EFFECTS OF CIRCUIT TRAINING ON DIFFERENT SURFACES ON SELECTED PHYSICAL AND PHYSIOLOGICAL VARIABLES OF SCHOOL BOYS

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ABSTRACT: Forty five boys in the age group of 13 to 14 years of Alagappa Model school, Karaikudi were selected at random and were divided randomly into three groups namely mud circuit training group, concrete circuit training group and control group. The experimental groups participated in the training programme for a period of 6 weeks. During this period, the control group was let off without any training. The data were collected on selected physical and physiological variables of speed, agility, leg explosive power, pulse rate, blood pressure, aerobic capacity respectively before training (pre-test) as well as after 6 weeks of training (post-test). Analysis of covariance was used to analyse the data. The result of the study clearly indicated that the mud circuit training group had improved the speed, agility, leg explosive power, pulse rate, blood pressure, aerobic capacity to a greater degree than concrete circuit training group.

Key words: Agility, leg explosive power, pulse rate, blood pressure

INTRODUCTION

Circuit training is an excellent way to simultaneously improve mobility, strength and endurance. The circuit training format utilizes a group of 6 to 10 strength exercises that are performed one exercise after another. Each exercise is done for a specified number of repititions or for a prescribed time period before moving on to the next exercise. The exercises within each circuit is separated by a longer rest period. The total number of circuits performed during a training session may vary from 2 to 6 depending on one‟s training level ie beginner or intermediate or advanced, one‟s period of training ie preparatory period or competition period and one‟s training objective. In each circuit, the same muscle group must not be exercised in consecutive exercises [1-4].

METHODOLOGY

Fourty five boys in the age group of 13 to 14 years of Alagappa Model school, Karaikudi were selected at random and they were divided randomly into three groups of 15 subjects each namely experimental group I - mud circuit training group, experimental group II - concrete circuit training group and group III - control group which was not given any training programme.

The selected physical variables were speed, agility, leg explosive power. The selected physiological variables were pulse rate, blood pressure, aerobic capacity. Speed was measured in seconds by 50 yards dash. Agility was measured in seconds by 10m agility shuttle run. Leg explosive strength was measured in metres by standing broad jump. Pulse rate was measured in counts per minute with the help of pulse monitor. Aerobic capacity was measured in seconds by 600m run test.

Experimental group I underwent circuit training on mud surface whereas experimental group II underwent circuit training on concrete surface. The different stations for both experimental group I and experimental group II were similar and the duration of exercises also was the same, only thing which differentiated both was the different surface. The training was carried out only on week days. Group III was the control group which did not participate in any training except their daily routines. There were six stations in the circuit training programme. In the first station high knee action was performed, push ups in the second station, back kicks in the third station, sit ups in the fourth station, tuck jumps in the fifth station, opposite of sit ups in the sixth station. Pre- test was conducted for all the 3 groups in the selected physical and physiological variables. After 6 weeks of training programme, post-tests were conducted. The training programme was scheduled from 3:30pm to 4:30pm on all week days. ANCOVA statistical technique was employed to find out the adjusted mean difference of the treatment groups. When the study was significant, the scheffe‟s post hoc test was used to find out the paired mean difference.

ANALYSIS OF DATA AND RESULTS OF THE STUDY

The pre-test and post-test scores of each variable were analysed using analysis of covariance at 0.05 level of confidence.

Table – I showing the analysis of covariance on data of pre-test ,post-test scores and adjusted post test of speed

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	8.59	8.61	8.49	B	0.136	2	0.068	0.208
				W	13.803	42	0.328	
Post-test	8.59	7.98	8.20	B	2.905	2	1.452	4.092*
				W	14.909	42	0.354	
Adjusted post-test	8.57	7.93	8.27	B	3.040	2	1.520	15.447*
				W	4.035	41	0.098	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 8.57 for control group, 7.93 for experimental group I and 8.27 for experimental group II. The obtained „F" ratio 15.447 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table – I (a) showing Scheffe"s post hoc test ordered adjusted final mean difference of speed

Control group	Exp. Group - I	Exp. Group - II	MD	CI
8.57	7.93	---	0.637	0.291
8.57	---	8.27	0.301	0.291
----	7.93	8.27	0.336	0.291

Table – I(a) shows that the difference between control group and experimental group I was 0.637, control group and experimental group II was 0.301, experimental group I and experimental group II was 0.336. The CI value 0.291 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface improved the speed of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

Table – II showing the analysis of covariance on data of pre-test ,post-test scores and adjusted post test of agility.

