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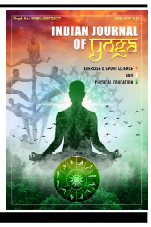

Experiment

Effects Of Circuit Training And Battle Rope Training On Cardio Respiratory Endurance Of School Girls

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ABSTRACT

The purpose of the present study was to find out the effects of circuit training and battle rope training on cardio respiratory endurance of school girls. To achieve the purpose of the study thirty school girls from M. Deivanai Achi Government Girls Higher Secondary School, Paganeri, Sivaganga District, Tamilnadu were selected as subjects. The selected subjects' age ranged from 11 to 13 years. The selected subjects were equally divided into three groups, i.e. two experimental groups and one control group. The experimental group-1 was allotted to circuit training (CT); the experimental group-2 was allotted for battle rope training (BRT) and group-3 acted as control group (CG). The cardio respiratory endurance was chosen as a dependent variable; it was tested by 9 minutes run/walk test. The test was taken before and after the training interventions. Analysis of covariance (ANCOVA) was used to analyze the significant difference, if any among the groups. In order to find out superiority effect among the groups, the Scheff's Post Hoc test was used. The level of significance was 0.05. After the six weeks training interventions the experimental groups improved the capacity of cardio respiratory endurance. The best improvement was noticed in circuit training.

INTRODUCTION

Now a day's fitness is considered as most important health indicators in childhood. The concept of physical fitness has since evolved to include morphological and metabolic components. (Sutha, Maniazhagu, 2019) During the early stages of strength training, especially with entry-level athlete almost any strength training method or program will result in strength development to some degree (Maniazhagu, Malar, Manogari, 2019) Children and young people are now recommended to take part in at least 60 minutes of moderate to vigorous physical activity daily to promote and protect healthy heart function, increase bone and muscle strength, improve mood and lower the risk of depression and reduce the risks of obesity, osteoporosis and diabetes (Malar, Maniazhagu, 2020) Different training methods have been commonly used to improve physical fitness and related standards of performance of athletes. (Maniazhagu, 2010) During recent years, the circuit training program is a form of exercise that has become widely used. (Davis et al, 2011) Circuit training is often erroneously portrayed as an intensive and stressful form of exercise, with a drill sergeant type in the middle of a circuit bellowing orders at weary recruits. Circuit training is a very versatile and adaptable mode of training that requires the performance of a series of carefully selected exercises. The use of resistance bands and cords as a form of exercise is becoming increasingly popular. (Lawrence, Hope, 2015) The intensity and vigor of circuit training are indeed challenging and enjoyable to the performer. This system

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produces positive changes in motor performance, general fitness, muscular power endurance and speed. (D. Maniazhagu, C.Robert Alexander and Sukumar Sha, 2011)

The circuit training effectively reduces the time devoted to training while allowing an adequate training volume to be achieved (Alcaraz Ramon et al. 2008). Moreover, it permits a greater motor engagement time (Lozano et al., 2009). Strength training is a long-term intention. Trainees do not achieve the peak performance immediately after the four to six weeks of training. But relatively during the competitive phase, which is months away from the anatomical adaptation phase. (Sridhar, Maniazhagu, 2018)

METHODOLOGY

To achieve the purpose of the study thirty school girls from M. Deivanai Achi Government Girls Higher Secondary School, Paganeri, Sivaganga District, Tamilnadu were selected as subjects. The selected subjects' age ranged from 11 to 13 years. The selected subjects were equally divided into three groups, i.e., two experimental groups and one control group. The experimental group-1 was allotted to circuit training (CT); the experimental group-2 was allotted for battle rope training (BRT) and group-3 acted as control group (CG). The cardio respiratory endurance was chosen as a dependent variable; it was tested by 9 minutes run/walk test. The test was taken before and after the training interventions. The training approach was taken for the period of six weeks, five days in a week.

Training Approaches

The selected two training groups performed their respective activities for five days in a week for the period of six weeks. The training intervention groups underwent their respective training as per the following schedule under the supervision of the researcher who provided motivation, advice and encouragement to the subjects. Every day the training was carried out only in the morning session that lasted for sixty minutes. Before and after every training session subject of experimental groups had the ten minutes of warm-up and ten minutes of warm down exercise involving jogging, stretching and mobility exercises.

