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A STUDY ON EFFECT OF CROSS TRAINING ON PHYSICAL FITNESS OF CRICKET PLAYERS

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ABSTRACT

This paper analyzes and presents the data obtained on selected criteria variables. The study's goal is to determine the impact of cross training and cricket training on selected physical fitness in male university cricket players. During the academic year 2020-2021, forty-five (n=45) men university cricket players were picked from Maharashtra state. The subjects' ages varied from 18 to 27 years. The individuals were separated into three groups of fifteen each with two experimental groups and one control group. The experimental group-I received cross-training (group A), whereas the experimental group-II received cricket training (group B) for a period of twelve weeks, three days per week, and group-III served as the control group (group C). Flexibility, agility, speed, strength and endurance were the criteria of physical variables used for this study. The standardized test items were used to measure the specified variables before and after the training session. The findings of this study show that cross-training with cricket training exercises can improve the performance of university cricket players in virtually all of the physical fitness. As a result, it is advised that coaches and physical educators in the game of university cricket players prioritize cross training alongside cricket training activities in their schedules.

Keywords: cricket players, cross-training, physical fitness, Flexibility, agility, speed, strength and endurance

INTRODUCTION

Sport encompasses all types of generally competitive physical activity that attempt to utilize, maintain, or enhance physical ability & abilities through casual or organized involvement, while also providing enjoyment to participants &, in some circumstances, spectators. There are hundreds of sports, ranging from those needing only two people to those requiring hundreds of simultaneous competitors, either in teams or competing individually.

Sport is generally defined as physical athleticism or dexterity-based activities, with largest major competitions, such as Olympic Games, admitting only sports that meet this definition & other organisations, such as Council of Europe, using definitions that exclude activities without a physical component from classification as sports. However, a multitude of competitive but non physical pastimes claim to be mind-sports. The International Olympic Committee (through ARISF) recognises chess & bridge as valid sports, however Sport Accord, international sports federation organisation, recognises five non-physical sports while limiting the number of mind games that may be considered sports.

In recent years, the area of sports has grown in popularity, as youngsters from developed, emerging, and underdeveloped nations participate in significant numbers, both recreationally and professionally. The effect of their quantitative engagement is improved performance and a

significant improvement in the level of sports and games. During the previous century, the effect of scientific knowledge on sports boosted the level of sports significantly. The use of science at many levels, such as improvements in facilities, training techniques, conditioning, nutrition, psychological intervention tactics, & professionalization of sports itself, has resulted in improved performance.

Fitness is a state that frequently describes a person's ability to perform. The ability to perform is determined by physical, mental, emotional, social, & spiritual components of fitness, which are all linked to total fitness. While fitness refers to body's maximum, economical, & efficient functioning, health refers to body's ideal homeostatic functioning.

PHYSICAL FITNESS FOR CRICKET

Cricket is a sport in which fitness has traditionally been overlooked. However, the success of the world-beating Australian team in the 1990s and 2000s has been credited to their professionalism, & in part to manner they handled their fitness. Other test-playing nations have recently placed a greater focus on fitness & are reaping advantages. With introduction of one-day cricket &, more recently, Twenty20, game, as well as the physical demands placed on a cricketer's body, have experienced considerable changes. The importance of fitness will vary based on type of game being played & role of player in team: fitness requirements of a fast bowler will be more & also different than those of an opening batsman, & oneday cricket will be more demanding than a test match.

Cricket appears to be a game that requires minimal muscular power. From a distance, cricket appears to be such a mild sport that concept of strength training & workouts appears to have limited relevance. Cricket, like many other games that feature relatively long periods of low activity interspersed by times of intense muscle attention, is deceptively tough and provides major physical training obstacles for players, particularly at the elite level.

Physical fitness is an important factor in cricket performance, since physically fit players perform better, more consistently, & with fewer injuries. Strength, speed, & endurance enable a cricketer to bat with power over extended periods of time, bowl more quickly & precisely, & field athletically. Every cricketer has a specific function, position, action, or ability, & fitness training should take this into account. A well-structured cricket training programme must take the individual's training history, injury history, training age, positional demands, technical execution, & training objectives into account.

- Multi-day contests need a large amount of running & sprinting spread out over a lengthy period of time. A huge number of overs must be bowled and batted over a lengthy period of time.
- A fast bowler must traverse an average of 16 kilometers every game while sprinting 66 times. Quality field movement and rapid sprinting between the wickets are critical components for success.
- Fielders traverse 6.4-8.5 kilometers in 80 minutes of fielding during a Twenty20 match, whereas fast bowlers cover 8.5 km and sprint 42 times. The game goes swiftly in this style, and there are higher expectations for energy and explosive abilities with the bat and ball.

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- During the run-up, a fast bowler may attain up to 95% of their maximal running speed. This may influence how fast you bowl.
- When a fast bowler's front and back feet collide with the ground, they may have to absorb 5-7 times their bodyweight.
- Leg strength is a significant factor in fast bowling speed and force absorption. Leg strength is thus essential for performance & injury prevention.
- Fatigue impacts upon decision making in batting.
- The ability to execute cricket shots is influenced by functional strength and mobility. This implies that batsmen must build from a sturdy & balanced foundation.
- Running speed & endurance refer to how successfully a batter can run between wickets over lengthy periods of time.
- The ability to execute spin bowling deliveries with consistency is affected by functional strength and mobility.
- Acceleration and rapid lateral movement are essential factors in bowling fielding off.
- A wicketkeeper must execute between 120 and 600 squats every day.
- Explosive movement, both laterally and above, is required to exploit every opportunity.
- When racing to the wicket to receive a ball or to the field near the batsman, acceleration is critical.
- Good foot movement is a key component of effective wicketkeeping.

