



## Effect different intensities of interval training on body mass index and resting pulse rate of high school women kabaddi players

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### Abstract

The purpose of the study was to find out a pretest-posttest randomized group design was used for this study. The randomly selected 60 Kabaddi players were divided into four groups randomly consisting of twenty girls school level kabaddi players in each. Before the training pre test was taken for all the groups on skin fold measurements to determine percent body fat, height, weight to calculate body mass index and cardio respiratory endurance variables, resting pulse rate. The control group did not undergo any type of training. Low intensity interval training was given to the experimental group I and medium intensity interval training was given to the experimental group II and high intensity interval training was given to experimental group III. At the end of twelve weeks the post test was conducted on selected variables. The difference between the initial and final scores on selected variables were the effect of respective experimental treatments. To test statistical significance, the obtained data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level of confidence was fixed to test the hypothesis of this study.

**Keywords:** body mass index and resting pulse rate

### Introduction

Every human being participates in some kind of sports activity or physical exercise during the course of his life. This exercise may vary for different individuals. It may be walking, jogging, cycling working in a factory or participation in games and sports. Regular participation in exercise programme markedly influences physical, physiological and mental fitness of an individual. Life will not be a life without physical activities. Through physical activities alone people were able to survive in earth. The story of evolution throws some light on the nature and type of activities which are an essential part of modern physical activities which are to be fit for day to day existence and to meet the occasional emergencies that arise.

Physical fitness is a capacity for sustained physical activity. It is to achieve success in every walk of life. The progress of one country depends mainly on the degree of physical fitness of the people. According to Willgoose (1961) <sup>[3]</sup> "Physical Fitness provides capacity for doing all types of activities". Currently there is wide interest to identify the most effective methods of training for strength and endurance development and this is of special significance for physical education programmes in schools and colleges.

### Need for the Study

Interval Training improves the functions of the circulatory, the respiratory and the muscle system while practice is largely aimed at improving the control of muscle activity by the nervous system. Kabaddi players who's chanting ability proves as vital for better performance requires cardio respiratory endurance.

The different cardiopulmonary adaptations and physiological demands have been of interest of evaluating athlete's performance due to different intensities of interval training. Therefore, women kabaddi players features and training

schedules of these extreme endurance sports have been proposed to be analyzed in this study.

Thus, this research was intended to find out the effect of different intensities of interval training on body composition and cardiorespiratory endurance of high school kabaddi players.

### Objective of the Study

Body composition and cardio respiratory fitness play vital role among kabaddi players, There are different training methods being followed by kabaddi players to gain optimum level of physical fitness, physiological, which will in turn contribute for improved performance in the game of kabaddi. The objectives of this study were as follows:

- Based on previous research findings, the study aims in formulate interval training of different intensities, namely, low, medium and high for school level women kabaddi players.
- The study aimed at assessing the body composition variables, body mass index, and cardio respiratory fitness such as resting pulse rate of women kabaddi players.
- The study was to experiment with different intensities of interval training among women kabaddi players and to find out the effects of such training on selected body composition and cardio respiratory endurance variables.
- To make suitable statistical analysis and find out the comparative effect of different intensities on selected criterion variables and find which of the experimental treatment was more beneficial for altering body composition and cardio respiratory endurance variables of women kabaddi players.

### Statement of the Problem

The purpose of the study was to find out the effect different intensities of interval training on body mass index and resting pulse rate of high school women kabaddi players

### Hypothesis

It was hypothesized that:

1. There would be significant differences due to different intensities of interval training on body composition variables body mass index, percent body fat and lean body mass of high school kabaddi players compared to control group
2. Comparison among treatment groups, namely low, medium and high intensity interval training groups, there would be no significant differences on selected body composition variables.
3. There would be significant different due to different intensities of interval training on cardio respiratory endurance variables resting pulse rate of high school kabaddi players compared to control group.
4. Comparing among the treatment groups of different intensities of interval training there would be no significant different on selected cardio respiratory endurance variables.