Training approaches for experimental group 1-(Circuit training)

Week 1 to 2

During the period the subjects performed 8 stations of circuit training in clockwise order. Totally 3 circuits was given. They advised to perform only fifteen seconds of each station. The same time was allowed for recovery in-between the stations. The 5 minutes was allowed to take rest in-between the circuit.

Week 3 to 4

During the period the subjects performed 8 stations of circuit training in clockwise order. Totally 3 circuits was given. They advised to perform only twenty seconds of each station. The same time was allowed for recovery in-between the stations. The 5 minutes was allowed to take rest in-between the circuit.

Week 5 to 6

During the period the subjects performed 8 stations of circuit training in clockwise order. Totally 3 circuits was given. They advised to perform only twenty five seconds of each station. The same time was allowed for recovery in-between the stations. The 5 minutes was allowed to take rest in-between the circuit.

Exercise involved in each Station

1. Vertical jump
2. Push up
3. High knee action
4. Dumbbells Bi-ceps
5. Back kick
6. Upper hand medicine ball
7. Burpee
8. Bent-knee sit-ups

Nature of training variables	
Total number of station	8 stations
Duration of each station	15 seconds
Exercise order	Clock wise
Rest in between station	15 seconds
Total number of circuit	3 circuit
Rest in between circuit	5 minutes
Duration of one circuit	2 minutes
Volume of the week	30 minutes

Training approaches for experimental group 2-(Battle rope training)

Exercises	Weeks	Rep	Duration	Sets	Rec.in.bet.sets
1. Double waves 2. Alternate waves 3. Low alternating waves 4. Power slams **5.** Alternating wave lunge jump	**1 to 2**	Each 2	Each 10 sec	2	5 minutes
	3 to 4	Each 3	Each 20 sec	2	5 minutes
	5 to 6	Each 4	Each 30 sec	2	5 minutes

Week 1 to 2

During the period the subjects performed 5 selected battle rope exercises. Each exercises the subjects performed ten seconds with two repetitions. The total number of set was 2. The recovery for in between exercise 1minute and in between set was 5 minutes.

Week 3 to 4

During the period the subjects performed 5 selected battle rope exercises. Each exercises the subjects performed twenty seconds with 3 repetitions. The total number of set was 2. The recovery for in between exercise 1minute and in between set was 5 minutes.

Week 3 to 4

During the period the subjects performed 5 selected battle rope exercises. Each exercises the subjects performed thirty seconds with 4 repetitions. The total number of set was 2. The recovery for in between exercise 1minute and in between set was 5 minutes.

RESULTS

Table-I

THE RESULTS OF ANALYSIS OF COVARIANCE ON CARDIO RESPIRATORY ENDURANCE OF DIFFERENT GROUPS

(Scores in Meters)

Test Conditions		Ex-1 CT	Ex-2 BRT	Gr-3 CG	SV	SS	Df	MS	'F' ratio
Pre test	Mean	1034.8	1044.7	1032.1	B	880.2	2	440.1	2.5
	S.D.	7.8	20.47	6.8	W	4752.6	27	176.02	
Post test	Mean	1283.1	1171.1	1029.6	B	323737.4	2	161868.7	299.1*
	S.D.	3.7	1.3	6.9	W	14609.8	27	541.1	
Adjusted Post test	Mean	1283.4	1171.3	1029.4	B	320337.8	2	160168.9	285.12*
					W	14605.6	26	561.7	

* Significant at .05 level of confidence. The required table values was 3.35 and 3.37 with the df of 2 and 27, 2 and 26.

RESULTS OF CARDIO RESPIRATORY ENDURANCE

The pre test mean and standard deviation on cardio respiratory endurance scores G1, G2 and G3 were 1034.8±7.8, 1044.7±20.47 and 1032.1±6.8 respectively. The obtained pre test F value of 2.5 was lesser than the required table F value 3.35. Hence the pre test means value of circuit training; battle rope training and control group on cardio respiratory endurance before start of the respective treatments were found to be insignificant at 0.05 level of confidence for the degrees of freedom 2 and 27. Thus this analysis confirmed that the random assignment of subjects into three groups were successful. The post test mean and standard deviation on cardio respiratory endurance of G1, G2 and G3 were 1283.1±3.7, 1171.1±1.3 and 1029.6±6.9 respectively. The obtained post test F value of

