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Effect of different intensity of physical fitness exercises on cardio-respiratory fitness and body composition of 10-12year female

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Abstract

The purpose of the study was to investigate which type of training intensity (Low, Medium, & High) was most effective for improving cardio-respiratory fitness and body composition of 12 weeks physical fitness exercises programme for female children age groups of 10-12years. Sixty subjects were randomly selected for this research work from Govt. schools of Chandigarh, U.T. In the age group of 10-12 years A, B, C and D was made of 15 subjects each. Group A (Low Intensity), Group B (Medium Intensity) & Group C (High intensity) acted as Experimental groups, who had participated in 12 weeks physical fitness exercise programme. Whereas other fifteen subjects followed their usual programme and acted as Control Group D. To determine the characteristics of Resting Heart Rate, Blood Pressure, Hemoglobin, Resting Respiratory rate, cardio-respiratory fitness and body composition, before and after 12 weeks of training at different intensity, mean and standard deviation was used. To compare adjusted posttest means of experimental groups and control group in relation to Resting Heart Rate, Blood Pressure, Hemoglobin, Resting Respiratory rate, cardio-respiratory fitness and Body Composition of 10-12 years, ANCOVA was used. The level of significance was set at 0.05. There were the significance difference found in all the variables except body composition and blood pressure. So, it was concluded that if exercises proposed in the present study performed at medium intensity i.e. 60-65% would be most suitable for improving cardiorespiratory fitness of 10-12 of female.

Keywords: Cardiorespiratory fitness, body composition, intensity, exercises heart rate

Introduction

Girls' physical education activity participation is generally less frequent and of a lower intensity than that of boys (Stratton, 1996; McKenzie *et al*, 2000). The physiological and psychosocial changes experienced during the adolescent may make them a particularly high-risk period for girls to adopt sedentary habits. (Rowland, 1999) There is need to encourage girls to get involved in sports and physical activity at early age.

The body composition parameters are important determinants of child health, also in regard to obesity. During growth and development of children, body composition, predominantly fat and lean body mass, plays a central role. Body composition changes during growth and with aging in relation to health, nutrition and physical activity. Parizkova, *et al* (1998)^[3] observed that the magnitude of change in body composition varies with the intensity and duration of physical activity among boys. Physique and body composition have an important role in the performance of various physical activities.

Cardiorespiratory endurance also called maximal oxygen uptake (VO₂max) is an important component of health-related fitness and is viewed as the primary indicator of cardiorespiratory fitness (Geithner *et al.*, 2004; Dixie, 2005)^[2]. Maximal oxygen uptake is defined as the highest rate at which oxygen can be taken in transported and used during maximal dynamic exercise (Dixie, 2005). The measurement of maximal oxygen uptake in children has received attention as arguably the most effective means of determining a child or adolescent's aerobic capacity or potential and his/her present level of VO₂max (Cooper's Institute For Aerobic Research, 2000). It has been realised that VO₂max and cardiorespiratory endurance are interrelated has resulted in a convergence of athletic performance and medical definitions of fitness. From the athletic perspective, cardiorespiratory functions determine VO₂max, which in turn determines

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fitness. Medically, increased fitness is associated with decreased risk of disease. Since cardiorespiratory disease is the greatest threat to the health of individuals in contemporary Western society, including developing countries, medical aspects of fitness is largely concerned with VO₂max (Cengiz *et al.*, 2004)^[2]. Quantitatively, maximal oxygen uptake can be expressed as VO₂max: Where:

- V = volume per minute
- O₂ = oxygen
- Max. = maximum

VO₂max can be expressed absolutely as liters per minute (l/min) or in relative (uptake to body weight) terms as milliliters of oxygen consumed per kilogram of body weight per minute (ml.kg⁻¹.min⁻¹).

Objective of the Study

1. The first objective of the present study was to determine the characteristics of Cardio-respiratory Fitness and Body Composition of Female Children having age of 10-12years.
2. The second objective was to compare adjusted posttest means of experimental groups and control group in relation to Cardio-respiratory Fitness and Body

Composition of 10-12 years female subjects resulting from training of three different types of intensities.

Material and Method

Sixty female subjects were randomly selected for this research work from Govt. schools of Chandigarh, (U.T.) age ranged from 10-12 years. The subject's age record (Date of birth) was taken from the school register.