### Significance of the Study

The following are the significance of the study.

1. This study may provide suitable interval training programmes to help kabaddi players improve fitness and thereby the performance in competition.
2. This study will help to find out different intensities of interval training programmes are essential to develop kabaddi players' cardio respiratory endurance.
3. Different intensities of interval training would help in maintaining and improving body weight and shape of women kabaddi players.
4. This study will provide additional knowledge to the research scholars regarding body composition and cardio respiratory endurance changes that could occur in the human organism due to specific and rigorous training.

### Limitations

This study was limited in the following respects.

1. The diet, atmosphere and temperature were not taken into consideration.
2. The performance and skills of the subjects and their background experience in the field of sports and games were not taken into consideration.
3. The psychological and nutritional status of the subjects were not measured in the study,
4. The subjects were allowed to do their routine work of the college throughout the experiment period.

### Delimitations

This study was delimited in the following respects.

1. The study was conducted on high school girls only.
2. Only women kabaddi players who represented their schools in inter school competitions were selected for this study.
3. This study was conducted on 60 high school girl kabaddi players from different schools in Andhra Pradesh.

4. The selected interval training exercises were applied to the subjects in this study.
5. The experiment was conducted for a period of twelve weeks
6. This study was conducted on body composition variables body mass index and cardio respiratory endurance variables resting pulse rate.
7. The age of the subjects ranged from 14 to 16 years.

### Definition of the Terms

The important terms used in this study are defined as follows:-

#### Training

Training has been explained as programme of exercise designed to improve the skills and increase the capacities as resting heart rate.

#### Interval Training

Fox and Mathews (1974) <sup>[6]</sup> defined interval training as a system of conditioning or training consisting of a series of repeated bouts of exercise alternated with periods of relief, light or mild exercise usually constitutes the relief period.

#### Intensity

Hardayal Singh (1984) <sup>[9]</sup> further stated that intensity is the rate of doing work. In other words it is the pace of which a physical activity is done.

Intensity is the impact of the load at every movement of the exercise with a degree of concentration of the volume of training work in time.

#### Body Mass Index

In order to find out whether an individual is overweight or not, body mass index is used. For the operational purposes body mass index is calculated by dividing the subject's body weight in kilogram by their height in metres squared. (Palanivel, 2004)

#### Resting Pulse Rate

The total number of beats of heart per minute during rest is called resting pulse rate (Shaver, 1982).

### Methodology

This chapter describes the methodology and procedure adopted. This includes the selection of subjects, selection of variables, research design, procedure for administering the test items, selection of test items, collection of data and statistical technique employed for analysing the data. The purpose of the study was to find out the effect of different intensities of interval training on body composition and cardio respiratory endurance variables among high school women kabaddi players.

### Selection of Subjects

The subjects taken for the present study were sixty school level women kabaddi players from different high schools in Andhra Pradesh. The subjects were kabaddi players represented their schools at inter school kabaddi tournaments. The subjects were selected on a random basis and were allotted to four groups (control, experimental group I, experimental group II and experimental group III) by random assignment. The age of the subjects ranged from 14 to 16 years with mean age of 15 years.

### Selection of Variables

The investigator reviewed books, journals, research articles on body composition variables and cardio respiratory endurance and selected the following variables for the purpose of this research.

#### 1. Dependent Variable

##### Body Composition Variables

1. Body Mass Index

##### Cardiorespiratory endurance Variables

1. Resting Pulse Rate

#### Independent Variable

1. Twelve weeks low intensity interval training
2. Twelve weeks medium intensity interval training
3. Twelve weeks high intensity interval training

### Experimental Design

The primary responsibility of the investigator is to adopt the appropriate experimental methodology before proceeding with data collection. (Clarke and Clarke, 1984) [5].