299.1 was higher than the required table F value of 3.35. Hence the post test means value of circuit training and battle rope training on cardio respiratory endurance were found to be significant at 0.05 level of confidence for the degrees of freedom 2 and 27. The results proved that the selected two training interventions circuit training and battle rope training was produced significant improvement rather than the control group of the sample populations. The adjusted post test means on cardio respiratory endurance scores of G1, G2 and G3 were 1283.4, 1171.3 and 1029.4 respectively. The obtained adjusted post test F value of 285.12 was higher than the required table F value of 3.37. Hence the adjusted post test means value of circuit training and battle rope training on cardio respiratory endurance were found to be significant at 0.05 level of confidence for the degrees of freedom 2and 26. The results confirm that the selected two training interventions namely circuit training and battle rope training on cardio respiratory endurance were produced significant difference among the groups.

The Scheff's post hoc test was administered to find the superiority effects among the groups. It is shown in table-I (a).

TABLE-I (A)
THE RESULTS OF SCHEFFE'S POST HOC TEST MEAN DIFFERENCES ON CARDIO RESPIRATORY ENDURANCE AMONG THREE GROUPS
(Scores in Meters)

Ex-1 CT	Ex-2 BRT	Gr-3 CG	Mean Differences	Confidence Interval Value
1283.4	1171.3		112.1*	33.62
1283.4		1029.4	253.9*	33.62
	1171.3	1029.4	141.8*	33.62

* Significant at .05 level of confidence.

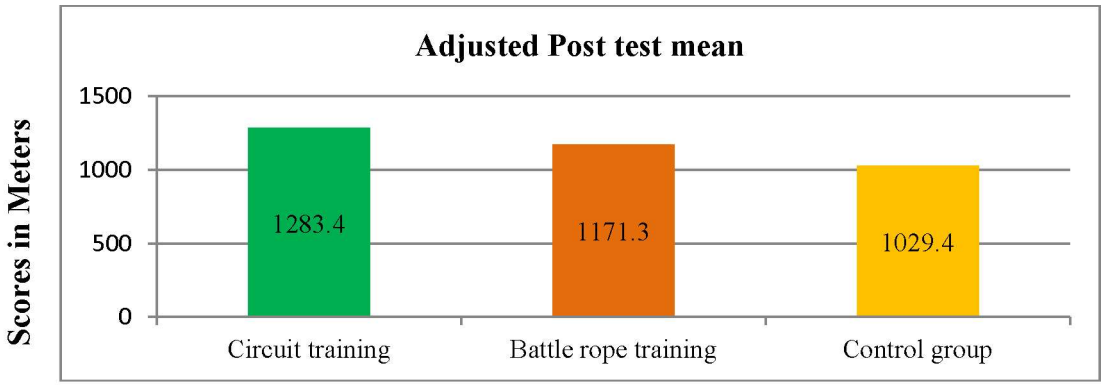
Result of Scheff's Post Hoc test on cardio respiratory endurance

Table I (a) shows the paired mean differences of selected groups on cardio respiratory endurance.

The paired mean differences between circuit training and battle rope training, circuit training and control group, battle rope training and control group were 112.1, 253.9, and 141.8 respectively. These values are higher than the confidential interval value of 33.62. Hence, it is clear that the pair wise comparisons of above groups were produced significantly different effect on cardio respiratory endurance.

The adjusted post test mean deference of experimental and control group value graphically represented in the figure 1.