Four groups A, B, C and D was made of 15 subjects each. Group A (Low Intensity), Group B (Medium Intensity) & Group C (High intensity) acted as experimental groups, who had participated in 12 weeks physical fitness exercise programme. Whereas other fifteen subjects followed their usual programme and acted as control Group D.

1. Cardio-respiratory Fitness was measured by using the Modified Cooper's 6-minute run/walk and the score was recorded to the nearest 50 meters. Further, by applying the Cooper's 12-minutes run/walk formula, the scores in distance were converted ml.kg⁻¹.ml⁻¹. In order to get the data of six minute final score was divided by two.
2. Fat percentage was measured with the help of a skinfold calliper and score was recorded in percentage.

Exercises intensity

Table 1: Different level of intensity was set by the target heart rate zone

Low Intensity	55-60% of max. Heart rate
	Repetition of exercises-8-10 (main part)
Medium Intensity	60-65% of max. Heart rate
	Repetition of exercises-12-15 (main part)
High Intensity	65-70% of max. Heart rate
	Repetition of exercises-15-20 (main part)

Statistical Technique

1. To determine the characteristics of Cardio-respiratory fitness and Body Composition, mean and standard deviation was used.
2. To compare adjusted posttest means of experimental groups and control group in relation to Cardio-respiratory Fitness and Body Composition of 10-12 year female subjects, resulting training of three different types of intensities and ANCOVA was used.

Table 2: Mean and standard deviation of different intensities (Low, Medium, and High and Control group) in relation to Cardiorespiratory Fitness (ml/kg/min)

Age (years)	Test	Low Intensity		Medium Intensity		High Intensity		Control Group	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
10-12	Pre	5.21	0.94	5.23	0.72	5.24	0.59	5.22	1.10
	Post	6.88	1.17	9.65	0.472	7.25	0.91	5.22	1.02

The above table reveals that in case of 10-12 years girls, the mean vo₂ max during pretest was more or less similar in all the three intensities but during posttest from low intensity vo₂ max of 6.88(ml/kg/min) to medium intensity there was increase vo₂ max 9.65(ml/kg/min). However, during high

intensity the vo₂ max lowered down to 7.25(ml/kg/min). Control group showed no effect from pre to post test. The table also reveals that the mean vo₂ max of 10-12 years was better in all the three intensities.

Table 3: Mean and standard deviation of different Intensities (Low, Medium, and High and Control group) in relation to Body Fat percentage (Percentage)

Age (years)	Test	Low Intensity		Medium Intensity		High Intensity		Control Group	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
10-12	Pre	4.39	0.91	4.37	0.83	4.14	0.78	4.15	0.76
	Post	4.04	0.93	3.88	0.52	3.74	0.66	4.13	0.84

The table reveals that in case of 10-12 years girls, the mean Body Fat Percentage during pretest was more or less similar in all the three intensities but during posttest from low intensity Body Fat Percentage 4.04(Percentage) to medium intensity there was decrease of Body Fat Percentage 3.88(Percentage). However, high intensity the Body Fat Percentage lowered down to 3.74(Percentage). Control group showed no effect from pre to post test. The table also reveals that the mean Body Fat Percentage of 10-12 years was better in all the three intensities.

Table 4: Analysis of Co-Variance of the Means of Three Experimental Groups and the Control Group Cardiorespiratory Fitness (ml/kg/min)

	Groups				Sum of Squares	Df	Means sum of square	F-ratio	
	Exp. I	Exp. II	Exp. III	Control Group					
	Pre-test Means	5.22	5.23	5.24					5.22
					W	38.67	56	0.69	

Post-test Means	6.88	9.65	7.23	5.22	A	150.99	3	50.33	58.32*
					W	48.33	56	0.86	
Adjusted posttest means	6.89	9.65	7.23	5.22	A	150.43	3	50.14	174.71*
					W	15.78	55	0.28	

*Significant at 0.05 level of significance

- N = 60
- Exp. I = Low Intensity Group
- Exp. II = Medium Intensity Group
- Exp. III = High Intensity Group
- A = Among Means variance
- W = With in Group variance
- F = Ratio needed for significance at 0.05 level of significance = $df(3, 56) = 2.76$, $df(3, 55) = 2.78$

The analysis of co-variance was insignificant in case of pre-test means from which it is clear that the pre-test mean does not differ significantly and that the random assignment of subjects to all the groups was quite successful. The post-test means of all the four groups yielded an F-ratio of 58.320 which was significant at 0.05 level of confidence. The difference between the adjusted posts means was found significant as the obtained F-ratio was 174.713. The F-ratio needed for significance at 0.05 level of confidence was 2.78.