TEN PRINCIPLES OF CRICKET FITNESS

- **Ground Based Activities**. Because a cricketer plays standing up, it is assumed that he should train standing up as well. Running, throwing, shooting, and bowling all begin with providing force to the ground. As a result, it makes sense to reduce as many sitting or laying down training activities as feasible.
- **Multiple Joint Actions**. Cricket skills need a high level of coordination. It may be trained by selecting workouts that require the use of more than one joint. Squats, for example, demand utilization of the knees, hips, ankles, and even the shoulders and arms to hold bar. A leg extension just needs that knees move.
- **Three Dimensional Movements.** Cricket is played in three dimensions (no, really), thus training should reflect that by using free weights wherever feasible, because free weights train the cricketer on three planes, whereas machines are only meant to train in two (with cams, seats and pulleys taking strain from third).
- **Train Explosively**. The ability of the muscles to operate fast determines speed and power. Muscles work quicker when trained with explosive rapid motions rather than sluggish strength workouts. As a result, activities like the clean and plyometrics are essential for cricketers.
- **Progressive Overload**. Workouts must be progressed to increase fitness. More repetitions equals more muscular endurance & size, but more weight equals more strength & power. While cricketers should not neglect former, they should prioritize latter.
- **Periodisation**. A periodised approach of yearly plan is vital to all players.

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- **Split Routine**. Splitting a weight training regimen across multiple days (rather than working the entire body every time) allows for more recovery time, which allows you to train harder.
- **Hard-Easy System**. This is related to periodisation. The idea is simple: cricketers cannot train at maximum intensity all of the time or they would burn out.
- **Train Specifically**. To get most out of us on cricket field, our training must be as realistic as possible. This includes activities that prepare the body to be swift and powerful, rather than extended runs.
- **Interval Training**. Following on from particular training, work & rest should mimic demands of cricket, which means brief bursts of intensive effort followed by lengthy stretches of active rest, much like batting, bowling, or fielding.

LITERATURE REVIEW

Ramesh (2010) conducted a study to determine effect of cross training & complicated training on college students' strength & speed characteristics. Forty-five guys were chosen at random, ranging in age from 18 to 21 years. Before & after the experiment, the specified speed and strength variables were examined. He discovered that the respondents' arm strength, explosive strength, strength endurance, acceleration, speed, & speed endurance increased when they participated in cross-training.

Houghton, L., Dawson, B., Rubenson, J., & Tobin, M. (2011) recreated physical demands of a century in One Day International Cricket. The simulated innings requires running-between-the-wickets over six five-over periods of 21 minutes each. There was a moderate trend for simulated innings to cover less ground than One-Day hitting (2171±157 vs. 2476±631 m • h 1; impact size = 0.78). This disparity was mostly explained by a substantial tendency toward decreased distance traveled walking in simulated innings compared to One-Day hitting (135 ±57 vs. 1604±438 m • h 1; impact size = 1.61). However, there was a clear trend in the simulated innings for distance traveled (both striding & sprinting) to be larger than actual One-Day batting (effect size > 1.2). In practice, simulated batting innings might be utilized for match-like physical training as well as a study procedure to measure demands of extended, high-intensity Cricket batting.

McNamara (2013) evaluated major fatigue & workload characteristics of Cricket fast bowlers & nonfast bowlers across a seven-week physical preparation phase & a ten-day intense competition period. These data show that physical demands of Cricket fast bowlers & nonfast bowlers differ, & that these external workloads influence the neuromuscular, endocrine, & perceptual fatigue responses of these players differently.

Phillips (2014) tried to get insight into the acquisition of competence in cricket fast bowling. Participants were questioned about particular criteria they thought were indicators of fast bowling competence potential. The relative relevance of each putative component of fast bowling knowledge, as well as how components interacted or grew over time, were of particular interest. The data are compatible with a dynamical systems model of skill acquisition in fast bowling, with various talent development pathways accessible. More research is required to link experience and theoretical knowledge on skill in other sports.

Mura et al. (2015) investigate the impact of physical activity programmes in schools on academic success and cognitive outcomes. PubMed/Medline, Scopus, and Google Scholar were used to find relevant literature. Only quasi-experimental and experimental studies targeting three to 18-year-old healthy students & aimed to demonstrate a link b/w exercise conducted in a school context & cognitive/academic performance were included. The search yielded 31 publications presenting the outcomes of twenty-eight school-based physical activity programmes.

Kathryn E.Wilson et al. (2015) calculated population correlations between Big-Five personality variables and physical activity and investigated if they differed depending on sample characteristics and study parameters. PRISMA criteria were followed while searching databases for papers published in English prior to November 1st, 2013.

The associations between Cross- training parameters (time since beginning training, frequency of weekly sessions) and indicators of wellbeing, self-esteem, body awareness, contentment with body image, and perceived body competence were examined by Ferenc Köteles et al. (2016). Online questionnaires were completed by 186 Norwegians who regularly engage in CrossFit (mean age: 28.97 years; 57.5 percent female) (WHO-5 Well-being Scale, PANAS, Rosenberg Self-Esteem Scale, Body Awareness Questionnaire, Body Image Ideals Questionnaire, Body Competence Scale, motivations for doing CrossFit).

Christine E. Roberts and colleagues (2017) evaluated effects of physical activity level & activity type on ADL in people aged 60 and up. Electronic search approaches found 47 relevant randomised controlled trials (till March 2015). Physical activity has a significant, beneficial effect on ADL physical performance (SMD = 0.72, 95 percent CI [0.45, 1.00]; $p<.01$), with greatest effects found for moderate physical activity levels and activity types with high mental (e.g., memory, attention), physical (e.g., coordination, balance), & social (e.g., social interaction) demands.

C. Beaudart et al. (2017) selected RCTs that looked at the combined impact of exercise training and nutritional supplements on muscular strength, muscle mass, or physical performance in people over the age of 60. Two independent reviewers selected the studies & extracted the data.

D. Goble and C. J. Christie (2017) studied how a long, fatigue-inducing Cricket-batting simulation affects cognitive and physical performance. The important outcome metrics for each cognitive test were speed & accuracy/error rates. Prolonged batting had a significant effect on executive task performance ($d = 0.85$; $P = 0.03$), as well as minor effects on visual attention & vigilance ($d = 0.56$; $P = 0.21$) & attention & working memory ($d = 0.61$; $P = 0.11$), with task performance declining after 30 overs. As a result, long hitting sessions with frequent shuttle runs fatigue amateur batters & impede higher-order cognitive function. This will have an effect on batting decision-making, response selection, reaction execution, & other executive functions.

