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Consequence of physical fitness workout on cardio-respiratory fitness and body composition of feminine adolescent

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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 feminine children age groups of 13-15years. Sixty subjects were randomly selected for this research work from Govt. schools of Chandigarh, U.T. In the age group of 13-15 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 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 post-test means of experimental groups and control group in relation to Cardio-respiratory fitness and Body Composition of 13-15 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. 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 13-15 of feminine.

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

Introduction
Though traditionally, exercise has been considered necessary only for adults, because children are naturally active so they do not need any structured program of physical activity. On other hand recent researches have proved that regular exercise is necessary for a child's health. For a modern child fitness is a backseat matter. It is evident that in the last decade, the level of physical fitness in children has been decreasing and the levels of obesity have increased **(**World Health Organization, 2009; Slinger, 2005), probably because the levels of physical activity needed from the children in school age are not sufficient to promote an ideal health (Koutedakis & Bouziotas, 2003) [5]. Children are becoming victims of inactive, unmotivated, unhealthy lifestyles making their physical health deteriorated day by day. Ignorance of exercise and nourished diet make most of the children obese.
Girls' physical education activity participation is generally less frequent and of a lower intensity than that of boys (Stratton, 1996; McKenzie *et al*, 2000) [10-11]. 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) [6] 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) [3, 12]. 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) [12]. 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) [1]. It has been realized that VO2max and cardiorepiratory end urance 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 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) [13]. 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

The first objective of the present study was to determine the characteristics of Cardio-respiratory Fitness and Body Composition of Feminine Children having age of 13-15years.

1. The second objective was to compare adjusted post-test means of experimental groups and control group in relation to Cardio-respiratory Fitness and Body Composition of 13-15 years feminine subjects resulting from training of three different types of intensities.

Material and Method

Sixty feminine subjects were randomly selected for this research work from Govt. schools of Chandigarh, (U.T.) age ranged from 13-15 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

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 post-test means of experimental groups and control group in relation to Cardio-respiratory Fitness and Body Composition of 13-15 year feminine subjects, resulting training of three different types of intensities and ANCOVA was used.

Table 1: Mean and Standard Deviation of different Intensities (Low, Medium, 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
13-15	Pre	4.65	1.13	4.63	1.47	4.68	1.23	4.67	0.91
	Post	6.34	1.29	8.37	1.44	6.41	1.55	4.58	0.84

The above table reveals that in case of 13-15 years the mean vo2 max during pre-test was more or less similar in all the three intensities but during post-test from low intensity vo2 max of 6.34(ml/kg/min) to medium intensity there was increase vo2 max 8.37(ml/kg/min). However, during high intensity the vo2 max lowered down to 6.41(ml/kg/min). Control group showed no effect from pre to post test.

Table 2: Mean and Standard Deviation of different Intensities (Low, Medium, 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
13-15	Pre	8.59	1.71	7.39	2.12	7.62	1.74	6.91	1.35
	Post	8.25	1.74	6.79	1.83	7.21	1.65	7.11	1.68

The table no-2 reveals that in case of 13-15 years the mean Body Fat Percentage during pre-test was more or less similar in all the three intensities but during post-test from low intensity Body Fat Percentage of 8.25(Percentage) to medium intensity there was a decrease of body fat percentage 6.79(Percentage). However, high intensity the Body Fat Percentage lowered down to 7.21(Percentage). Control group showed no effect from pre to post test.

Table 3: Analysis of Co-Variance of the Means of Three Experimental Groups and the Control Group Cardio-respiratory 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	4.65	4.63	4.68	4.67	A	0.02	3	0.007	0.005
					W	80.28	56	1.43	
Post-test Means	6.33	8.37	6.41	4.58	A	107.69	3	35.89	20.965*
					W	95.89	56	1.71	
Adjusted post-test means	6.34	8.39	6.38	4.58	A	109.58	3	36.53	58.678*
					W	34.23	55	0.62	

* 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	=	Within 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 a F-ratio of 20.965 which was also found significant at 0.05 level of confidence. The difference between the adjusted post means was found insignificant as the obtained F-ratio was 58.678. The F-ratio needed for significance at 0.05 level of confidence was 2.78.