Figure-1



Discussion on findings

After analyzing the statistical end results the researcher found that the selected training groups have significantly improved cardio respiratory endurance from the base line to post interventions. The pre to post intervention was present as follows. The circuit training (CT) group from pre (1034.8±7.8), to post (1283.1±3.7) and battle rope training after group from pre (1044.7±20.47) to post (1171.1±1.3) has significantly changed. The percentage of improvement for circuit training and battle rope training group were 24.06% and 12.09% respectively. The result of this study proves that the cardio respiratory endurance increased significantly over the six weeks training period for circuit training and battle rope training when comparing to the control group. However, circuit training would produce better improvement than the other training namely battle rope training. Further battle rope training group also produces better improvement on cardio respiratory endurance than the control group. The control group did not show any significant changes on cardio respiratory endurance. Kumar Jagadish, Dr. Maniazhagu (2015) found that the interval training on treading (INT-TR) and interval training on spinning produced significantly different improvements on cardio respiratory endurance of college untrained women. D Maniazhagu, S Malar, M Manogari (2019) found that the circuit training and battle rope training improves the performance of speed. Studies have reported that neuromuscular training is likely to enhance athletic performance (Wojtys EM, Huston LJ, Taylor PD, 1996 and Emery CA, Cassidy JD, Klassen TP, Rosychuk RJ, Rowe BH.2005). Chappell and Limpisvasti (2008) that 6 weeks (NTP) resulted in significant improvement in vertical jump height in female collegiate athletes. S Malar, D Maniazhagu (2019) found that the neuromuscular drills combined with asana practices and asana practices combined with neuromuscular drills produced greater improvement on dependent variable. Sridhar, Maniazhagu, Revathi (2011) found that the maximal exercise improves the hematological variables in middle- and long-distance runner. Maniazhagu, Robert C. Alexander, Sukumar Sha (2011) found that the aerobic training and circuit training produced improvement on muscular strength and muscular endurance. Myer et al. (2005) studied the effect of a neuromuscular training program on measures of athletic performance and lower-extremity movement biomechanics in female athletes, especially female basketball players, and found significant improvement in measures of athletic performance. Recently, recreational soccer has emerged as a feasible and efficacious strategy for increasing health-related fitness in adult populations.(Milanovic Z, Pantelic S, Sporis G, Mohr M, Krustrup P ,2015 and Krustrup P, Nielsen JJ, Krustrup BR, Christensen JF, Pedersen H, Randers MB ,2009)When we exposed untrained adolescents to short-term soccer-based training, there was a marked positive between-group effect on postural balance, but an unclear effect on 10-m sprint, 20-m sprint, CMJ, SLJ, flexibility, and Yo-Yo IRT performance when compared with controls . The between-group effect on balance was highly significant despite poor reliability of the test .For sprint and jump performance, the within-group analyses showed improvements similar or slightly lower than data reported in RCT studies for young adults and untrained adults (Krustrup P, Christensen JF, Randers MB, Pedersen H, Sundstrup E, Jakobsen MD, et al,2010 and Milanovic Z, Pantelic S, Sporis G, Mohr M, Krustrup P ,2015) that included more participants and longer training periods (12-40 weeks) than the present study. Hence, the lack of between-group differences in most of the physical tests may be linked to sample size and to the short training period. The only study in which the effects of recreational soccer in adolescents were investigated showed that obese adolescents improve their health markers (VO2max, body composition, blood pressure) after a 12 week recreational soccer program.12 It has been reported that the positive effects of recreational soccer can be explained by the high exercise intensity achieved during training. S. Leo Stanly, Maniazhagu Dharuman (2020) revealed that the after the 12 weeks training interventions all the experimental groups improved the capacity of cardio respiratory endurance in selected subjects. The best improvement was noticed in combined practice of tai chi, pilates and yoga group. Hemambara Reddy, D Maniazhagu (2015) exposed the low intensity of aquatic plyometric training, low intensity of land plyometric training improved speed in school boys. Umesh Muktamath, D Maniazhagu, Vinuta Muktamatha, Basavaraj Ganiger (2010) found that the plyometric training and circuit training have produced improvement on speed leg explosive power and anaerobic power of male college students. Hammami A, Kasmi S, Chamari K, Farinatti P, Fgiri T, Chamari K, et al.2017) In the present study, the mean HR was 84.6% of HRpeak, a value that is comparable to that obtained in adult participants, where HR generally exceeded 80% of HRmax, (Krustrup P, Nielsen JJ, Krustrup BR, Christensen JF, Pedersen H, Randers MB ,2009). In addition to the high exercise intensity, recreational soccer represents an odd-impact physical activity that involves intense actions and movements in different directions. K Tamilarasi, D Maniazhagu (2014) found that the combination of assisted and resisted sprint training produced greater improvement on anaerobic power. D Maniazhagu (2019) revealed that the low and moderate intensities of aquatic plyometric training combined with yogic practices on anaerobic capacity of junior athletes.

CONCLUSION

After the six weeks of circuit and battle rope training have produced greater effect on cardio respiratory endurance. The superior effect was found in circuit training than the battle rope training. The control group did not show any significant improvement**.**

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