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Original Research Paper

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COMPARATIVE EFFECT OF WEIGHT TRAINING AND CIRCUIT TRAINING ON MOTOR FITNESS VARIABLES OF PROFESSIONAL TRAINEES.

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ABSTRACT The purpose of this study was to know the comparative effect of weight training and circuit training on selected motor fitness variables such as Explosive strength, Strength Endurance, Speed Endurance, Speed, Agility and Flexibility. Ninety professional trainees, age ranging between 20 to 23 years acted as subjects and assigned to three groups (two experimental and one control group) with 30 students each. The two experimental groups were weight training and circuit training. Selected motor fitness variables were measured before and after training. All the experimental Groups (weight training and circuit training) were administered with the scheduled programme of concerned training, thrice in a week for duration of 6 weeks under direct supervision of the researcher. The analysis of data revealed that the two experimental groups, showed significant gains in performance of selected motor fitness variables after administration of training for duration of 6 weeks. The control group did not show any significant increase in the performance.

KEYWORDS : Weight Training, Circuit Training, Explosive Strength, Strength Endurance, Speed Endurance, Speed, Agility and Flexibility.

INTRODUCTION:

Sports training aims at the improvement of performance. It is formulated in such a way that the sportsman is able to win or at least successfully participate in a competition. Motor fitness refers to the efficiency of basic movements in additional to the physical fitness. Motor fitness is a term that describes an athlete's ability to perform effectively during sports or other physical activity. An athlete's motor fitness is a combination of five different components, each of which is essential for high levels of performance. Improving fitness involves a training regimen in all five.

The purpose of this study was to determine the effect of a weight training programme and a circuit training programme on motor fitness variables of physical education professional trainees.

METHODOLOGY:

A total of 90 (Ninety) college male students belonging to B.P.Ed and M.P.Ed. classes were taken as subjects for the study. Their age ranged from 21 to 26 years. Groups A, B and C underwent the pre-test on all the parameters, pertinent to the study. Then groups A and B underwent the weight training and circuit training, respectively for a period of 6 weeks, as designed under careful supervision of the investigator. The group C served as control and was not allowed to undergo the exercises. After the end of six weeks training programme, the three groups underwent post test on all the variables on which pre test was made. To obtain the data pertinent to the purpose of study, the following motor fitness variables were selected. 1. Explosive strength (Vertical jump), 2. Strength Endurance (Sit-ups), 3. Speed Endurance (1500m run), 4. Speed (30m. flying start), 5. Agility (Shuttles run 6 X 10 mts), 6. Flexibility (Forward bend and reach Test)

FINDINGS:

The statistical analysis of data on Motor Fitness of the subjects belonging to two experimental groups and one control group, each comprising of thirty subjects, is presented below.

Table – 1(significance Of Difference Between Pre-test And Post-test Means Of The Two Experimental Groups And The Control Group In Vertical Jump)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' ratio
Weight training	56.833±0.969	66.467±0.252	9.634	1.040	9.263*
Circuit Training	56.367±0.882	66.267±0.307	9.900	0.877	11.292*
Control	56.233±1.003	57.800±0.840	1.567	0.436	1.288

* Significant at 0.05 level of confidence, $t'_{0.05}(29) = 2.045$. Table 1 clearly reveals that the plyometric training group and circuit training group improved significantly yielding 't' value 9.263 and 11.292, respectively, where as the control group did not show any significant improvement in vertical jump performance of subjects indicating 't' values of 1.288. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

Table – 2 (analysis Of Variance And Covariance Of The Means Of Two Experimental Groups And The Control Group In Vertical Jump)

	Weight training group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	56.833	56.367	56.233	B 141.956 W 2368.500	2 87	70.978 27.224	2.607
Post-test means	66.467	66.267	57.800	B 1468.356 W 752.133	2 87	734.178 8.645	84.923*
Adjusted post-test means	66.650	66.582	57.301	B 1639.660 W 561.017	2 86	819.830 6.523	125.674*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for vertical jump showed that the resultant 'F' ratio of 2.607 was not significant in case of pre-test means. The post

test means yielded 'F' ratio of 84.923, which was found to be significant. The adjusted final means yielded the 'F' ratio of 125.674 and was found significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

Table –3 (paired Adjusted Final Means And Differences Between Means For The Two Experimental Groups And The Control Group In Vertical Jump)

Weight training group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
66.650	66.582		0.068	1.347
66.650		57.301	9.349	1.347
	66.582	57.301	9.281	1.347

* Significance at $_{0.05}$ level. It is clear from the Table 3 that the mean differences with respect to performance in vertical jump of plyometric training group and circuit training group was found to be significantly greater than that of control group. No significant difference between circuit training group and plyometric training group was found with respect to vertical jump performance.