Davis (2018) researched cricketers' perceptions of opponents' emotional interactions. The current study contributes to previous research on interpersonal emotion regulation within teams by showing that professional cricketers are aware of impact of cognitions & emotions on performance & attempt to negatively affect these traits during competition.

Yüksel et al. (2019) look at the impact of frequent Cross- training on force & jump characteristics. The study included 32 healthy wrestlers divided into 16 experimental & sixty control groups. Cross- training, known as Cindy, was performed three times per week for eight weeks in experimental group. For 20 minutes, the workout included five bars, 10 push-ups, & 15 squats. The traditional wrestling practice was continued by the control group. The Myotest accelerometric system was used to measure the values of subjects. ANOVA with repeated measures was used to analyze the data. According to the findings, CrossFit training enhanced athletes' squat jump heights (Wilks' Lambda = 0.541, F (1,30) = 25, p = 0.00). The mean post-training jump values (33.778±5.48) were greater than pre-training leap values (32.169±4.95) ($p<0.05$). Cindy CrossFit research may be finished to increase leaping and strength capacity.

Few studies have looked at burdens put on teenage cricket players, according to Lee Pote and Candice Jo-Anne Christie (2019). The goal of this study was to establish the demands imposed on schoolboy cricketers, especially in the setting of South Africa. Fast bowlers threw more balls during matches than during practices, whereas batsmen did more shuttles during practices than during matches. Matches had greater session RPE than practices. Workload and injury risk did not appear to be related; however, this might be owing to limited sample size. It was determined that it is critical to monitor individual player workloads. In addition, practice intensities must be increased to match game demands. Finally, study design was effective, and methods employed were found to be suitable for a larger population.

Using children with autism spectrum disorder as their sample population, Anneliese Ruggeri et al. (2020) looked at the impact of motor and physical activity therapy on motor outcomes as well as the effects of motor learning techniques on the acquisition, retention, and transfer of motor skills. Six datasets spanning 2000 to 2019 were studied. In all, 41 studies were completed, including 7 motor learning studies and 34 intervention studies. The strength of the evidence was uneven throughout. 1173 kids with autism spectrum disorders, ranging in age from 3 to 19, were participants.

Hassane Zouhal et al. (2020) discovered the benefits of physical training on anthropometric features, physical performances, & physiological capacity in those who are overweight or obese. From its commencement until June 2019, a systematic literature search method was used, with four electronic databases yielding 2,708 results. We included 116 studies in our final analysis after screening for titles, abstracts, & full texts.

Dirk Thiele et al. look at the effects of strength training (ST) on many aspects of physical fitness in rowers, such as lower/upper limb maximum strength, muscular endurance, jump performance, and sport-specific performance (2020). Studies that looked at how ST influenced at least one proxy of physical fitness and/or sport-specific performance in rowers and included an active control group were only included. Using random-effects models, weighted and summed standardised mean differences were determined (SMD). In order to better understand how ST type or degree of competence affect performance in a particular sport, subgroup studies were conducted.

Feifei Wang et al. (2021) conducted a thorough review of the last eight years of publications. Between January 2010 and June 2018, relevant studies were found using the search terms'sleep quality' and 'physical activity' in PubMed & Scopus. All of the papers presented were

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properly vetted and studied. The moderate and strong PA thresholds were used to compare physical intensity and sleep quality.

Weldon A, Clarke ND, Pote L, and Bishop C. (2021) create a physical profile of international cricketers and study whether or not there are positional distinctions between bowlers and hitters. This research looks at the physical characteristics of international cricketers. Batters outperformed bowlers in lower-body power, and other physical test scores were comparable across positions. Individual results for each physical test, on the other hand, indicated that there are disparities amongst players. Strength and conditioning coaches should consider this when using physical profile data to guide program design and assessment.

OBJECTIVES OF THE STUDY

The purpose of this study is to investigate a study of effect of cross training on physical fitness among cricket players

RESEARCH METHODOLOGY

To meet the current study's goal, forty-five male university cricket players from Maharashtra state were chosen at random as subjects. Their ages varied from 18 to 27 years. The research scholar studied the available scientific literature relevant to the subject from books, journals, magazines, websites, and research papers, and the following variables and tests were chosen based on feasibility on criteria and availability.

PHYSICAL VARIABLES

S.NO.	VARIABLES	TESTS
1	Flexibility	Sit and reach
2	Agility	"T" shuttle run test
3	Speed	50 mtrs dash
4	Strength	Bent – Knee Sit – Ups
5	Endurance	Cooper 12 minutes Run/Walk

The study was designed as a genuine random group design with a pre-test and post-test. The subjects (N=45) were divided into three equal groups of fifteen each. In a comparable fashion, the groups were classified as cross–training, cricket training exercises, and cross–training plus cricket training activities. The three groups took part in the training for a total of twelve weeks in order to determine the outcome of the training packages. The paired 't' test was employed to determine the difference between each group's before and post-test results. Because the individuals were chosen at random, analysis of covariance (ANACOVA) was performed because the groups were not equivalent in reference to the factors to be evaluated. As a result, the difference in means between the three groups in the pre-test had to be considered during the analysis of post-test mean differences. This was accomplished through the use of covariance analysis, in which the end means were adjusted for differences in the original means and the modified means were assessed for significance. When the adjusted post-test means were determined to be significant, the scheffe's post-hoc test was used to determine the paired means difference. A level of significance of 0.05 was used and regarded sufficient for the investigation.

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DATA ANALYSIS AND INTERPRETATIONS

The impact of each independent variable on each criteria variable was examined and reported below:

TABLE 1 SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF GROUP A

S.No	VARIABLES	PRE-TEST MEAN	POST-TESTMEAN	MEAN DIFFERENCE	'T'RATIO
1	Speed	4.757	4.486	0.271	4.941*
2	Agility	8.789	8.399	0.290	5.863*
3	Endurance	2456.672	2713.335	256.663	6.987*
4	Strength	45.278	51.208	5.930	10.124*
5	Flexibility	29.007	33.076	4.069	6.878*

(*Significant at 0.05 level of confidence. The table values required for significance at 0.05 level of confidence for df 15 is 2.14, respectively).

