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## Effect of complex training with and without interval training on selected bio motor variables among inter collegiate basketball players

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### Abstract

Basketball is considered as one of the most popular sports in the world. It is played and watched by more people than any game, extending to more than 170 countries around the globe. Dr. James Naismith is known world-wide as the inventor of basketball. Basketball stands as the third fastest game played in short court surfaces. Players have been trained with varied physical training module namely stretching exercises, resistance training, plyometric training, interval training, and combination of these and so on. Of these, plyometric and resistance training are very widely used in the game of basketball since it develops the strength and explosive power which are the major determinants of performance of a player in basketball. Training programmed for improving bio motor variables speed, agility, flexibility, cardiovascular endurance and muscular strength and endurance. The idea of the study was to find out the enhancing bio motor variables among inter collegiate basketball players through complex training with and without interval training. To achieve the purpose of the study, 60 inter collegiate basketball players would randomly selected from Coimbatore district and their age ranged between 18 and 25year. All bio motor variables were assessed by standard tests; Speed (50m dash), Agility (4x10 shuttle run), Flexibility (sit and reach), Cardiovascular endurance (Cooper 12-minute run and walk) and muscular strength and endurance (sit ups). Complex training with interval training group, Interval training group and Control group (n=60) would undergone for a period of 12 weeks. The results revealed that there was a significant difference found on the criterion variables. The difference was found by complex training with interval training and interval training given to the experimental group I, experimental group II and control group on speed, agility, flexibility, cardiovascular endurance and muscular strength and endurance of inter collegiate basketball players.

**Keywords:** Complex training with interval training, interval training, speed, agility, flexibility, cardiovascular endurance, muscular strength and endurance and basketball players.

### Introduction

The modern basketball player must possess special physical qualities for effective game development. A characteristic of this sport is the continuous repetition of such efforts, under the pressure of one or more opponents, and with very short recovery times. A programmed called particular complex and interval training comprises performance training created expressly to improve athletic performance. Training programmed for improving bio motor performance may target fitness like speed, agility, flexibility, cardiovascular endurance and muscular strength and endurance, and Complex training with basketball can be an effective way to develop the physical attributes and required to excel in the sport. It's essential to maintain consistency, stay focused on your goals, and listen to your body to avoid overtraining or injuries. Complex training program can be a great way to develop a well-rounded skill set while improving your physical conditioning. Complex training as the execution of a resistance training exercise using a heavy load (1-5RM) followed relatively quickly by the execution of a biomechanically similar plyometric exercise. Complex training alternates biomechanically similar high load weight training exercises with plyometric exercises, set for set in the same workout. An example of complex training would include performing a set of squats followed by a set of jump squats. As in the case of plyometric training, complex training appears to have its origins in Eastern Europe (Docherty, *et al.* 2004) <sup>[14]</sup>.

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Costill (1986) [15] has made the important distinction between three types of interval training: aerobic, aerobic-anaerobic, and anaerobic. Aerobic interval training involves repeated short runs or swims at just below race pace, with very brief rest intervals of five to 15 seconds. This type of interval training requires oxygen uptakes of approximately 65 to 75 percent of  $\text{VO}_2$  max and heart rates to this type of an aerobic interval training workout. A player needs this kind of particular Complex training with interval training, Interval training for success in sports. Thus, the present studies have been carried out to study the Effect of complex training with and without interval training on selected Bio Motor variables among inter collegiate basketball players. Both Complex training with interval training, interval training can be effective components of a well-rounded fitness program.

### Methodology

The idea of the study was to find out the complex training with and without interval training on selected Bio Motor

variables among inter collegiate basketball players. To achieve the purpose of the study, twenty inter collegiate basketball players would randomly selected from affiliated collegiate from Bharathiar University, Coimbatore district, Tamil Nadu and their age ranged between 18 and 25year. The selected Bio motor variables were assessed by standard tests; Speed (50m dash), Agility (4x10 shuttle run), Flexibility (sit and reach), Cardiovascular endurance (Cooper 12-minute run and walk) and muscular strength and endurance (sit ups). Total number of subject 60 divided into three equal group complex training with interval training group and interval training group and control group (n=20) would undergone for a period of twelve weeks.

