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Effect different intensities of interval training on percent body fat and cardio respiratory endurance 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 and cardio respiratory endurance variables. 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: Percent body fat and cardio respiratory endurance

Introduction
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). "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. Sports training is a specialized process of the physical perfection of the content of which is the planned preparation for top class performance in the event or discipline chosen on the basis of evaluation and training. For improving the standard of play in the field of sports, conditioning exercises play a prominent role. Conditioning is essential for any form of sports or games.
Exercise builds confidence, physical and mental abilities. Cultivates power of will and determination and promotes personal efficiency and a number of positive mental characteristics. Exercise brings healthful activity to every organ, gland and all of the body, it makes the entire body active and radiantly alive with a feeling, energy and well-being that an individual feels very buoyant and alert. Exercise is the best insurance against disease or sickness. (Mujumdar, 1950) [3].

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 adaptions 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:

a) 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.
b) The study aimed at assessing the body composition variables percent body fat, and cardio respiratory fitness such as cardio respiratory endurance of women kabaddi players.
c) 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.
d) 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 percent body fat and cardio respiratory endurance 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 percent body fat, 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 cardio respiratory endurance 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 percent body fat 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) 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 consistutes the relief period.

Intensity

Hardayal Singh (1984) 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.

Percent Body Fat

Percent body fat is simply the proportion of total weight that is fat weight.(Lawrence Gray Kumar, 2002) A person's body fat percentage is the total weight of the person's fat divided by the person's weight and consists of essential body fat and storage body fat. (en.wikipedia.com)

Cardio respiratory Endurance
The ability to sustain a series of repetitions of an activity without unduly taking the physiological systems that furnish the fuel and oxygen to the muscles. It is operationally defined as the amount of distance covered in meters in 12 minutes.

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.

Dependent Variable
Body Composition Variables
Percent body fat

Cardio respiratory endurance Variables
Cardio respiratory endurance

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) 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 girl's 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, and cardio respiratory endurance variables. 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.
Percent body fat was calculated using the following formulae
Percent body fat (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 interaclass correlation coefficient (Baumgartner and Jackson, 1975).The intraclass correlation coefficient obtained for test-retest data are presented in Table I.

Table I: Intra Class Correlation Coefficient of Test – Retest Scores

S. No	Variables	Coefficient of Correlation
1	Percent body fat	0.95*
2	Cardio respiratory Endurance	0.89*

***** 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.

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

Cardiorespiratory Endurance Test
Purpose
To measure the cardiorespiratory endurance

Equipments
A stop watch, whistle and distance markers were used.

Procedure
The subjects were positioned behind the line and upon the starting ran/ walked as many laps as possible around the track in 12 minutes. The tester and tester assistants maintained the distance covered by the subjects and when the stop signal was given by the investigator by blowing a whistle, the tester assistants ran immediately to the spot where the subject is stopped at the moment the whistle was blown. The scores were recorded in meters.

Scores
Score was the distance covered by each subject in 12 minutes.

Statistical procedure
These test data must be analysed in ways appropriate to the research design (Clarke and Clarke, 1970) . 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).

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).

Computation of analysis of covariance and post HOC TEST

Results on percent body fat

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

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	22.278	0.92	20.72	23.78
	Final	21.69	0.91	20.22	23.30
	Adjusted Mean	21.70			
Medium intensity interval training	Initial	22.43	1.16	21.00	24.48
	Final	21.03	1.22	19.42	23.38
	Adjusted Mean	20.92			
High intensity interval training	Initial	22.27	0.95	20.60	24.00
	Final	20.09	1.11	18.68	22.58
	Adjusted Mean	20.11			
Control Group	Initial	22.18	0.92	20.62	23.68
	Final	21.99	0.91	20.52	23.60
	Adjusted Mean	22.08			

Table II shows that the pre-test mean on Percent Body Fat of low intensity interval training group was 22.278 with standard deviation ± 0.92 pre-test mean of medium intensity interval training group was 22.43 with standard deviation ± 1.16, the pre-test mean of high intensity interval training group was 22.27 with standard deviation ± 0.95, the pre-test mean of control group was 22.18 with standard deviation ± 0.92.

The descriptive statistics on post-test mean on Percent Body Fat of low intensity interval training group was 21.69 with standard deviation ± 0.91 post-test mean of medium intensity interval training group was 21.03 with standard deviation ± 1.22, the post-test mean of high intensity interval training group was 20.09 with standard deviation ± 1.22, the post-test mean of control group was 21.99 with standard deviation ± 0.91.