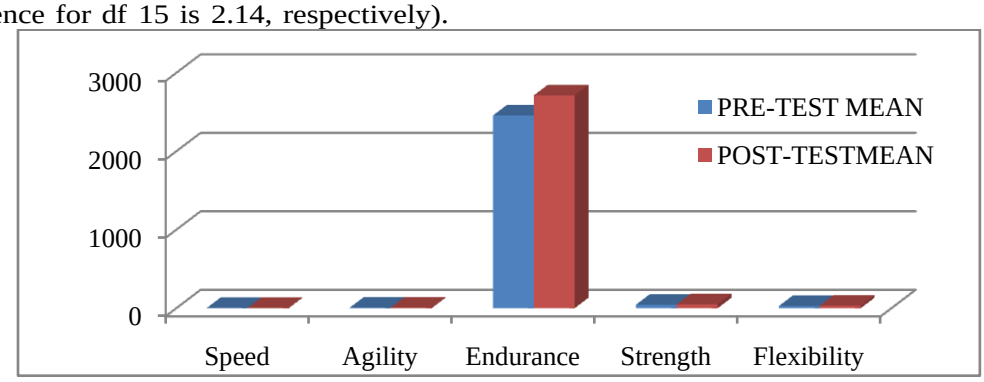

FIGURE 1 PRE AND POST TEST MEAN SCORES ON SELECTED VARIABLES OF GROUP A

The obtained 't' ratios for speed, agility, endurance, strength and flexibility, were 4.941, 5.863, 6.987, 10.124 & 6.878 respectively. The resulting 't' ratios on the specified variables were discovered to be larger than the needed table value of 2.140 at the 0.05 level of significance for 15 degrees of freedom. As a result, it was discovered to be substantial. The findings of this investigation were statistically significant and favorably described its effects.

TABLE 2 SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF GROUP B

S.NO	VARIABLES	PRE-TEST MEAN	POST-TEST MEAN	MEAN DIFFERENCE	'T' RATIO
1	Speed	4.742	4.583	0.159	9.613*
2	Agility	8.704	8.445	0.259	4.984*
3	Endurance	2491.338	2741	249.662	5.715*
4	Strength	43.607	49.205	5.598	4.386*
5	Flexibility	29.736	34.278	4.542	5.377*

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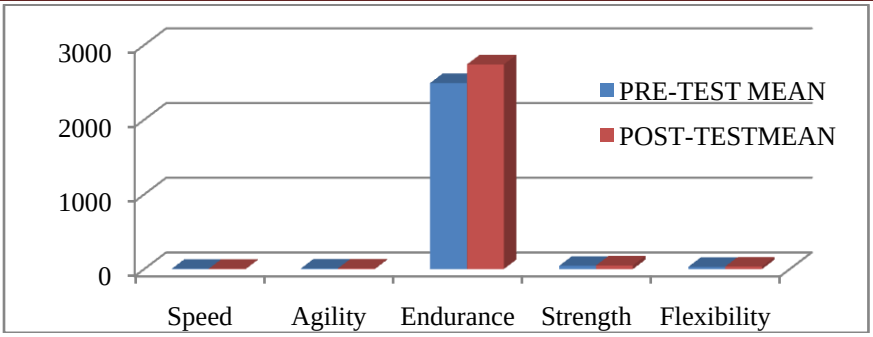

FIGURE 2 PRE AND POST TEST MEAN SCORES ON SELECTED VARIABLES OF GROUP B

According to table 2, the acquired 't' ratios for speed, agility, endurance, strength and flexibility, were 9.613, 4.984, 5.715, 4.386 and 5.377. The resulting 't' ratios on the specified variables were determined to be larger than the needed table value of 2.14 for 15 degrees of freedom at the 0.05 level of significance. As a result, it was discovered to be substantial. The findings of this investigation were statistically significant and favourably described its effects.

TABLE 3 SIGNIFICANCE OF MEAN GAINS & LOSSES BETWEEN PRE AND POST TEST SCORES ON SELECTED VARIABLES OF GROUP C

S.NO	VARIABLES	PRE-TEST MEAN	POST-TEST MEAN	MEAN DIFFERENCE	'T' RATIO
1	Speed	4.762	4.652	0.110	4.669*
2	Agility	9.067	8.864	0.203	1.768
3	Endurance	2430	2558.670	128.670	1.557
4	Strength	43.071	44.209	1.138	2.116
5	Flexibility	27.878	28.704	0.826	0.025

*Significant at 0.05 level of confidence. The table values required for significance at 0.05 level of confidence for df 15 is 2.14 respectively).

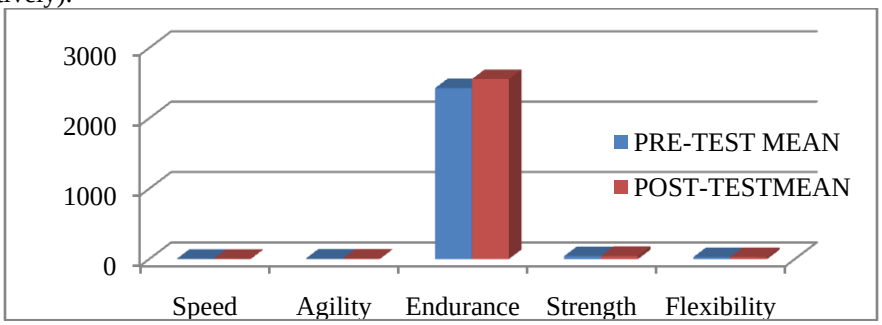

FIGURE 3 PRE AND POST TEST MEAN SCORES ON SELECTED VARIABLES OF GROUP C

The acquired 't' ratios were 4.669, 1.768, 1.557, 2.116 and 0.025 speed, agility, endurance, strength and flexibility respectively. At the 0.05 level of significance for 15 degrees of freedom, the obtained 't' ratios on the specified variables were determined to be larger than the needed table value of 2.140. As a result, it was discovered to be substantial. The findings of this investigation were statistically significant and favorably described its effects.

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RESULTS OF ANALYSIS OF CO-VARIANCE

The table below depicts the statistical findings of the combined and personalised effect of group A and cricket training workouts on selected physical male university cricket players in Maharashtra.