### Criterion Measures

The subjects of complex training with interval training group and interval training group and control group would assessed on the selected variables by the standardized test items before and after the training period of twelve weeks.

**Table 1:** Show criterion variables, test items and units of measurement

S. No.	Criterion Variables	Test Items	Units of Measurement
<b>Bio Motor Variable</b>			
1	Speed	50m Dash	In Seconds
2	Agility	Shuttle run 4x10mts	In Seconds
3	Flexibility	Sit and Reach	In Centimetres
4	Cardiovascular Endurance	Cooper 12-minutes' Walk/Run test	In Meters
5	Muscular Strength and Endurance	Sit Ups	In Counts

### Training Programmed

The total duration of complex training with interval training and interval training for three alternative days. During the training period 90 min the subject were treated with complex training with interval training group (Monday, Wednesday, Friday) and interval training group (Tuesday, Thursday, Saturday) for three alternative days per week.

Experimental Group-I Complex training with interval training group (CTWITG), Experimental Group II Interval Training Group (ITG), Control Group III Not engaged in any specific training program. Training duration one and half hours (90minutes), Preparation / warm-up-10 minutes, Training for specific components-60 minutes, Distributed Rests-10

minutes, Relaxation / Cool-down-10 minutes. Training session per week three alternative days a week only in the morning total length of training twelve weeks training load progression every four weeks.

### Statistical Techniques

The present study were mainly on testing the significant of mean differences among the groups and secondarily with the increase of means in each group from baseline to post test for various measures. The statistical tool used for the criterion measures were tested for significance by applying paired, 't' test. All of the statistical analysis tests were computed at 0.05 level of significance ( $p < 0.05$ ).

### Results

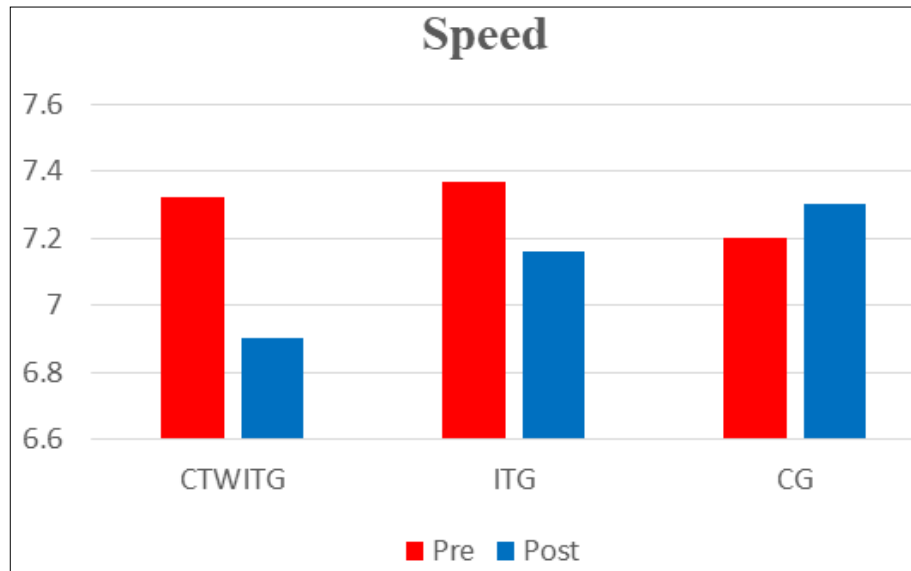
**Table 2:** Significance of mean gains/losses between pre and post-test of CYWITG, ITG, CG of inter collegiate basketball players on speed