The adjusted mean on Percent Body Fat on low intensity interval training group was 21.70, medium intensity interval training group was 20.92, high intensity interval training group was 20.11 and control group was 22.08, as shown in Table II.

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

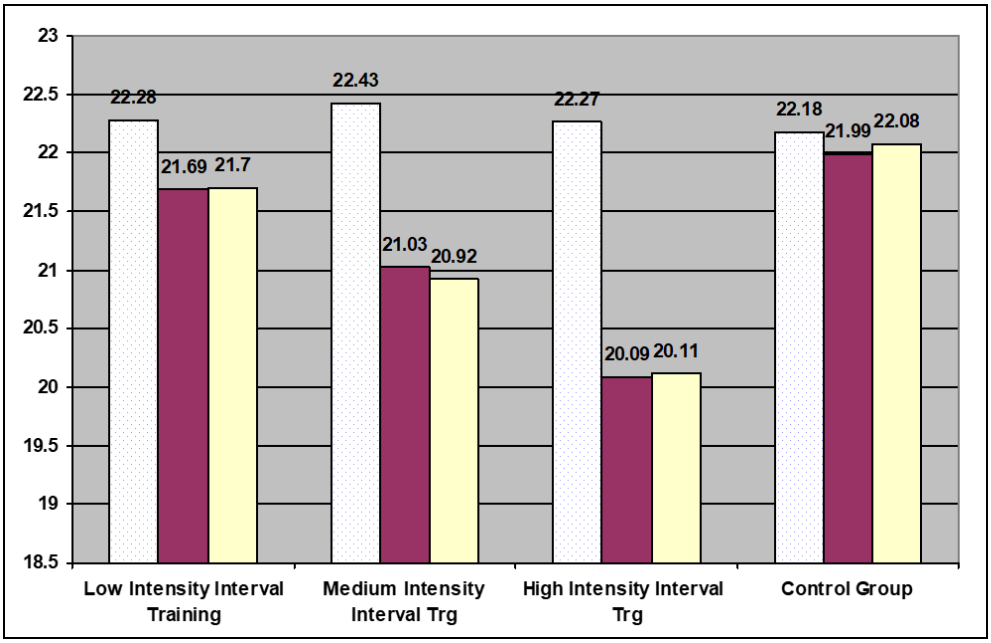

Fig I: Bar diagram showing pre, post and adjusted means on percent body fat due to low, medium and high intensity interval training and control groups

The results on descriptive statistics proved that there exist differences in different intensities of interval training compared to control group of variable Percent Body Fat. And to test statistical significance of the differences, the obtained data on Percent Body Fat using ANCOVA was presented in.

Table 3: Computation of analysis of covariance due to low, medium and high intensity interval training and control group on percent body fat

	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre-test Mean	Between	0.47	3	0.16	0.16
	Within	55.39	56	0.99	
Post-test Mean	Between	31.74	3	10.58	9.64*
	Within	61.46	56	1.10	
Adjusted Post-test Mean	Between	34.53	3	11.51	31.15*
	Within	20.32	55	0.37	

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

As shown in Table III, the obtained F ratio of 0.16 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 III, the obtained F ratio of 9.64 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 31.15. 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 Percent Body Fat 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 4: Multiple Comparisons between Low, Medium, and High intensity interval training and Control Groups and Scheffe's Post Hoc Analysis on Percent Body Fat

Low intensity interval training Group	Medium intensity interval training Group	High intensity interval training Group	Control Group	Mean Diff	C.I
21.70	20.92			0.78*	0.63
21.70		20.11		1.59*	0.63
21.70			22.08	-0.39	0.63
	20.92	20.11		0.81*	0.63
	20.92		22.08	-1.17*	0.63
		20.11	22.08	-1.98*	0.63

***** 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 0.63. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level.
Low intensity interval training Vs Medium intensity interval training Groups (MD: 0.78)
Low intensity interval training Vs High intensity interval training Groups (MD: 1.59)
Medium intensity interval training Vs High intensity interval training Group (MD: 0.81)
Medium intensity interval training Vs Control Groups (MD: -1.17)
High intensity interval training Vs Control Groups (MD: -1.98)
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 Control Groups (MD: -0.39)