[Note- CG- GROUP C, **DF**-DEGREES OF FREEDOM, **WG**- WITHIN GROUPS, **SOV**- SUM OF VARIANCE, **MS**-MEANSQUARE, **BS**-BETWEEN SET, **SS**-SUM OF SQUARES, **BM**-BETWEEN MEAN, **WS**-WITHIN SET]

TABLE 4 FLEXIBILITYOF GROUP C AND GROUPS (A&B) (IN CENTIMETERS)

TEST	GROUP C	GROUP A	GROUP B	SOV	SS	DF	MS	F-RATIO
Pre-test								
Mean	27.871	29.001	29.732	**B.M.**	26.532	2	13.274	1.301
SD(±)	3.272	4.012	1.942	**W.G.**	428.676	42	10.217	
Post-test								
Mean	28.709	33.073	34.277	**B.M.**	257.481	2	128.748	12.673*
SD(±)	3.732	3.496	2.093	**W.G.**	426.778	42	10.161	
Adjusted Post-test								
Mean	29.601	32.953	33.486	**B.S.**	125.382	2	62.698	33.581*
				W.S.	76.545	41	1.876	

(*Significant at 0.05 level of confidence.*The table values required for significance at 0.05 level of confidence for 2 & 42 and 2 & 41 are 3.22 and 3.23respectively).

The pre-test mean values for the group C, group A, and group B are 27.871, 29.001, and 29.732, respectively, according to table 4. The calculated 'F' ratio of 1.301 for pre-test scores was less than the table value, 3.22 for degrees of freedom 2 and 42 for significant at the 0.05 level of confidence in flexibility. Group C, group A, and group B post-test mean values are 28.709, 33.073, and 34.277, respectively. The resulting 'F' ratio of 12.673 for post-test scores was more than the table value of 3.22 for degrees of freedom 2 and 42 needed for significance at the 0.05 level of confidence on flexibility. Group C, group A, and group B adjusted post-test averages are 29.601, 32.953, and 33.486, respectively. The calculated 'F' ratio of 33.581 for adjusted post-test means was larger than the table value of 3.23 for degrees of freedom 2 and 41 needed for significance at the 0.05 level of confidence on flexibility. The study found a significant difference in the adjusted post-test means of the group C, group A, and group B on flexibility. Because the acquired 'F' ratio value was significant, the Scheffe's test was used to determine the paired mean difference, which is shown in table 5.

TABLE 5 THE SCHEFFE'S TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS ON FLEXIBILITY

GROUP C	GROUP A	GROUP B	MD	CI
-	32.953	33.486	0.533	0.725
29.601	32.953	-	3.352	
29.601	-	33.486	3.885	

[*Significant at 0.05 level of confidence]

The mean difference values between group A and group B, group C and group A, and group A and group B are 0.533, 3.352, and 3.885, respectively, which are larger than the confidence interval value of 0.725 at the 0.05 level of confidence. The study's findings revealed a substantial difference in flexibility between the group C and group A and the group C and group

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B. Figure 4 depicts the pre, post, and modified post-test means values of the group C, group A, and group B on flexibility.

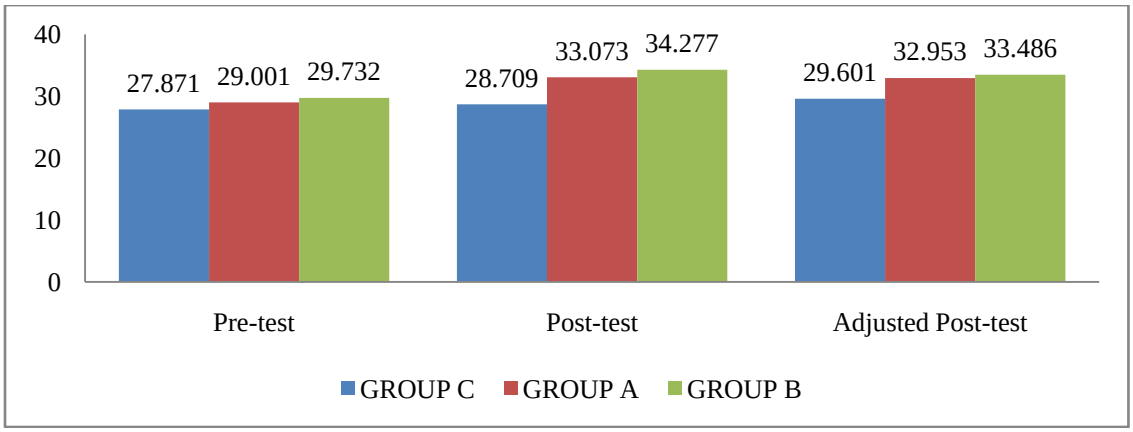

FIGURE 4 THE PRE, POST AND ADJUSTED MEAN VALUES OF FLEXIBILITY ON GROUP C, GROUP A AND GROUP B

TABLE 6 AGILITY OF GROUP C AND GROUPS (A&B)(IN SECONDS)

TEST	GROUP C	GROUP A	GROUP B	SOV	SS	DF	MS	F-RATIO
Pre-test								
Mean	9.064	8.782	8.704	B.M.	1.072	2	0.544	2.041
SD(±)	0.723	0.358	0.419	W.G.	11.051	42	0.263	
Post-test								
Mean	8.863	8.391	8.442	B.M.	1.209	2	1.002	4.462*
SD(±)	0.671	0.229	0.389	W.G.	9.429	42	0.221	
Adjusted Post-test								
Mean	8.689	8.468	8.567	B.S.	0.372	2	0.148	5.279*
				W.S.	1.431	41	0.046	

[*Significant at 0.05 level of confidence, *The table values required for significance at 0.05 level of confidence for 2 & 42 and 2 & 41 are 3.22 and 3.23 respectively).