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	16.82	16.75	16.73	B	0.066	2	0.033	0.018
				W	74.936	42	1.784	
Post-test	16.82	15.67	16.34	B	10.048	2	5.024	3.564*
				W	59.201	42	1.409	
Adjusted post-test	16.77	15.68	16.37	B	9.098	2	4.549	29.970*
				W	6.223	41	0.151	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 16.77 for control group, 15.68 for experimental group I and 16.37 for experimental group II. The obtained „F" ratio 29.970 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table – II (a) showing Scheffe"s post hoc test ordered adjusted final mean diference of agility.

Control group	Exp. Group - I	Exp. Group - II	MD	CI
16.779	15.68	---	1.090	0.361
16.77	---	16.37	0.405	0.361
---	15.68	16.37	0.685	0.361

Table – II(a) shows that the difference between control group and experimental group I was 1.090, control group and experimental group II was 0.405, experimental group I and experimental group II was 0.685. The CI value 0.361 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface improved the agility of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

Table – III showing the analysis of covariance on data of pre-test ,post-test scores and adjusted post test of leg explosive power

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	1.44	1.44	1.46	B	0.003	2	0.001	0.057
				W	1.267	42	0.030	
Post-test	1.44	1.61	1.52	B	0.223	2	0.111	3.363*
				W	1.398	42	0.033	
Adjusted post-test	1.44	1.62	1.51	B	0.232	2	0.116	25.615*
				W	0.186	41	0.004	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 1.44 for control group, 1.62 for experimental group I and 1.51 for experimental group II. The obtained „F" ratio 25.615 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table – III (a) showing Scheffe"s post hoc test ordered adjusted final mean diference of leg explosive power

Control group	Exp. Group - I	Exp. Group - II	MD	CI
1.44	1.62	---	0.174	0.062
1.44	---	1.51	0.063	0.062
---	1.62	1.51	0.111	0.062

Table – III(a) shows that the difference between control group and experimental group I was 0.174, control group and experimental group II was 0.063, experimental group I and experimental group II was 0.111. The CI value 0.062 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface improved the explosive power of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

Table – IV showing the analysis of covariance on data of pre-test ,post-test scores and adjusted post test of pulse rate

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	90.33	90.40	90.40	B	0.044	2	0.022	0.001
				W	528.533	42	12.584	
Post-test	90.40	85.60	87.66	B	173.911	2	86.955	5.981*
				W	610.533	42	14.536	
Adjusted post-test	90.44	85.57	87.64	B	179.147	2	89.573	84.245*
				W	43.593	41	1.063	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 90.44 for control group, 85.57 for experimental group I and 87.64 for experimental group II. The obtained „F" ratio 84.245 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table - IV(a) showing Scheffe"s post hoc test ordered adjusted final mean diference of pulse rate

Control group	Exp. Group - I	Exp. Group - II	MD	CI
90.44	85.57	---	4.869	0.956
90.44	---	87.64	2.802	0.956
---	85.57	87.64	2.067	0.956

Table – IV(a) shows that the difference between control group and experimental group I was 4.869, control group and experimental group II was 2.802, experimental group I and experimental group II was 2.067. The CI value 0.956 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface lowered the pulse rate of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

Table V showing the analysis of covariance on data of pre-test ,post-test scores and adjusted post test of systolic blood pressure

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	119.13	119.20	119.20	B	0.044	2	0.022	0.002
				W	418.533	42	9.965	
Post-test	119.26	115.80	117.73	B	90.533	2	45.266	4.166*
				W	456.266	42	10.863	
Adjusted post-test	119.31	115.77	117.71	B	93.955	2	46.977	77.133*
				W	24.970	41	0.609	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 119.31 for control group, 115.77 for experimental group I and 117.71 for experimental group II. The obtained „F" ratio 77.133 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table - V(a) showing Scheffe"s post hoc test ordered adjusted final mean diference of systolic blood pressure