Table – 4 (significance Of Difference Between Pre-test And Post-test Means Of The Two Experimental Groups And The Control Group In Sit Ups)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
Weight training	25.267±0.386	27.800±0.147	2.533	0.409	6.195*
Circuit Training	25.133±0.431	26.767±0.345	2.667	0.222	7.350*
Control	25.367±0.403	25.167±0.458	0.200	0.111	1.795

* Significant at $_{0.05}$ level of confidence, 't' 0.05 (19) = 2.045. Table 7 clearly shows that both plyometric training group and circuit training group improved significantly yielding 't' value of 6.195 and 7.350, respectively, whereas, control group did not show any significant improvement in sit ups performance of subjects indicating 't' values of 1.795. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

Table – 5 (analysis Of Variance And Covariance Of The Means Of Two Experimental Groups And The Control Group In Sit Ups)

	Weight training group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	25.267	25.133	25.367	B 0. 822 W 432.300	2 87	0.411 4.969	0. 083
Post-test means	27.800	26.767	25.167	B 105.622 W 304.333	2 87	52.811 3.498	15. 097*
Adjusted post-test means	27.793	26.843	25.098	B 112.072 W 137.329	2 86	56.036 1.597	35. 094*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for sit ups showed the resultant 'F' ratio of 0.083, which was not significant in case of pre test means. The post test means and adjusted final means yielded the 'F' ratio of 15.097 and 35.094 and were found significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

Table – 6 (paired Adjusted Final Means And Differences Between Means For The Two Experimental Groups And The Control Group In Sit Ups)

Weight training group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
27.793	26.843		0.950	1.576
27.793		25.098	2.695*	1.576
	26.843	25.098	1.745*	1.576

* Significant at 0.05 level of confidence. It was clear from the Table 9 that, the mean difference with respect to performance in sit ups of plyometric training group and circuit training group was found to be significantly greater than that of control group. No significant difference between plyometric group and circuit training group was found with respect to sit ups performance.

Table – 7 (significance Of Difference Between Pre-test And Post-test Means Of The Two Experimental Groups And The Control Group In 1500m Run)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
Weight training	51.600±0.247	50.100±0.399	1.500	0.409	3.668 *
Circuit Training	51.600±0.261	41.867±0.261	9.733	0.359	27.14 4*
Control	52.000±0.209	51.933±0.230	0.067	0.143	0.465

* Significant at 0.05 level of confidence, 't' 0.05 (29) = 2.045. Table 13 clearly reveals that plyometric training group and circuit training group improved significantly yielding 't' value of 3.668 and 27.144, respectively, whereas, control group did not show any significant improvement in 1500m run performance of subjects indicating 't' values of 0.465. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

Table – 8 (analysis Of Variance And Covariance Of The Means Of Two Experimental Groups And The Control Group In 1500m Run)

	Weight training group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	51.600	51.600	52.000	B 3.200 W 150.400	2 87	1.600 1.729	0. 926
Post-test means	50.100	41.867	51.933	B 1724.867 W 244.033	2 87	862.43 3 2.805	307. 465*
Adjusted post-test means	49.958	41.871	51.872	B 36.869 W 42.913	2 86	18.435 0.449	36. 943*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for 1500m run showed that the resultant 'F' ratio of 0.926 was not significant in case of pre-test means. The post test and adjusted final means yielded the 'F' ratio of 307.465 and 36.943, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

Table – 9 (paired Adjusted Final Means And Differences Between Means For The Two Experimental Groups And The Control Group In 1500m Run)

Weight training group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
49.958	41.871		8.087*	4.339
49.958		51.872	1.914	4.339
	41.871	51.872	10.001*	4.339

* Significant at 0.05 level of confidence. It is evident from the Table 15 that the mean differences with respect to performance in 1500m run of circuit training group was found to be significantly lower than that of both plyometric training group and control group. No significant difference between

plyometric group and control group was found with respect to 1500m run performance.

Table – 10 (significance Of Difference Between Pre-test And Post-test Means Of The Two Experimental Groups And The Control Group In 30m Flying Start)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
Weight training	3.897±o.378	3.131±0.127	0.766	3.512	21.810*
Circuit Training	3.918±0.445	3.919±0.445	0.001	0.033	1.000
Control	3.901±0.337	3.910±0.373	0.009	0.679	1.276

* Significant at 0.05 level of confidence, $t'_{0.05}$ (29) = 2.045. Table 16 clearly reveals that plyometric training group improved significantly yielding 't' value 21.810, whereas, circuit training group and control group did not show any significant improvement in 30m flying start performance of subjects indicating 't' values of 1.0 and 1.276, respectively. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

Table – 11 (analysis Of Variance And Covariance Of The Means Of Two Experimental Groups And The Control Group In 30m Flying Start)

	Weight training group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	3.897	3.918	3.901	B 0.771 W 396.478	2 87	0.386 4.548	0.085
Post-test means	3.131	3.919	3.910	B 1226.821 W 307.701	2 87	613.410 3.536	173.437*
Adjusted post-test means	3.138	3.909	3.913	B 1196.258 W 86.231	2 86	598.129 1.003	596.527*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for 30m flying start showed that the resultant 'F' ratio of 0.085 in case of pre-test means, which was not significant. The post test means were found to be significantly different with regard to 30m flying start having estimate of 'F' ratio as 173.437. The adjusted final means also yielded the 'F' ratio of 596.527 and was found to be significantly different from each other. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

Table – 12 (paired Adjusted Final Means And Differences Between Means For The Two Experimental Groups And The Control Group In 30m Flying Start)

Weight training group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
3.138	3.909		0.771*	0.471
3.138		3.913	0.775*	0.471
	3.909	3.913	0.004	0.471

* Significant at 0.05 level of confidence. It is clear from the Table 18 that the mean difference with respect to performance in 30m flying start of plyometric group was found to be significantly better than that of both circuit training group and control group. No significant difference between circuit training group and control group was found with respect to 30m flying start performance.