Variables	Group	Pre-test Mean and SD	Post-test Mean and SD	Mean Diff.	SE	T-Ratio
Speed	CTWITG	7.32±.360	6.90±.39	.419	.059	7.11*
	ITG	7.37±.438	7.16±.406	.205	.057	3.58*
	CG	7.20±.382	7.30±.300	.100	0.76	1.31

\*Significant at 0.05 level of confidence

Table-II reveals that the obtained mean values of pre-test and post test scores of Speed on Complex Training with Interval Training Group were 7.32 and 6.90, Interval Training Group 7.37 and 7.16, Control Group 7.20 and 7.30 respectively; the obtained t-ratio was complex training with interval training Group 7.11, Interval Training Group 3.58 and Control Group 1.31. The required table value is 2.09 at 0.05 level of

confidence for the degree of freedom 1 and 19. The obtained t-ratio was greater than the table value. It is found to be significant changes in Speed of the basketball players. The mean values on complex training with interval training group, interval training group and control group are graphically represented in Figure-1.



**Fig 1:** Bar diagram showing the pre-test & post-test CYWITG, ITG, CG of inter collegiate basketball players on speed

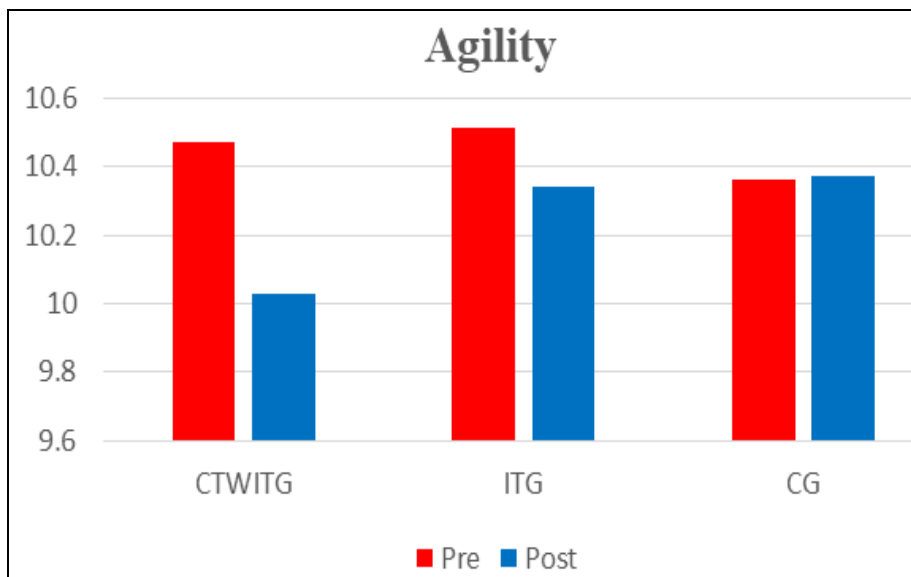
**Table 3:** Significance of mean gains/losses between pre and post-test of CYWITG, ITG, CG of inter collegiate basketball players on agility

Variables	Group	Pre-test Mean and SD	Post-test Mean and SD	Mean Diff.	SE	T-Ratio
Agility	CTWITG	10.47±.425	10.03±.345	.439	.041	10.52*
	ITG	10.51±.410	10.34±.385	.174	.028	6.09*
	CG	10.36±.346	10.37±.372	.010	.042	.238

\*Significant at 0.05 level of confidence

Table-3 Reveals that the obtained mean values of pre-test and post test scores of agility on complex training with interval

training group were 10.47 and 10.03, Interval Training Group 10.51 and 10.34, Control Group 10.36 and 10.37 respectively; the obtained t-ratio was complex training with interval training group 10.52, Interval Training Group 6.09 and Control Group .238. The required table value is 2.09 at 0.05 level of confidence for the degree of freedom 1 and 19. The obtained t-ratio was greater than the table value. It is found to be significant changes in Agility of the basketball players. The mean values on Complex Training with interval training group, interval training group and control group are graphically represented in Figure-2.