Results on cardio respiratory endurance

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

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	2050.67	115.17	1890.00	2190.00
	Final	2132.00	149.72	1850.00	2300.00
	Adjusted Mean	2138.81			
Medium Intensity Interval training	Initial	2058.00	66.89	1930.00	2180.00
	Final	2188.67	65.67	2080.00	2290.00
	Adjusted Mean	2188.96			
High Intensity Interval training	Initial	2050.67	73.51	1910.00	2160.00
	Final	2159.33	60.65	2070.00	2250.00
	Adjusted Mean	2166.15			
Control Group	Initial	2074.00	168.13	1900.00	2450.00
	Final	2095.33	157.11	1910.00	2450.00
	Adjusted Mean	2081.41			

Table V shows that the pre-test mean on Cardio respiratory Endurance of low intensity interval training group was 2050.67 with standard deviation ± 115.17 pre-test mean of medium intensity interval training group was 2058.00 with standard deviation ± 66.89, the pre-test mean of high intensity interval training group was 2050.67 with standard deviation ± 73.51, the pre-test mean of control group was 2074.00 with standard deviation ± 168.13.

The descriptive statistics on post-test mean on Cardio respiratory Endurance of low intensity interval training group was 2132.00 with standard deviation ± 149.72 post-test mean of medium intensity interval training group was 2188.67 with standard deviation ± 65.67, the post-test mean of high intensity interval training group was 2159.33 with standard deviation ± 65.67, the post-test mean of control group was 2095.33 with standard deviation ± 157.11.

The adjusted mean on Cardio respiratory Endurance on low intensity interval training group was 2138.81, medium intensity interval training group was 2188.96, high intensity interval training group was 2166.15 and control group was 2081.41, as shown in Table V.

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

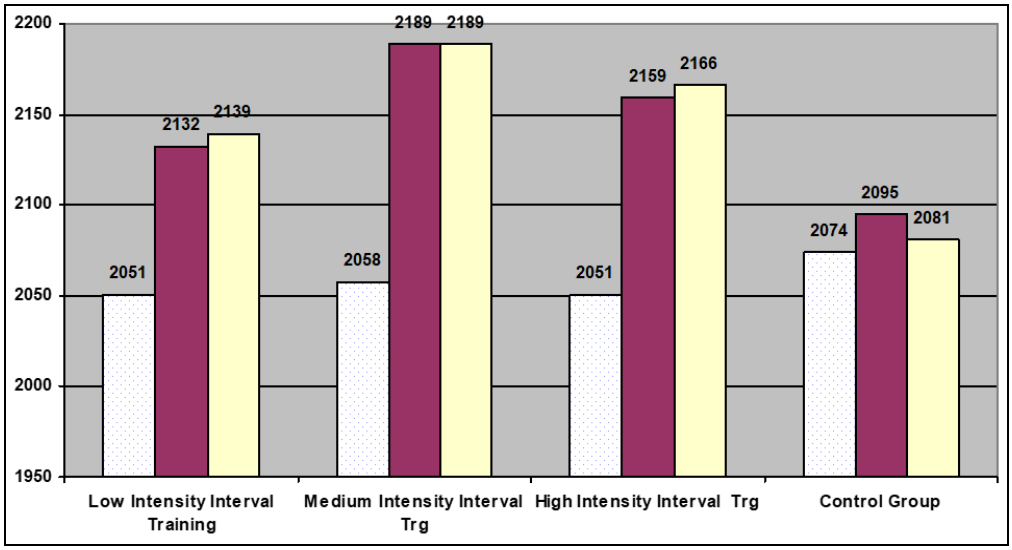

Fig 2: Bar diagram showing pre, post and adjusted means on cardio respiratory endurance due to low, medium and high intensity interval training and control groups

The results on descriptive statistics proved that there exists differences in different intensities of interval training compared to control group of variable Cardio respiratory Endurance. And to test statistical significance of the differences, the obtained data on Cardio respiratory Endurance using ANCOVA was presented in.