Table – 13 (significance Of Difference Between Pre-test And Post-test Means Of The Two Experimental Groups And The Control Group In Shuttle Run)

Groups	Pre-test mean ±SE	Post-test mean ±SE	Difference between means	SE	't' Ratio
Weight training group	17.300±0.153	15.767±0.133	1.533	0.208	7.389*
Circuit Training	17.267±0.143	16.867±0.124	0.400	0.149	2.693*
Control	17.267±0.172	17.267±0.166	0.000	0.107	0.008

* Significant at 0.05 level of confidence, 't' 0.05 (29) = 2.045. Table 19 clearly reveals that plyometric training group and circuit training group improved significantly yielding 't' value of 7.389 and 2.693, respectively, whereas, control group did not show any significant improvement in shuttle run performance of subjects indicating 't' values of 0.008. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

Table – 14 (analysis Of Variance And Covariance Of The Means Of Two Experimental Groups And The Control Group In Shuttle Run)

	Weight training group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	17.300	17.267	17.267	B 0.022 W 64.033	2 87	0.011 0.736	0.015
Post-test means	15.767	16.867	17.267	B 36.200 W 52.700	2 87	18.100 0.606	29.880*
Adjusted post-test means	15.758	16.871	17.271	B 36.869 W 42.913	2 86	18.435 0.499	36.943*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for shuttle run showed that the resultant 'F' ratio of 0.015 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 29.880 and 36.943, respectively and differences among means were found significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

Table – 15 (Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Shuttle Run)

Weight training group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
15.758	16.871		1.113*	0.599
15.758		17.271	1.513*	0.599
	16.871	17.271	0.400	0.599

* Significant at 0.05 level of confidence. It is clear from the Table 21 that the mean differences with respect to performance in shuttle run of plyometric training group was found to be significantly better than that of both circuit training and control group. No significant difference between control group and circuit training group was found with respect to shuttle run performance.

Table – 16 (significance Of Difference Between Pre-test And Post-test Means Of The Two Experimental Groups And The Control Group In Forward Bend And Reach Test)

Groups	Pre-test mean ±SE	Post-test mean ±SE	Difference between mean	SE	't' Ratio
Weight training group	21.733±0.230	24.100±0.130	2.367	0.212	11.183*
Circuit Training	21.700±0.240	20.567±0.114	1.133	0.202	5.613*
Control	21.700±0.120	21.600±0.243	0.100	0.130	0.769

* Significant at 0.05 level of confidence, 't' 0.05 (29) = 2.045. Table 22 clearly reveals that both the plyometric training

group and circuit training group improved significantly yielding 't' value of 11.183 and 5.613, respectively, whereas, control group did not show any significant improvement in forward bend and reach performance of subjects indicating 't' values of 0.769. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

Table – 17 (analysis Of Variance And Covariance Of The Means Of Two Experimental Groups And The Control Group In Forward Bend And Reach Test)

	Weight training group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	21.733	21.700	21.700	B 0.022 W 130.467	2 87	0.011 1.500	0. 007
Post-test means	24.100	20.567	21.600	B 198.022 W 77.267	2 87	99.011 0.888	111. 484*
Adjusted post-test means	24.090	20.572	21.605	B 196.168 W 50.313	2 86	98.084 0.585	167. 653*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for forward bend and reach test showed that the resultant 'F' ratio of 0.007 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 111.484 and 167.653 and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

Table – 18 (paired Adjusted Final Means And Differences Between Means For The Two Experimental Groups And The Control Group In Forward Bend And Reach Test)

Weight training group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
24.090	20.572		3.518*	1.515
24.090		21.605	2.418*	1.515
	20.572	21.605	1.033	1.515

* Significant at 0.05 level of confidence. It is clearly evident from the Table 24 that the mean differences with respect to performance in forward bend and reach of plyometric group was found to be significantly greater than that of both circuit training group and control group. No significant difference between circuit training group and control group was found with respect to forward bend and reach test performance.

CONCLUSION:

The analysis of data revealed that the two experimental groups, administered with weight training exercises and circuit training showed significant gains in performance of motor fitness components after administration of training for a duration of 6 weeks. The control group did not show any significant increase in the performance of any component under study. The weight training showed significant gain in performance of subjects in, 30 mt flying start, shuttle run, forward bend and reach test. Circuit training schedule could enhance the performance in medicine ball throw and 1500 mt run where as both plyometric training and circuit training showed significant increase in performance in sit-up, push-up and vertical jump ability. The results of the study coincided with the general conception that plyometric exercise improves speed and agility and circuit training helps to improve strength and endurance of the players in a progressive manner. It seemed that circuit training affected the motor fitness parameters and probably between levels of participation of subjects.

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