Table 5: Post Hoc Comparison of Adjusted Means Scores of Cardio-respiratory Fitness in Different Groups (ml/kg/min)

Low intensity	Medium intensity	High intensity	Control group	Mean difference	Critical difference
6.89	9.65			2.76*	0.391
6.89		7.23		0.34	
6.89			5.22	1.67*	
	9.65	7.23		2.42*	
	9.65		5.22	4.435*	
		7.23	5.22	2.014*	

* Significant at 0.05 level of significance

The above table shows that significance difference was found between Low Intensity and Medium Intensity, Low Intensity and Control Group, Medium Intensity and High Intensity, Medium Intensity and Control Group and High Intensity and Control Group as the obtain Mean Difference was greater than the C.D. at 0.05 level of significance.

Whereas no significance different was found between Low Intensity and High Intensity as the obtained M.D. was less than C.D.

Finally as the adjusted mean of Mean of Medium Intensity was greater than the other Intensity, it may useful for improving Cardiorespiratory Fitness.

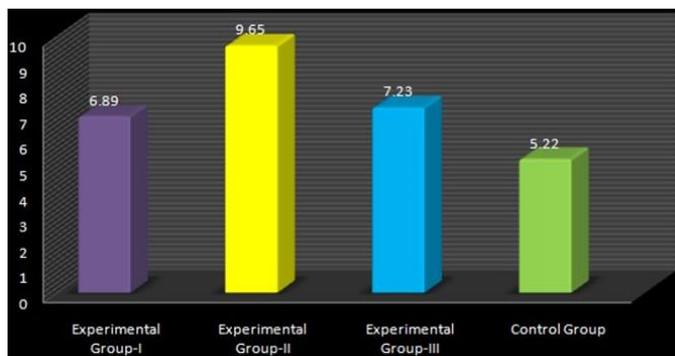


Fig 1: Graphical representation of adjusted mean of cardio-respiratory fitness

Table 6: Analysis of Co-Variance of the Means of Three Experimental Groups and the Control Group Body Fat Percentage (Percentage)

	Groups				Sum of Squares	Df	Means sum of square	F-ratio
	Exp. I	Exp. II	Exp. III	Control Group				
	Pre-test Means	4.39	4.36	4.14				
Post-test Means	4.03	3.87	3.73	4.13	A: 1.34, W: 31.93	3, 56	0.45, 0.57	0.794
Adjusted posttest means	3.95	3.8	3.81	4.2	A: 1.52, W: 15.21	3, 55	0.51, 0.27	1.828

* Significant at 0.05 level of significance

- N = 60
- Exp. I = Low Intensity Group
- Exp. II = Medium Intensity Group
- Exp. III = High Intensity Group
- A = Among Means variance
- W = With in Group variance
- F = Ratio needed for significance at 0.05 level of significance = $df(3, 56) = 2.76$, $df(3, 55) = 2.78$

The analysis of co-variance was insignificant in case of pre-test means from which it is clear that the pre-test mean does not differ significantly and that the random assignment of subjects to all the groups was quite successful. The post-test means of all the four groups yielded an F-ratio of 0.794 which was not significant at 0.05 level of confidence. The difference between the adjusted posttest means was also found insignificant as the obtained F-ratio was 1.828. The F-ratio needed for significance at 0.05 level of confidence was 2.78.

Discussion

The present study revealed that *significant difference was found in Cardio-respiratory fitness in age group of 10-12 years female*. Further, it was found that out of all the three intensities, medium intensity was most suitable for improving cardio-respiratory fitness. The study was supported by the findings of the Turley KR, *et al* (1997)^[4] who concluded that in the sample of 7-to 9-yr-old boys and girls there are few significant differences in submaximal cardiovascular responses to exercise on either exercise modality. In the present study it was also found that there were *insignificant difference was found in case of body composition in the age group of 10-12years*. The study was supported by the findings of the Treuth MS, *et al*, (2005)^[6] who examined the association between overweight and physical activity or sedentary time measured by accelerometry in rural boys and girls 7 to 19 years old. They found that no associations between measures of body composition and time spent in an activity level were seen in boys.

Conclusion

It was concluded that if exercises proposed in the present study performed at medium intensity i.e. 60-65% would be most suitable for improving cardiorespiratory fitness of 10-12 years of female.

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