**Fig 2:** Bar diagram showing the pre-test& post-test CYWITG, ITG, CG of inter collegiate basketball players on agility

**Table 4:** Significance of mean gains /losses between pre and post-test of CYWITG, ITG, CG of inter collegiate basketball players on flexibility.

Variables	Group	Pre-test Mean and SD	Post test Mean and SD	Mean Diff.	SE	T-Ratio
Flexibility	CTWITG	26.70±5.13	31.90±2.90	5.20	.634	8.19*
	ITG	26.95±5.07	29.90±4.50	2.95	.564	5.23*
	CG	27.00±5.98	26.65±6.10	.356	.274	1.28

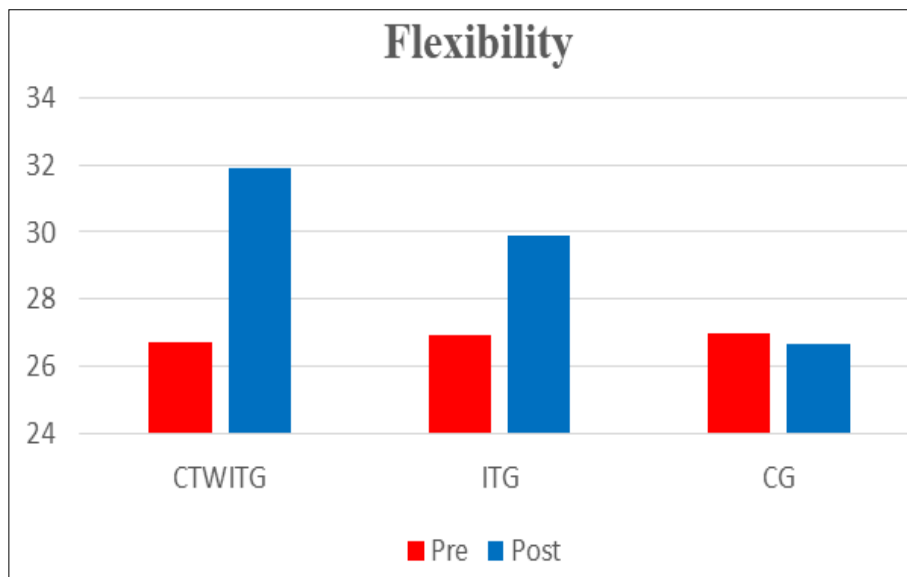
\*Significant at 0.05 level of confidence

Table-IV reveals that the obtained mean values of pre-test and post test scores of flexibility on complex training with interval training group were 26.70 and 31.90, Interval Training Group

26.95 and 29.90, Control Group 27.00 and 26.65 respectively the obtained t-ratio was complex training with interval training group 8.19, Interval Training Group 5.23 and Control

Group 1.28. The required table value is 2.09 at 0.05 level of confidence for the degree of freedom 1 and 19. The obtained t-ratio was greater than the table value. It is found to be significant changes in flexibility of the basketball players. The

mean values on complex training with interval training group, interval training group and control group are graphically represented in Figure-3.



**Fig 3:** Bar diagram showing the pre-test& post-test CYWITG, ITG, CG of inter collegiate basketball players on flexibility