A pretest-posttest randomized group design was used for this study. The randomly selected 60 Kabaddi players were divided into four groups randomly consisting of twenty girls school level kabaddi players in each. Before the training pre test was taken for all the groups on skin fold measurements to determine percent body fat, height, weight to calculate body mass index and cardio respiratory endurance variables, resting pulse rate. The control group did not undergo any type of training. Low intensity interval training was given to the experimental group I and medium intensity interval training was given to the experimental group II and high intensity interval training was given to experimental group III. At the end of twelve weeks the post test was conducted on selected variables. The difference between the initial and final scores on selected variables were the effect of respective experimental treatments. To test statistical significance, the obtained data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level of confidence was fixed to test the hypothesis of this study.

### Criterion Measures

By glancing the literature, and in consultation with professional experts, the following variables were selected as the criterion measures in this study.

1. Body mass index was calculated using the following formulae

Body mass index (BMI) = body weight (in kg) / height in metres squared. (Palanivel, 2004)

### Tester's Competency

Reliability was established by the test-retest processes. Nine students from all the three groups were tested on selected variables. The repeated measurement of individuals on the same test is done to determine reliability. It is a univariate not a bivariate situation, it makes sense then to use a univariate statistics like the intraclass correlation coefficient (Baumgartner and Jackson, 1975). The intraclass correlation coefficient obtained for test-retest data are presented in Table I.

**Table 1:** Intra Class Correlation Coefficient of Test – Retest Scores

S. No	Variables	Coefficient of Correlation
1	Body Mass Index	0.97*
2	Resting pulse rate	0.91*

\* Significant at 0.05 level

### Test Administration and Collection of Data

The investigator explained the objectives of the test to the subject before the test.

#### Age

Age of the subjects were taken as per the records in the school and verified through the birth certificate of the subjects and recorded for the purpose of this study.

#### Height

##### Objective

To measure height

#### Apparatus used

Stadiometer and Anthropometric rod

#### Test Description

Height will be measured by anthropometric rod. The subject stand erect bare footed on a plane horizontal surface against a wall with her heels, back of the shoulder and head touching the wall and stretch the body. Stretched upwards as much as possible without her heel leaving the ground. Than anthropometric rod is kept in front of the subject and the crossbar of the anthropometry is adjusted so that the lower edge touches the highest point of the subject's head. Height will be recorded in meters.

#### Weight

##### Objective

To measure weight

#### Apparatus used

Weighing Machine

#### Test Description

The weights of the subjects were taken on a weighing machine with the subjects wearing short and vest only. They stood on the weighing machine and weight was recorded nearest to half a kilogram. (Yobu, 1983).

#### Calculation of Body Mass Index

From the height and weight obtained following above procedures, body mass index of each subject was calculated. Body mass index was calculated by dividing the subject's body weight in kilogram by their height in metres squared. (Palanivel, 2004)

#### Resting Pulse rate

##### Objective

The purpose of this test was to record the number of heart beat per minute.

#### Equipment

A stop watch (1/100 of a second) and a chair.

**Procedure and Scoring**

The resting heart rate of all the subjects was recorded in sitting position in the morning session. Before taking the resting heart rate, the subjects were asked to sit in a chair inside a room and relax for 20 minutes. To record the heart rate, finger tips were placed on the radial artery at the subject’s wrist in such a manner that palpation was clear and the number of palpation was counted for one minute.

**Statistical Procedure**

These test data must be analysed in ways appropriate to the research design (Clarke and Clarke, 1970) [4]. The following statistical tool, that is., Analysis of Covariance ANACOVA was followed to estimate the effect of different intensities of interval training on body composition and cardio respiratory endurance variables among high school women kabaddi

players using the formula as suggested by Thomas and Nelson (1990) [13].

The significant differences obtained between the groups were analysed by Scheffe’s Post Hoc Test. To test if significant differences between the groups and to determine which group performed better. The Scheffe’s Post Hoc test conducted (Clarke and Clarke, 1972) [11].

**Computation of Analysis of Covariance and Post HOC TEST**

**Results on Body Mass Index**

The descriptive statistics comparing the initial and final means of Body Mass Index due to different intensities (low, medium and high intensity) of interval training, and control groups of school women kabaddi players is presented in Table I.