Table 4: 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
6.34	8.39			2.05*	0.576
6.34		6.38		0.04	
6.34			4.58	1.76*	
	8.39	6.38		2.01*	
	8.39		4.58	3.81*	
		6.38	4.58	1.80*	

* 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 difference Intensity was greater than the other Intensity, it may useful for improving Cardiorespiratory Fitness.

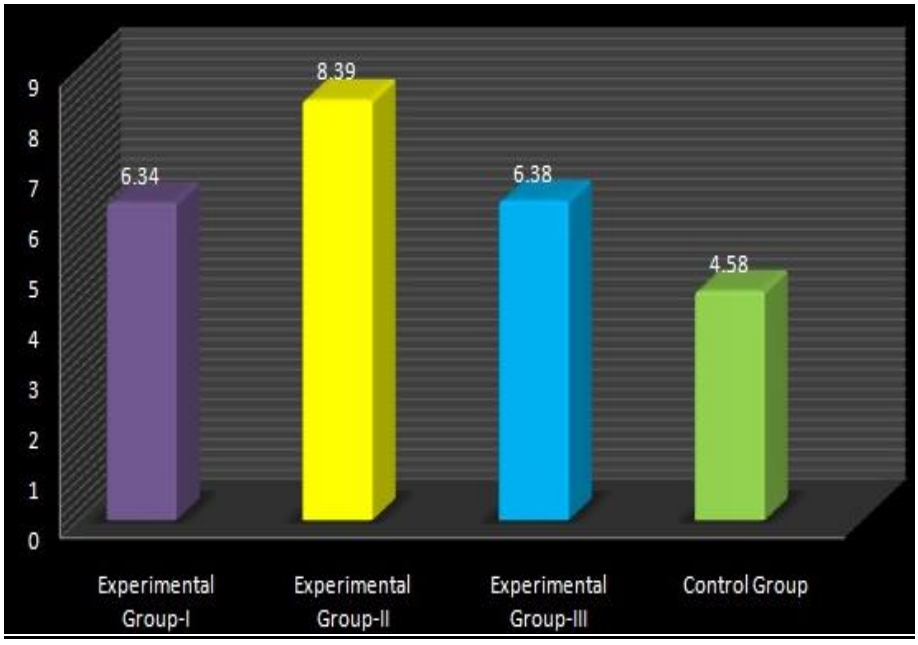

Fig 1: Graphical representation of Adjusted mean of Cardio-respiratory Fitness

Table 5: Body Fat Percentage (*Percentage*) Analysis of Co-Variance of the Means of Three Experimental Groups and the Control Group

	Groups				Sum of Squares		Df	Means sum of square	F-ratio
	Exp. I	Exp. II	Exp. III	Control Group					
Pre-test Means	8.59	7.39	7.62	6.92	A	22.47	3	7.49	2.444
					W	171.59	56	3.06	
Post-test Means	8.25	6.79	7.21	7.11	A	18.05	3	6.02	2.011
					W	167.55	56	2.99	
Adjusted post test means	7.39	7.01	7.22	7.75	A	4.39	3	1.46	2.76
					W	29.22	55	0.53	

* 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	=	Within 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 a F-ratio of 2.011 which was not significant at 0.05 level of confidence. The difference between the adjusted post means was found insignificant as the obtained F-ratio was 2.760. 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 13-15 years feminine. 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) 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 13-15years. The study was supported by the findings of Ekelund U, et al, (2001) [2] examined the strength of the relationship between different variables of physical activity and aerobic fitness and body fat in adolescent (14-15year) boys and girls, who concluded that no significant associations between physical activity variables and the data on body fat were observed. The total amount of physical activity (AEE) was related to VO2peak, at least in adolescent girls. Harris KC, *et al*, (2009) [4] conducted a systematic review and meta-analysis to determine the effect of school-based physical activity interventions on body mass index (BMI) in children. They found no consistent changes in other measures of body composition. School-based physical activity interventions did not improve BMI, although they had other beneficial health effects

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 13-15 years of feminine.

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