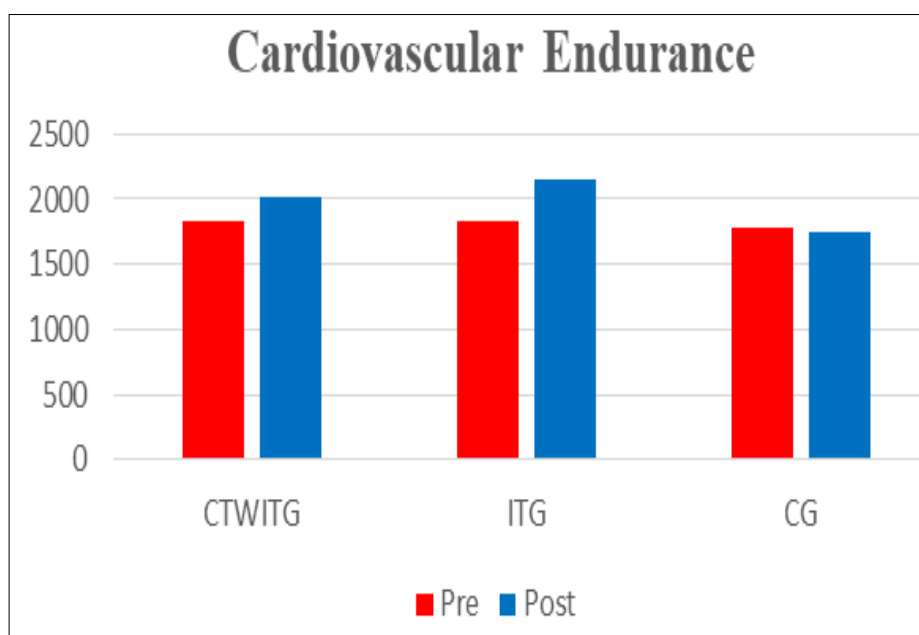
**Table 5:** Significance of mean gains /losses between pre and post-test of CYWITG, ITG, CG of inter collegiate basketball players on cardiovascular endurance

Variables	Group	Pre-test Mean and SD	Post test Mean and SD	Mean Diff.	SE	T-Ratio
Cardiovascular Endurance	CTWITG	1829.50±186.61	2018.25±234.44	188.75	53.14	3.55*
	ITG	1835.50±118.34	2151.00±53.98	315.50	31.01	10.17*
	CG	1774.25±210.13	1749.00±204.42	25.25	39.36	.641

\*Significant at 0.05 level of confidence

Table-IV reveals that the obtained mean values of pre-test and post test scores of cardiovascular endurance on complex training with interval training group were 1829.50 and 2018.25, Interval Training Group 1835.50 and 2151.00, Control Group 1774.25 and 1749.00 respectively the obtained t-ratio was complex training with interval training group 3.55, Interval Training Group 10.17 and Control Group .641. The

required table value is 2.09 at 0.05 level of confidence for the degree of freedom 1 and 19. The obtained t-ratio was greater than the table value. It is found to be significant changes in Cardiovascular Endurance of the basketball players. The mean values on complex training with interval training group, interval training group and control group are graphically represented in Figure-4.



**Fig 4:** Bar diagram showing the pre-test& post-test CYWITG, ITG, CG of inter collegiate basketball players on cardiovascular endurance

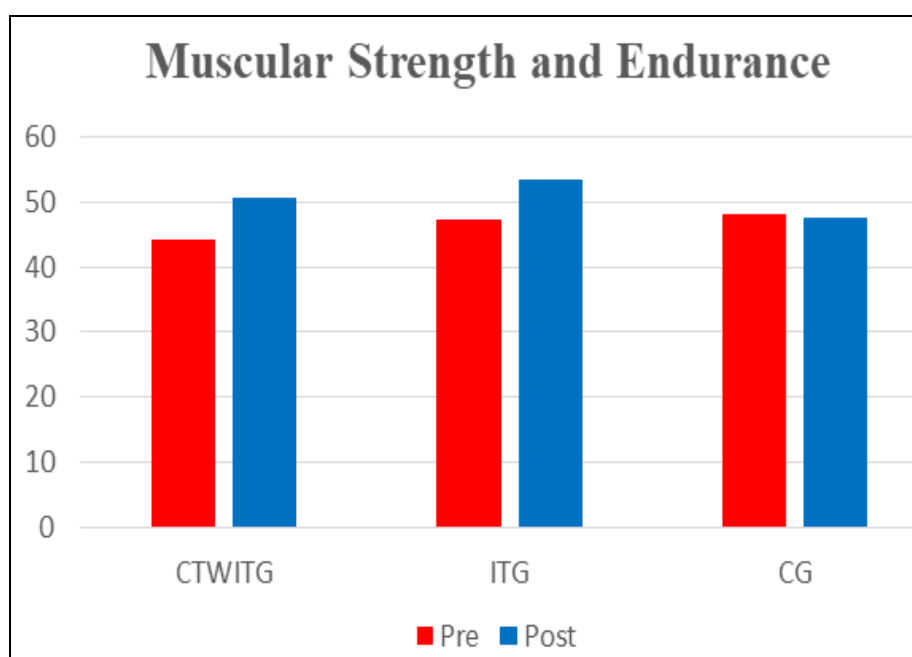
**Table 6:** Significance of mean gains /losses between pre and post-test of CYWITG, ITG, CG of inter collegiate basketball players on muscular strength and endurance