**Table 2:** Descriptive Statistics on Low, Medium and High Intensity training and Control Groups

Groups	Test	Mean	Standard Deviation	RANGE	
				Min	Max
Low Intensity Interval training	Initial	22.35	1.85	19.60	25.64
	Final	22.31	1.05	20.69	24.24
	Adjusted Mean	22.34			
Medium Intensity Interval training	Initial	22.09	1.26	20.57	24.24
	Final	21.36	1.37	19.38	24.24
	Adjusted Mean	21.54			
High Intensity Interval training	Initial	22.66	1.59	20.90	25.64
	Final	21.45	1.32	19.49	24.03
	Adjusted Mean	21.30			
Control Group	Initial	22.50	1.36	19.60	24.52
	Final	22.72	1.22	20.55	24.92
	Adjusted Mean	22.66			

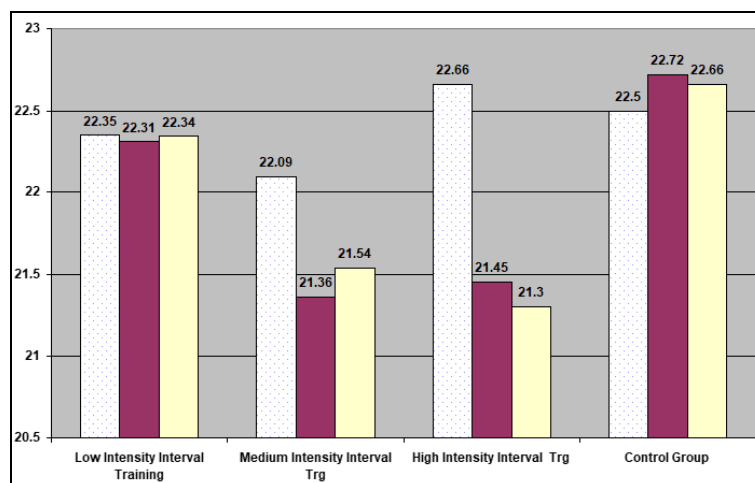
Table I shows that the pre test mean on Body Mass Index of low intensity interval training group was 22.35 with standard deviation  $\pm$  1.85 pre test mean of medium intensity interval training group was 22.09 with standard deviation  $\pm$  1.26, the pre test mean of high intensity interval training group was 22.66 with standard deviation  $\pm$  1.59, the pre test mean of control group was 22.50 with standard deviation  $\pm$  1.36.

The descriptive statistics on post test mean on Body Mass Index of low intensity interval training group was 22.31 with standard deviation  $\pm$  1.05 post test mean of medium intensity interval training group was 21.36 with standard

deviation  $\pm$  1.37, the post test mean of high intensity interval training group was 21.45 with standard deviation  $\pm$  1.37, the post test mean of control group was 22.72 with standard deviation  $\pm$  1.22.

The adjusted mean on Body Mass Index on low intensity interval training group was 22.34, medium intensity interval training group was 21.54, high intensity interval training group was 21.30 and control group was 22.66, as shown in Table I.

The obtained mean values on the experimental and control groups were presented in Figure I.



**Fig 1:** Bar Diagram Showing Pre, Post and Adjusted Means on Body Mass Index Due to Low, Medium and High Intensity Interval Training and Control Groups

The results on descriptive statistics proved that there exist differences in different intensities of interval training compared to control group of variable Body Mass Index.

And to test statistical significance of the differences, the obtained data on Body Mass Index using ANCOVA was presented in Table II.

**Table 3:** Computation of Analysis of Covariance Due to Low, Medium and High Intensity Interval Training and Control Group on Body Mass Index

	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	Between	2.64	3	0.88	0.38
	Within	131.28	56	2.34	
Post Test Mean	Between	19.74	3	6.58	4.24*
	Within	86.82	56	1.55	
Adjusted Post Test Mean	Between	18.60	3	6.20	7.76*
	Within	43.95	55	0.80	

Required  $F_{(0.05), (df 3,56)} = 2.77$

\* Significant at 0.05 level of confidence

As shown in Table II, the obtained F ratio of 0.38 on pre test means of the groups was not significant at 0.05 level as the obtained F value was less than the required table F value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at initial stage.