Table 6: Computation of analysis of covariance due to low, medium and high intensity interval training and control group on cardio respiratory endurance

	Source of Variance	Sum of Squares	DF	Mean Squares	Obtained F
Pre-test Mean	Between	5446.67	3	1815.56	0.14
	Within	719736.67	56	12852.44	
Post-test Mean	Between	71138.33	3	23712.78	1.72
	Within	771280.00	56	13772.86	
Adjusted Post-test Mean	Between	96457.28	3	32152.43	8.73*
	Within	202668.97	55	3684.89	

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

* Significant at 0.05 level of confidence

As shown in Table VI, the obtained F ratio of 0.14 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 VI, the obtained F ratio of 1.72 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.

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 8.73. 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 Cardio respiratory Endurance 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 7: Multiple comparisons between low, medium, and high intensity interval training and control groups and scheffe's post hoc analysis on cardio respiratory endurance

Low intensity interval training group	Medium intensity interval training group	High intensity interval training Group	Control Group	Mean Diff	C.I
2138.81	2188.96			-50.15	63.32
2138.81		2166.15		-27.33	63.32
2138.81			2081.41	57.41	63.32
	2188.96	2166.15		22.82	63.32
	2188.96		2081.41	107.55*	63.32
		2166.15	2081.41	84.74*	63.32

***** 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 63.32. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level. Medium intensity interval training Vs Control Groups (MD: 107.55)

High intensity interval training Vs Control Groups (MD: 84.74)

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: -50.15)

Low intensity interval training Vs High intensity interval training Groups (MD: -27.33)

Low intensity interval training Vs Control Groups (MD: 57.41)

Medium intensity interval training Vs High intensity interval training Group (MD: 22.82)

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.

Conclusions

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

1. It was concluded that 12 weeks low, medium and high intensity interval training significantly altered percent body fat of the school women kabaddi players compared to control group. Comparing between treatment groups it was found high intensity interval training, was significantly better than low and medium intensity interval training.
2. It was concluded that 12 weeks medium and high intensity interval training significantly altered cardio respiratory endurance 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 cardio respiratory endurance.

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.

Reference

1. Lawrance V. Gray Kumar and Mamata Manjari Panda, Modern Principles of Athletic Training, India: Friends Publications, 2002, 22.
2. Michael Levitzky G. Pulmonary Physiology 7th ed, New York: The Mc Grow Hill Company, Inc; c2007.
3. Mujumdar DC. Encyclopedia of Indian Physical Culture, Baroda: Baroda Good Companies, 1950, 27.
4. Sharma RC. Health and Physical Education, Ludhiana: Tandon Publications, 1987, 101.
5. Shaver Larry G. Essentials of Exercise Physiology, New Delhi: Surjeet Publications, 1982, 10.
6. Strukic. Basic Physiology, New York: Spring Ervellong, 1981, 124.
7. Wallace Donoghue C. How to Measure Your Body Fat Percent - An Instruction Manual for the Slim Guide Skinfolds Caliper, Michigan: Creative Health Products, 1987, 136.
8. William Mc Ardle D, Frank Katch I, Victor Katch L. Exercise Physiology, Energy, Nutrition and Human Performance Philadelphia: Lea and Febiger, 1991, 17.
9. William JCP, Sperryn PN. Sports Medicine, London: Edward Arnold Publishers Ltd., 1976, 8.
10. Alejandro Martínez-Rodríguez, *et al*. Benefits of Adding an Aquatic Resistance Interval Training to a Nutritional Education on Body Composition, Body Image Perception and Adherence to the Mediterranean Diet in Older Women, Nutrients. 2021;13(8):2712.
11. Ali Ataeinosrat, *et al*. Intensity Dependent Effects of Interval Resistance Training on Myokines and Cardiovascular Risk Factors in Males With Obesity, Front Endocrinol (Lausanne). 2022;13:895512.
12. Astrand and Radhal. The Effect of Alactic and Lactic Compounds in Judo Performance, The Sport Science of Elite Indo Athletes. 1986;25:73-79.
13. Bacharach DW, Von Davillard SP. Intermediate and

Long term Anaerobic Performance of Elite Alpine Skiers, Unpublished Master's Thesis, (St. Cloud State University; c2004.
14. Benjamin Ryan J, *et al*. Moderate-Intensity Exercise and High-Intensity Interval Training Affect Insulin Sensitivity Similarly in Obese Adults, J Clin Endocrinol Metab. 2020;105(8):e2941-e2959.
15. Bernardo Ide N, *et al*. Immunological Responses to a Brazilian Jiu-Jitsu High-Intensity Interval Training Session, J Hum Kinet. 2019;70(1):115-124.