According to table 6 the pre-test mean values for the group C, group A, and group B are 9.064, 8.782, and 8.704, respectively. The obtained 'F' ratio of 2.041 for pre-test scores was smaller than the table value, 3.22 for degrees of freedom 2 and 42 for significant at the 0.05 level of confidence on agility. The group C, group A, and group B post-test mean values are 8.863, 8.391, and 8.442, respectively. The computed 'F' ratio of 4.462 for posttest scores was higher than the table value of 3.22 for degrees of freedom 2 and 42 needed for significant at 0.05 level of confidence for agility. Group C, group A, and group B have adjusted post-test averages of 8.689, 8.468, and 8.567, respectively. The calculated 'F' ratio of 5.279 for adjusted post-test means was higher than the table value of 3.23 for degrees of freedom 2 and 41 necessary for significance at the 0.05 level of confidence on agility. The study found a significant difference in the adjusted post-test means of the group C, group A, and group B on agility. Because the acquired 'F' ratio value was significant, the Scheffe's test was used to determine the paired mean difference, as shown in table 7.

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TABLE 7 THE SCHEFFE'S TEST FOR THE DIFFERENCEBETWEEN PAIRED MEANS ON AGILITY

GROUP C	GROUP A	GROUP B	MD	CI
-	8.468	8.567	0.099	0.112
8.689	8.468	-	0.221*	
8.689	-	8.567	0.122*	

(*Significant at 0.05 level of confidence)

The mean difference values between group A and group B, group C & group A, and group C & group B are 0.099, 0.221, and 0.122, respectively, which are greater than the confidence interval value of 0.112 at the 0.05 level of confidence, according to table 7. The study's findings revealed a substantial difference in agility between the group C and group A and the group C and group B. Figure 5 depicts the pre, post, and modified post-test mean values of agility for the group C, group A, and group B.

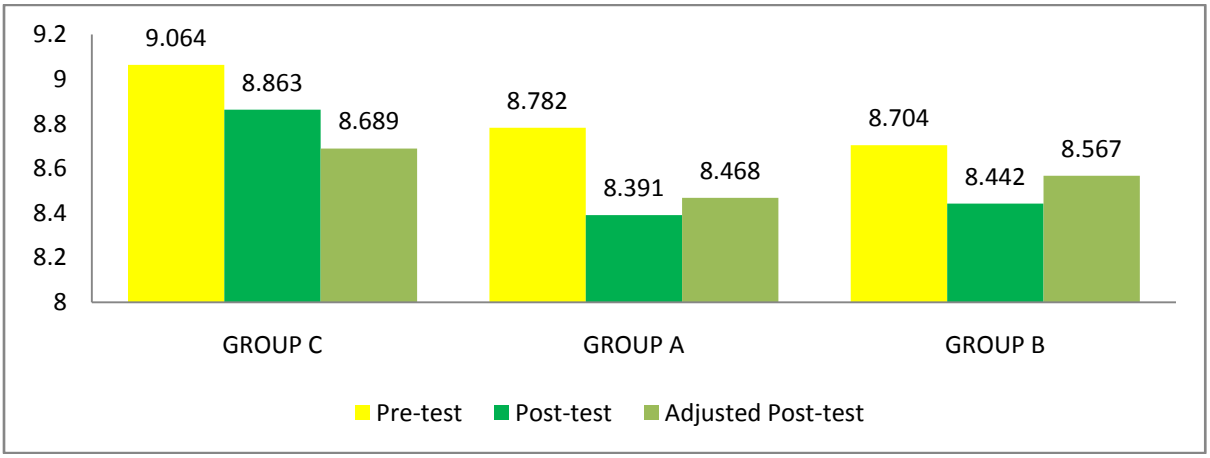

FIGURE 5 THE PRE, POST AND ADJUSTED MEAN VALUES OF AGILITY ON GROUP C, GROUP A AND GROUP B

TABLE 8 SPEED OF GROUP C AND GROUPS (A&B)

TEST	GROUP C	GROUP A	GROUP B	SOV	SS	DF	MS	F-RATIO
Pre-test								
Mean	4.767	4.753	4.749	**B.M.**	0.041	2	0.546	0.223
SD(±)	0.086	0.103	0.106	**W.G.**	0.352	42	0.269	
Post-test								
Mean	4.651	4.489	4.581	**B.M.**	0.234	2	1.001	52.945*
SD(±)	0.048	0.0534	0.052	**W.G.**	0.097	42	0.223	
Adjusted Post-test								
Mean	4.762	4.504	4.616	**B.S.**	0.485	2	0.148	33.593*
				W.S.	0.292	41	0.046	

[*Significant at 0.05 level of confidence, * The table values required for significance at 0.05 level of confidence for 2 & 42 and 2 & 41 are 3.22 and 3.23 respectively).

The pre-test mean values for the group C, group A, and group B are 4.767, 4.753, and 4.749, respectively, as shown in table 8. The resulting 'F' ratio of 0.223 for pre-test scores was smaller than the table value, 3.22 for degrees of freedom 2 and 42 for speed significance at 0.05 level of confidence. The group C, group A, and group B post-test mean values are 4.651, 4.489, and 4.581, respectively. The calculated 'F' ratio of 52.945 for posttest scores was larger than the

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table value of 3.22 for degrees of freedom 2 and 42 needed for significance at the 0.05 level of confidence on speed. Group C, group A, and group B adjusted post-test averages are 4.762, 4.504, and 4.616, respectively. The calculated 'F' ratio for adjusted post-test averages of 33.593 was larger than the table value of 3.23 for degrees of freedom 2 and 41 necessary for significance at 0.05 level of confidence on speed. The study found a significant difference in the adjusted post-test means of the group C, group A, and group B on speed. Since the obtained 'F' ratio value was significant, further to find out the paired mean difference, the Scheffe's test was employed and presented in table 9.

TABLE 9 THE SCHEFFE'S TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS ON SPEED

GROUP C	GROUP A	GROUP B	MD	CI
-	4.504	4.616	0.112*	0.046
4.762	4.504	-	0.258*	
4.762	-	4.616	0.146*	

*Significant at 0.05 level of confidence.

The mean difference values between group A and group B, group C & group A, and group C & group B are 0.112, 0.258, and 0.146, respectively, which are greater than the confidence interval value of 0.046 at the 0.05 level of confidence, according to table 9. The study's findings revealed a substantial difference between group A and group B, group C and group B, and group A and group C. The study's findings revealed a substantial difference in speed between the group C and group A. Figure 6 depicts the pre, post, and modified post-test means values of the group C, and group B on speed.