The results presented in Table II, the obtained F ratio of 4.24 on post test means of the groups was significant at 0.05 level as the obtained F value was greater than the required table F value of 2.77 to be significant at 0.05 level. This shows that there was significant difference in means of the groups at initial stage. Taking into consideration of the pre

test means and post test means, adjusted post test means were determined and analysis of covariance was done. The obtained F value on adjusted means was 7.76. The obtained F value was greater than the required value of 2.77 and hence it was accepted that there was significant differences among the adjusted means on the Body Mass Index of the subjects.

Since significant improvements were recorded, the results were subjected to post hoc analysis using Scheffe’s Confidence Interval test. The results were presented in Table III.

**Table 4:** Multiple Comparisons between Low, Medium, and High intensity interval training and Control Groups and Scheffe’s Post Hoc Analysis on Body Mass Index

Low intensity interval training Group	Medium intensity interval training Group	High intensity interval training Group	Control Group	MEAN DIFF	C.I
22.34	21.54			0.80	0.93
22.34		21.30		1.04*	0.93
22.34			22.66	-0.32	0.93
	21.54	21.30		0.24	0.93
	21.54		22.66	-1.11*	0.93
		21.30	22.66	-1.36*	0.93

\* Significant at 0.05 level.

The post hoc analysis of obtained ordered adjusted means proved that to be significant at 0.05 level confidence the required confidence interval was 0.93. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level. Low intensity interval training Vs High intensity interval training Groups (MD: 1.04)

Medium intensity interval training Vs Control Groups (MD: -1.11). High intensity interval training Vs Control Groups (MD: -1.36). The following paired mean comparisons were less than the required confidence interval and were not significant at 0.05 level. Low intensity interval training Vs

Medium intensity interval training Groups (MD: 0.80). Low intensity interval training Vs Control Groups (MD: -0.32). Medium intensity interval training Vs High intensity interval training Group (MD: 0.24)

**Results on Resting Pulse Rate**

The descriptive statistics comparing the initial and final means of Resting Pulse Rate due to different intensities (low, medium and high intensity) of interval training, and control groups of school women kabaddi players is presented in Table-IV.

**Table 5:** Descriptive Statistics on Low, Medium and High Intensity training and Control Groups

Groups	Test	Mean	Standard Deviation	RANGE	
				Min	Max
Low Intensity Interval training	Initial	71.07	2.46	67.00	75.00
	Final	69.13	2.29	66.00	73.00
	Adjusted Mean	69.09			
Medium Intensity Interval training	Initial	71.53	2.39	68.00	76.00
	Final	68.87	3.16	63.00	74.00
	Adjusted Mean	68.39			
High Intensity Interval training	Initial	71.00	1.25	69.00	73.00
	Final	69.33	1.29	67.00	71.00

	Adjusted Mean	69.35			
Control Group	Initial	70.47	2.45	65.00	76.00
	Final	70.67	2.64	65.00	77.00
	Adjusted Mean	71.18			

Table IV shows that the pre test mean on Resting Pulse Rate of low intensity interval training group was 71.07 with standard deviation  $\pm 2.46$  pre test mean of medium intensity interval training group was 71.53 with standard deviation  $\pm 2.39$ , the pre test mean of high intensity interval training group was 71.00 with standard deviation  $\pm 1.25$ , the pre test mean of control group was 70.47 with standard deviation  $\pm 2.45$ .

The descriptive statistics on post test mean on Resting Pulse Rate of low intensity interval training group was 69.13 with standard deviation  $\pm 2.29$  post test mean of medium intensity interval training group was 68.87 with standard

deviation  $\pm 3.16$ , the post test mean of high intensity interval training group was 69.33 with standard deviation  $\pm 3.16$ , the post test mean of control group was 70.67 with standard deviation  $\pm 2.64$ .