Control group	Exp. Group - I	Exp. Group - II	MD	CI
119.31	115.77	---	3.534	0.724
119.31	---	117.71	1.601	0.724
---	115.77	117.71	1.933	0.724

Table – V(a) shows that the difference between control group and experimental group I was 3.534, control group and experimental group II was 1.601, experimental group I and experimental group II was 1.933. The CI value 0.724 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface lowered the systolic blood pressure of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

Table VI showing the analysis of covariance on data of pre-test ,post-test scores & adjusted post test of diastolic blood pressure

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	74.40	74.40	74.46	B	0.044	2	0.022	0.001
				W	692.933	42	16.498	
Post-test	74.60	70.26	72.53	B	140.933	2	70.466	4.551*
				W	650.266	42	15.482	
Adjusted post-test	74.62	70.28	72.49	B	140.847	2	70.423	65.382*
				W	44.161	41	1.077	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 74.62 for control group, 70.28 for experimental group I and 72.49for experimental group II. The obtained „F" ratio 65.382 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table - VI(a) showing Scheffe"s post hoc test ordered adjusted final mean diference of diastolic blood pressure

Control group	Exp. Group - I	Exp. Group - II	MD	CI
74.62	70.28	---	4.333	0.962
74.62	---	72.49	2.129	0.962
---	70.28	72.49	2.204	0.962

Table – VI(a) shows that the difference between control group and experimental group I was 4.333, control group and experimental group II was 2.129, experimental group I and experimental group II was 2.204. The CI value 0.962 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface lowered the diastolic blood pressure of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

Table – VII showing the analysis of covariance on data of pre-test ,post-test scores and adjusted post test of aerobic capacity

Means	Control group	Exp. Group - I	Exp. Group - II	SV	SS	df	MS	OF
Pre-test	159.72	161.22	153.90	B	448.81	2	224.40	0.472
				W	19966.07	42	475.38	
Post-test	159.77	134.71	146.85	B	4713.56	2	2356.78	5.604*
				W	17662.35	42	420.53	
Adjusted post-test	158.54	132.19	150.61	B	5463.67	2	2731.83	38.119*
				W	2938.28	41	71.66	

*Significant at 0.05 level of confidence.

The adjusted post- test means were 158.54 for control group, 132.19 for experimental group I and 150.61 for experimental group II. The obtained „F" ratio 38.119 was higher than the table „F" ratio 3.22. Hence , the pre-test was significant at 0.05 level of confidence for the degree of freedom 2 and 41.

Table -VII(a) showing Scheffe"s post hoc test ordered adjusted final mean diference of aerobic capacity

Control group	Exp. Group - I	Exp. Group - II	MD	CI
158.54	132.19	---	26.351	7.581
158.54	---	150.61	7.923	7.581
---	132.19	150.61	18.429	7.581

Table – VII(a) shows that the difference between control group and experimental group I was 26.351, control group and experimental group II was 7.923, experimental group I and experimental group II was 18.429. The CI value 7.581 is greater than the table F ratio value. Hence all the three comparisons were significant. The results of the study indicates that circuit training on mud as well as concrete surface improved the aerobic capacity of the subjects. When compared between the two experimental groups, it was found out that circuit training on mud was better than the circuit training on concrete surface.

CONCLUSION

Within the limitations of the present study, the following inferences were drawn.

1. 6 weeks of training of both the mud circuit training group and the concrete circuit training group showed significant increase in speed, agility, leg explosive power, pulse rate, blood pressure and aerobic capacity.
2. Between the experimental groups, the mud circuit training group showed significant superiority in speed, agility, leg explosive power, pulse rate, blood pressure and aerobic capacity over the concrete circuit training group.
3. Whereas, the concrete circuit training group was seen to improve in speed, agility, leg explosive power, pulse rate, blood pressure and aerobic capacity to a greater degree than the control group.

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