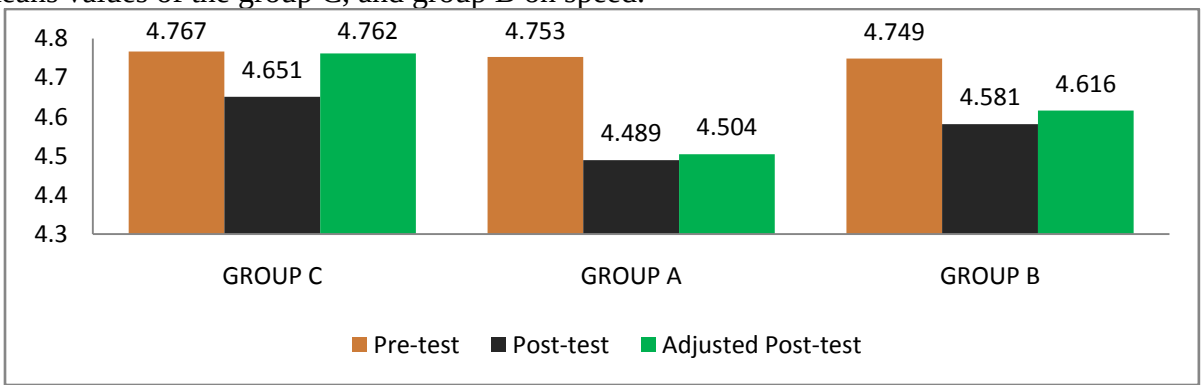

FIGURE 6 THE PRE, POST AND ADJUSTED MEAN VALUES OF SPEED ON GROUP C, GROUP A AND GROUP B

TABLE 10 STRENGTH OF GROUP C AND GROUPS (A&B)

TEST	GROUP C	GROUP A	GROUP B	SOV	SS	DF	MS	F-RATIO
Pre-test								
Mean	43.072	45.274	43.601	**B.M.**	39.514	2	19.769	0.711
SD(±)	5.208	4.913	5.675	**W.G.**	1165.476	42	27.752	
Post-test								
Mean	44.204	51.207	49.206	**B.M.**	390	2	195	8.789*
SD(±)	5.064	4.631	4.783	**W.G.**	933.201	42	22.227	
Adjusted Post-test								
Mean	44.963	50.136	49.512	**B.S.**	234.683	2	117.34	39.324*
				W.S.	125.552	41	3.06	

[*Significant at 0.05 level of confidence, * The table values required for significance at 0.05 level of confidence for 2 & 42 and 2 & 41 are 3.22 and 3.23 respectively).

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The pre-test mean values for the group C, group A, and group B are 43.072, 45.274, and 43.601, respectively, as shown in table 5.10. The calculated 'F' ratio of 0.711 for pre-test scores was less than the table value, 3.22 for degrees of freedom 2 and 42 for significant at the 0.05 level of confidence on strength. The group C, group A, and group B post-test mean values are 44.204, 51.207, and 49.206, respectively. The calculated 'F' ratio of 8.789 for post-test scores was larger than the table value of 3.22 for degrees of freedom 2 and 42 necessary for significant at 0.05 level of confidence. Group C, group A, and group B adjusted post-test averages are 44.963, 50.136, and 49.512, respectively. The calculated 'F' ratio of 39.324 for adjusted post-test means was higher than the table value of 3.23 for degrees of freedom 2 and 41 necessary for significance at the 0.05 level of confidence on strength. The study found a significant difference in the adjusted post-test means of the group C, group A, and group B on strength. Because the acquired 'F' ratio value was significant, the Scheffe's test was used to determine the paired mean difference, which is shown in table 11.

TABLE 11 THE SCHEFFE'S TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS ON STRENGTH

GROUP C	GROUP A	GROUP B	MD	CI
-	50.136	49.512	0.624*	4.453
44.963	50.136	-	5.173*	
44.963	-	49.512	4.549*	

*Significant at 0.05 level of confidence.

The mean difference values between group A and group B, group C and group A, and group C and group B are 0.624, 5.173, and 4.549, respectively, which are more than the confidence interval value of 4.453 at the 0.05 level of confidence. The study's findings revealed a substantial difference in strength between the group C and group A and the group C and group B. Figure 7 depicts the pre, post, and modified post-test mean values of the group C, group A, and group B on strength.

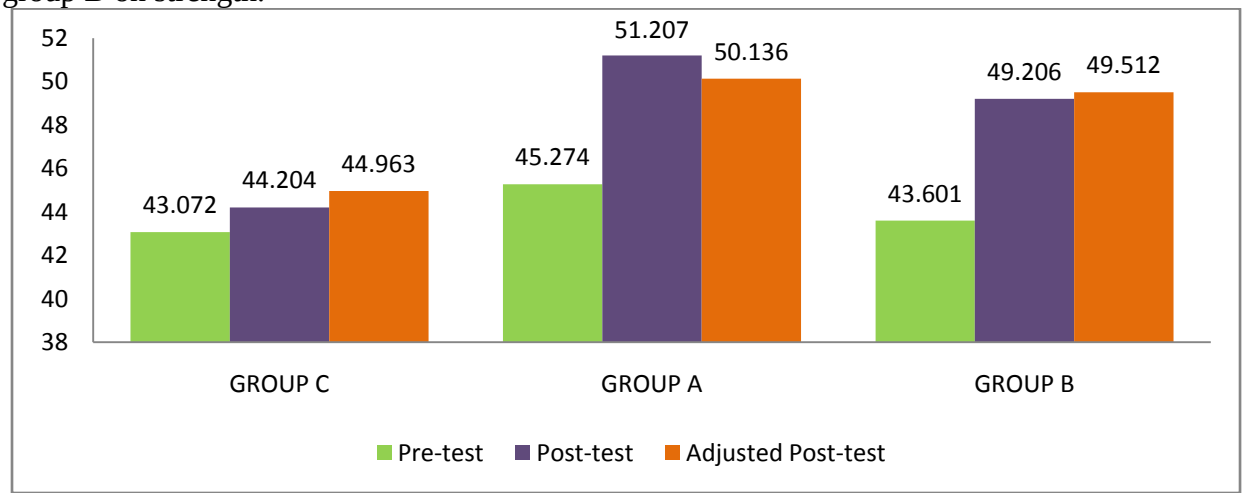

FIGURE 7 THE PRE, POST AND ADJUSTED MEAN VALUES OF STRENGTH ON GROUP C, GROUP A AND GROUP B

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TABLE 12 ENDURANCE OF GROUP C AND GROUPS (A&B) (IN METERS)