The adjusted mean on Resting Pulse Rate on low intensity interval training group was 69.09, medium intensity interval training group was 68.39, high intensity interval training group was 69.35 and control group was 71.18, as shown in Table IV.

The obtained mean values on the experimental and control groups were presented in Figure II.

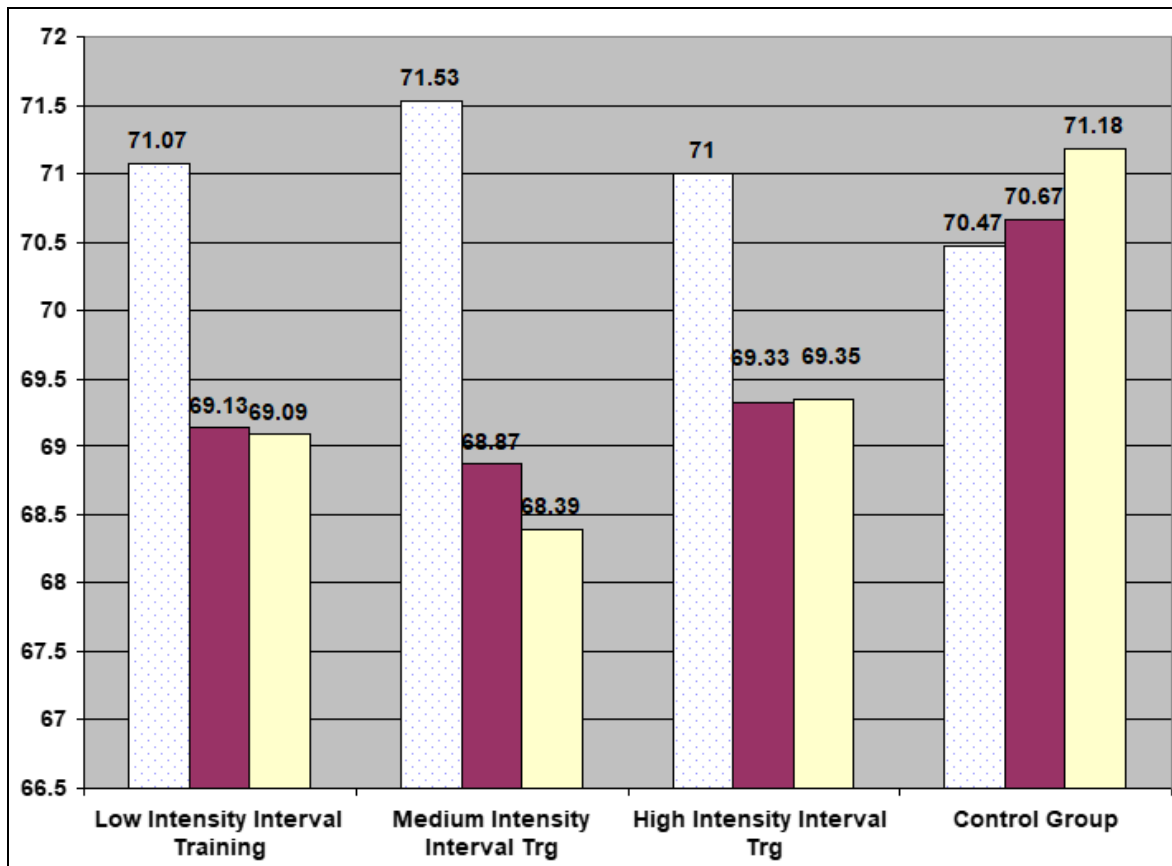


Fig 2: Bar Diagram Showing Pre, Post And Adjusted Means On Resting Pulse Rate Due To Low, Medium And High Intensity Interval Training And Control Groups

The results on descriptive statistics proved that there exist differences in different intensities of interval training compared to control group of variable Resting Pulse Rate.

And to test statistical significance of the differences, the obtained data on Resting Pulse Rate using ANCOVA was presented in Table V.