Variables	Group	Pre-test Mean and SD	Post-test Mean and SD	Mean Diff.	SE	T-Ratio
Muscular Strength and Endurance	CTWITG	44.30±6.74	50.50±4.62	3.20	.613	5.21*
	ITG	47.20±7.10	53.30±3.77	6.10	.951	6.41*
	CG	48.10±7.34	47.50±6.52	.650	.442	1.47

\*Significant at 0.05 level of confidence

Table-IV reveals that the obtained mean values of pre-test and post test scores of muscular strength and endurance on

complex training with interval training group were 44.30 and 50.50, Interval Training Group 47.20 and 53.30, Control Group 48.10 and 47.50 respectively the obtained t-ratio was Complex Training With interval training group 5.21, interval training group 6.41 and Control Group 1.47. The required table value is 2.09 at 0.05 level of confidence for the degree of freedom 1 and 19. The obtained t-ratio was greater than the table value. It is found to be significant changes in Muscular Strength and Endurance of the basketball players. The mean values on complex training with interval training group, interval training group and control group are graphically represented in Figure-5.



**Fig 5:** Bar diagram showing the pre-test & post-test CYWITG, ITG, CG of inter collegiate basketball players on muscular strength and endurance

### Discussion on findings

The data analysis shows that a twelve-weeks Complex Training with Interval Training program combined with Interval Training significantly improved Bio Motor variables for speed, agility, flexibility, cardiovascular endurance and muscular strength and endurance. This could be explained by the development of Speed, Agility and Flexibility during Complex Training with Interval Training. Interval Training increases cardiovascular endurance and muscular strength and endurance. Regular participation in complex training requires dedication, consistency, and a thoughtful approach to balancing strength development with sports- fitness and skill. By continually refining and optimizing your program, you can enhance your athletic performance in your chosen sport, such as basketball. Interval training involves making strategic adjustments to your workout routine to continuously challenge your body and enhance your fitness gains. Here are some key strategies to help you improve your interval training. The findings of the present study are in consonance with the results arrived at by Arslan *et al.*, (2022) [12], Comyns *et al.*, (2007) [13], Kumari, A *et al.* (2023) [5].

### Conclusions

Based on the findings and within the limitation of the study it is noticed that practice of complex training with interval training helped to improve speed, agility and flexibility and interval training helped to improve cardiovascular endurance

and muscular strength and endurance of intercollegiate basketball players. It was also seen that there is progressive enhancement in the selected criterion variables of complex training with interval training and interval training after twelve weeks of training programmed. Further, it also helps to improve speed, agility, flexibility, cardiovascular endurance and muscular strength and endurance.

It was concluded that individualized effects of complex training with interval training group showed a statistically significant positive sign over the course of the treatment period on speed, agility, flexibility of intercollegiate basketball players.

It was concluded that individualized effects of interval training group showed a statistically significant positive sign over the course of the treatment period on cardiovascular endurance and muscular strength and endurance of intercollegiate basketball players.

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