TEST	GROUP C	GROUP A	GROUP B	SOV	SS	DF	MS	F-RATIO
Pre-test								
Mean	4526.673	4573.331	4863.332	**B.M**	998111.118	2	499.55.568	1.573
SD(±)	522.321	592.179	573.362	**WG**	13331000	42	317404.765	
Post-test								
Mean	4600	4924	5163.332	**BM**	2399737.78	2	1199868.896	4.164*
SD(±)	518.381	550.662	542.604	**WG**	12128893.3	42	28873.186	
Adjusted Post-test								
Mean	4717.375	5000.478	4971.319	**BS**	714018.193	2	357009.092	16.398*
				WS	892932.521	41	21778.446	

[*Significant at 0.05 level of confidence, * The table values required for significance at 0.05 level of confidence for 2 & 42 and 2 & 41 are 3.22 and 3.23 respectively].

The pre-test mean values for the group C, group A, and group B are 4526.673, 4573.331, and 4863.332, respectively, according to table 5.12. The resulting 'F' ratio for pre-test scores was 1.573, which was less than the table value, 3.22 for degrees of freedom 2 and 42 necessary for significance at 0.05 level of confidence for endurance. The group C, group A, and group B post-test mean values are 4600, 4924, and 5163.332, respectively. The computed 'F' ratio of 4.164 for post-test scores was higher than the table value of 3.22 for degrees of freedom 2 and 42 needed for significance at 0.05 level of confidence for endurance. Group C, group A, and group B adjusted post-test averages are 4717.375, 5000.478, and 4971.319, respectively. The computed 'F' ratio of 16.398 for adjusted post-test means was larger than the table value of 3.23 for degrees of freedom 2 and 41 necessary for endurance significance at the 0.05 level of confidence. The study found a significant difference in the adjusted post-test means of the group C, group A, and group B on endurance. Because the acquired 'F' ratio value was significant, the Scheffe's test was used to determine the paired mean difference, which is shown in table 13.

TABLE 13 THE SCHEFFE'S TEST FOR THE DIFFERENCE BETWEEN PAIRED MEANS ON ENDURANCE

GROUP C	GROUP A	GROUP B	MD	CI
-	5000.478	4971.319	28.159	75.025
4717.315	5000.478	-	283.163*	
4717.315	-	4971.319	254.004*	

*Significant at 0.05 level of confidence.

The table 13 shows that the mean difference values between group A & group B, group C & group A and group C & group B are 28.159, 283.163 and 254.004, respectively which are greater than the confidence interval value 75.025 at 0.05 level of confidence. The results of the study showed that there were a significant difference between group C & group A and group C & group B on endurance. Figure 8 depicts the pre, post, and modified post-test means values of the group C, group A, and group B on endurance.

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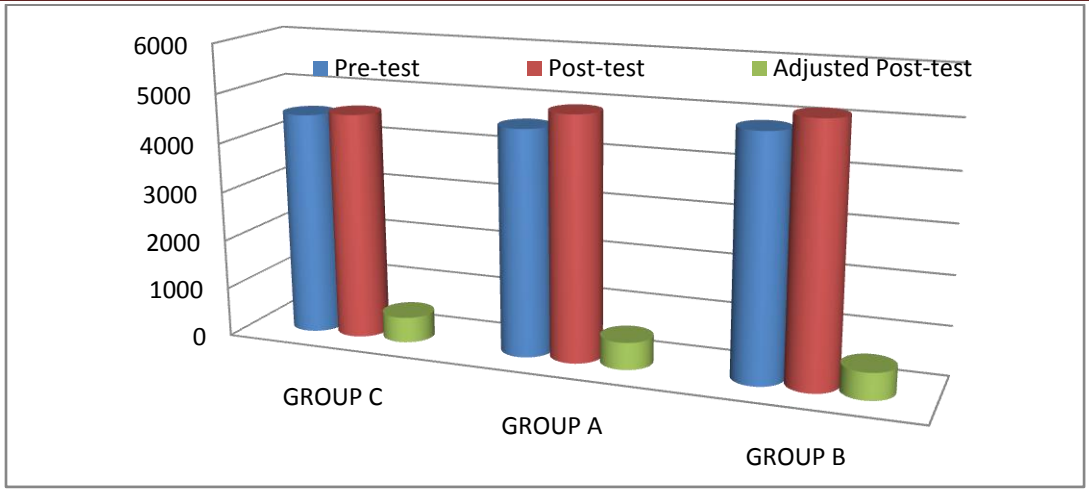

FIGURE 8 THE PRE, POST AND ADJUSTED MEAN VALUES OFENDURANCE ON GROUP C, GROUP A AND GROUP B

CONCLUSIONS

From the analysis of the data, the following conclusions were drawn.

1. After twelve weeks of cross-training, the experimental group 'A' showed considerable improvement in all of the specified physical fitness.
2. After twelve weeks of cricket training workouts, the experimental group 'B' showed considerable improvement in all of the specified physical fitness.
3. After twelve weeks of combining cross-training with cricket training activities, the experimental group 'C' showed considerable improvement in all of the specified physical fitness.
4. The cross-training group improved much more than the cricket training workouts group in all of the specified physical fitness.
5. All performance metrics improved significantly in the group that did cricket training workouts.
6. The combined cross-training with cricket training exercises group improved much more than the personalized groups in all of the assessed fitness.
7. The findings of this study show that cross-training with cricket training exercises can improve the performance of university cricket players in virtually all of the physical fitness. As a result, it is advised that coaches and physical educators in the game of university cricket players prioritize cross training alongside cricket training activities in their schedules.
8. It is also advised that cricket players at any level have knowledge of cross-training in order to coach the players to improve their performance.

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