Table 6: Computation of Analysis of Covariance Due to Low, Medium and High Intensity Interval Training and Control Group on Resting Pulse Rate

	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	Between	8.58	3	2.86	0.59
	Within	270.40	56	4.83	
Post Test Mean	Between	28.87	3	9.62	1.61
	Within	334.13	56	5.97	
Adjusted Post Test Mean	Between	61.87	3	20.62	11.27*
	Within	100.65	55	1.83	

Required  $F_{(0.05), (df 3,56)} = 2.77$ , \* Significant at 0.05 level of confidence

As shown in Table V, the obtained F ratio of 0.59 on pre test means of the groups was not significant at 0.05 level as the obtained F value was less than the required table F value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at initial stage.

The results presented in Table V, the obtained F ratio of 1.61 on post test means of the groups was significant at 0.05 level as the obtained F value was lesser than the required table F value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at initial stage.

**Table 7:** Multiple Comparisons between Low, Medium, and High intensity interval training and Control Groups and Scheffe’s Post Hoc Analysis on Resting Pulse Rate

Low intensity interval training Group	Medium intensity interval training Group	High intensity interval training Group	Control Group	MEAN DIFF	C.I
69.09	68.39			0.70	1.41
69.09		69.35		-0.26	1.41
69.09			71.18	-2.09*	1.41
	68.39	69.35		-0.96	1.41
	68.39		71.18	-2.79*	1.41
		69.35	71.18	-1.83*	1.41

\* Significant at 0.05 level.

The post hoc analysis of obtained ordered adjusted means proved that to be significant at 0.05 level confidence the required confidence interval was 1.41. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level. Low intensity interval training Vs Control Groups (MD: -2.09) Medium intensity interval training Vs Control Groups (MD: -2.79)

High intensity interval training Vs Control Groups (MD: -1.83)

The following paired mean comparisons were less than the required confidence interval and were not significant at 0.05 level. Low intensity interval training Vs Medium intensity interval training Groups (MD: 0.70). Low intensity interval training Vs High intensity interval training Groups (MD: -0.26). Medium intensity interval training Vs High intensity interval training Group (MD: -0.96)

**Level of Significance**

The study was to find out the effect of different intensities of interval training on body composition and cardio respiratory endurance variables of school women kabaddi players, such as, body mass index, percent body fat, lean body mass, cardio respiratory endurance, resting pulse rate, breath holding time and vital capacity. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the groups on selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as appropriate.

**Findings**

Based on the results of the study, it was found that different intensities of interval training can beneficially alter body composition and cardio respiratory endurance variables of school level women kabaddi players.

Taking into consideration of the pre test means and post test means, adjusted post test means were determined and analysis of covariance was done. The obtained F value on adjusted means was 11.27. The obtained F value was greater than the required value of 2.77 and hence it was accepted that there was significant differences among the adjusted means on the Resting Pulse Rate of the subjects.

Since significant improvements were recorded, the results were subjected to post hoc analysis using Scheffe’s Confidence Interval test. The results were presented in Table VI.

**Conclusions**

Within the limitations and delimitations of the study, the following conclusions were drawn.

1. It was concluded that 12 weeks medium and high intensity interval training significantly altered body mass index of the school women kabaddi players compared to control group. Comparing between medium and high intensity interval training, it was found that high intensity interval training was better than medium intensity interval training.
2. It was concluded that 12 weeks low, medium and high intensity interval training significantly altered resting pulse rate of the school women kabaddi players compared to control group. Comparing between treatment groups it was found that there was no significant difference in altering resting pulse rate.

**Recommendations**

The findings of this study proved that there were significant improvement due to different intensities of interval training among school level women kabaddi players. In view of the findings of this study, the following recommendations are made.

1. The findings of this study may be considered while scheduling coaching programmes for women kabaddi players.
2. In view of the findings of this study, weight management education may be imparted to the women kabaddi players so that they could attain the desirable level of body types suited to their game.

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