, "Effects of lower limb plyometric training on body composition, explosive strength, and kicking speed in female soccer players," Journal of Strength and Conditioning Research, vol. 23, pp. 1714–1722, 2009.

[4] Chaouachi, M. Brughelli, G. Levin, N. B. Boudhina, J. Cronin, and K. Chamari, "Anthropometric, physiological and performance characteristics of elite team-handball players," Journal of Sports Sciences, vol. 15, pp. 151–157, 2009.

[5] G. Davies, B. L. Riemann, and R. Manske, "Current concepts of plyometric exercise," International Journal of Sports Physical Therapy, vol. 10, pp. 760–786, 2015.

[6] O. Diallo, E. Dore, P. Duche, and E. Van Praagh, "Effects of plyometric training followed by a reduced training programme on physical performance in prepubescent soccer players," Journal of Sports Medicine and Physical Fitness, vol. 41, pp. 342–348, 2001.

[7] M. J. Duncan, L. Woodfield, and Y. Al-Nakeeb, "Anthropometric and physiological characteristics of junior elite volleyball

players," British Journal of Sports Medicine, vol. 40, pp. 649–651, 2006.

[8] T. J. Gabbett, "Physiological and anthropometric characteristics of amateur rugby league players," British Journal of Sports Medicine, vol. 34, pp. 303–307, 2000.

[9] Z. Habib, M. A. Khan, and S. A. Khan, "Effects of aerobic training versus cross-training upon cardiorespiratory endurance of middle-distance runners," The Sky, vol. 6, pp. 172–183, 2022.

[10] S. K. Joshi and A. S. Sisodiya, "Effect of isotonic and isometric exercises on the performance of batting and bowling skills in cricket," International Journal of Physical Education, Sports and Yogic Sciences, vol. 1, no. 2, pp. 7–9, Aug.–Nov. 2013.

[11] V. Jothi and M. Eleckuvan, "Effect of concurrent strength and plyometric training on selected biomotor abilities," Recent Research in Science and Technology, vol. 2, no. 5, pp. 124–126, 2010.

[12] F. M. Impellizzeri, E. Rampinini, C. Castagna, F. Martino, S. Fiorini, and U. Wisloff, "Effects of plyometric training on sand versus grass on muscle soreness and jumping and sprinting ability in soccer players," British Journal of Sports Medicine, vol. 42, pp. 42–46, 2008.

[13] Y. Michailidis, I. G. Fatouros, E. Primpa, C. Michailidis, A. Avloniti, and A. Chatzinikolaou, "Plyometrics trainability in preadolescent soccer athletes," Journal of Strength and Conditioning Research, vol. 27, pp. 38–49, 2013.

[14] S. Mujika and S. Padilla, "Muscular characteristics of detraining in humans," Medicine & Science in Sports & Exercise, vol. 33, no. 8, pp. 1297–1303, 2001.

[15] J. P. Neary, T. P. Martin, and H. A. Quinney, "Effects of taper on endurance cycling capacity and single muscle fiber properties," Medicine & Science in Sports & Exercise, vol. 35, no. 11, pp. 1875–1881, 2003.

[16] T. D. Noakes and J. J. Durandt, "Physiological requirements of cricket," Journal of Sports Sciences, vol. 18, no. 12, pp. 919–929, 2000.

[17] S. Ostojic, S. Mazic, and N. Dikic, "Profiling in basketball: Physical and physiological characteristics of elite players," Journal of Strength and Conditioning Research, vol. 20, pp. 740–744, 2006.

[18] M. Portus, S. Timms, W. Spratford, N. Morrison, and R. Crowther, "A batting skills test to assist the development of elite cricketers," in Proc. Conference of Science, Medicine & Coaching in Cricket, Sheraton Mirage, Gold Coast, Queensland, Australia, Jun. 1–3, 2010.

[19] S. K. Powers and E. T. Howley, Exercise Physiology: Theory and Application to Fitness and Performance. New York, NY, USA: McGraw-Hill Education, 2011, pp. 211–212.

[20] R. Ramirez-Campillo, C. Burgos, C. Henríquez-Olguín, D. C. Andrade, C. Martínez, C. Alvarez, M. Castro-Sepúlveda, M. C. Marques, and M. Izquierdo, "Effect of unilateral, bilateral and combined plyometric training on explosive and endurance performance of young soccer players," Journal of Strength and Conditioning Research, vol. 29, no. 5, pp. 1317–1328, 2015.

[21] R. Ramirez-Campillo, C. Meylan, C. Alvarez, C. Henriquez-Olguin, C. Martinez, R. Canas-Jamett, D. C. Andrade, and M. Izquierdo, "Effects of in-season low-volume high-intensity plyometric training on explosive actions and endurance of young soccer players," Journal of Strength and Conditioning Research, vol. 28, pp. 1335–1342, 2014.

[22] D. Rezaeimanesh and P. A. Farsani, "The effect of a 6-week isotonic training period on lower body muscle EMG changes in volleyball players," Procedia—Social and Behavioral Sciences, vol. 30, pp. 2129–2133, 2011.

[23] B. Shepley, J. D. McDougall, N. Cipriano, J. R. Sutton, M. A. Tornopolsky, and G. Coates, "Physiological effects of tapering in highly trained athletes," Journal of Applied Physiology, vol. 72, no. 2, pp. 706–711, 1992.

[24] T. Stolen, K. Chamari, C. Castagna, and U. Wisløff, "Physiology of soccer: An update," Sports Medicine, vol. 35, pp. 501–536, 2005.