



COMPARATIVE EFFECT OF TRAINING LOADS DOMINATED BY STRENGTH AND ENDURANCE ON SELECTED PHYSIOLOGICAL VARIABLES OF BASKETBALL PLAYERS

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ABSTRACT

The purpose of the study was to compare the effects of training loads dominated by Strength and Endurance on selected physiological variables of Basketball players. One hundred and twenty male basketball players who had participated in inter college tournaments under North Bengal University were acted as subjects and equally divided into three groups (two experimental and one control). The two experimental groups, administered with endurance dominated training and strength dominated training showed significant gains in performance of almost all physiological components after administration of training for 10 weeks duration.

KEYWORDS : Training loads, Strength, Endurance, Physiological Variables, Basketball Players

Introduction:

Competitive Basketball demands high level of physical and Physiological capabilities. Only those trained with proper requisites in terms of loading of rudiments for the Execution of skills, will withstand the wear and tear of competition and put in, their best accordingly. Keeping the above facts in view, the present study was under taken to find out the effect of training loads dominated by strength and endurance on selected physiological variables of basketball players.

The purpose of the study was to compare the effects of training loads dominated by Strength and Endurance on selected physiological variables of Basketball players.

Methodology:

The subjects were one hundred and twenty male basketball players who had participated in inter college tournaments under North Bengal University. The age of the subjects ranged from 19 to 24 years. They were from Ananda Chandra College, Jalpaiguri region. The subjects were equally assigned to three groups (two experimental and one control) using random sampling procedure. The two experimental groups participated in the training programme for a period of ten weeks. The first group (Group A / Endurance dominated training group) performed endurance dominated exercises, the second group (Group B / Strength dominated training group) performed strength dominated exercises and the third group (Group C / Control group) was not allowed to do any additional exercise.

The subjects belonging to the two experimental Groups underwent training for five days in a week that is from Monday to Friday for a period of ten weeks. No specific training was imparted to group C. All the three groups practiced Basketball skills during the experimental period as a part of their basketball training programme. The two Experimental groups ED and SD were trained with endurance loads and strength loads, respectively thrice a week that is on Mondays, Wednesdays and Fridays and for the remaining two days, viz. Tuesday and Thursdays were devoted for development of other motor Components.

Tests in selected physiological variables were administered to the subjects of all the groups before (pre test) and after (post test) the experimental periods of ten weeks.

Physiological Variables: Hyman's Cardio-Pulmonary Index, Body Composition (Percentage of Body Fat, Lean Body Weight, Body Density). The Hyman's Cardio-pulmonary Index was calculated using Vital Capacity in 100 ml. units, Maximum Breath Holding in seconds, maximum Expiratory Pressure in Hg. Mm., Age in full calendar Years,

Resting Pulse Rate per minute, Systolic and Diastolic Blood Pressure in Hg. Mm. The body composition variables were calculated by using different formulas with the help of Skin fold measurements taken at different sites in the body.

To find out the differential effects of the treatments using the analysis of variance and co-variance, the level of significance was set at 0.05 level of confidence which was considered adequate and appropriate for purpose of the study.

Findings: For each of the chosen variables, the results pertaining to significant difference, if any, between the pre test and post test means for the three groups after ten weeks of training, which were submitted to analysis of covariance, are given in Table 1 to Table 12.

Table – 1: Significance of Difference between Pre-Test and Post-Test Means of the two Experimental Groups and the Control Group in Hyman's Cardio Pulmonary Index

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
ED	0.883±0.028	1.049±0.018	0.166	0.031	5.271*
SD	1.000±0.018	1.065±0.025	0.065	0.011	6.168*
Control	0.954±0.036	1.028±0.032	0.074	0.037	2.011

* Significant at 0.05 level of confidence, 't' 0.05 (39) = 2.023

Table 1 very clearly reveals that, both the experimental groups improved significantly yielding 't' value of 5.271 and 6.168, whereas, control group did not show any significant improvement in Hyman's pulmonary index performance of subjects indicating 't' values of 2.011. The needed 't' value for significance at 0.05 level of confidence with 39 degrees of freedom was 2.023. With respect to Hyman's pulmonary index, it was found that the differences between the means existed and the experimental groups improved and no significant changes were observed in the control group. As the experimental groups showed a significant increase, the data were analysed by applying variance and covariance to find out if there was significant differences among the groups.

Table – 2: Analysis of Variance and Covariance of the Means of two Experimental Groups and the Control Group in Hyman's Cardio Pulmonary Index

	ED group	SD group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	0.883	1.000	0.954	B 0.277	2	0.139	4.279
				W 3.792	117	0.032	*

Post-test means	1.049	1.065	1.028	B 0.027 W 3.054	2 117	0.014 0.026	0.519
Adjusted post-test means	1.073	1.044	1.025	B 0.460 W 2.463	2 116	0.230 0.021	10.95 2*

* Significant at 0.05 level of confidence, N = 120, B = Between group variance, W = Within group variance

The analysis of covariance for Hyman's pulmonary index showed that the resultant 'F' ratio of 0.519 was not significant in case of post test means. The pre test and adjusted final means yielded the 'F' ratio of 4.279 and 10.952, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df2, 117) was 3.09. As differences between adjusted final means for the groups were found significant, the critical differences for adjusted means was applied to find out which of the differences were most significant.

Table – 3: Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Hyman's Cardio Pulmonary Index

ED group	SD group	Control group	Difference between means	Critical differences for adjusted mean
1.073	1.044		0.029*	0.018
1.073		1.025	0.048*	0.018
	1.044	1.025	0.019*	0.018

* Significant at 0.05 level of confidence

It is clearly evident from Table 3 that the performance in Hyman's pulmonary index of both ED and SD groups were found to be significantly greater than that of control group. Significant difference between ED and SD group was also found with respect to Hyman's pulmonary index performance making ED group the best among three groups.

Table – 4: Significance of Difference between Pre-Test and Post-Test Means of the Two Experimental Groups and The Control Group in Percentage of Fat

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
ED	15.905±0.779	12.150±0.689	3.755	1.073	3.499*
SD	15.648±0.464	14.150±0.403	1.498	0.144	10.389*
Control	15.583±0.352	15.463±0.340	0.120	0.086	1.011

* Significant at 0.05 level of confidence, 't' 0.05 (39) = 2.023

Table 4 very clearly reveals that, both the experimental groups improved significantly yielding 't' value of 3.499 and 10.389, whereas, control group did not show any significant improvement in percentage of fat of subjects indicating 't' values of 1.011. The needed 't' value for significance at 0.05 level of confidence with 39 degrees of freedom was 2.023. With respect to percentage of fat, it was found that the differences between the means existed and the experimental groups improved and no significant changes were observed in the control group. As the experimental groups showed a significant increase, the data were analysed by applying variance and covariance to find out if there was significant differences among the groups.

Table – 5: Analysis of Variance and Covariance of the Means of two Experimental Groups and the Control Group in Percentage of Fat

	ED group	SD group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	15.905	15.648	15.583	B 2.327 W1475.577	2 117	1.164 12.612	0.092
Post-test means	12.150	14.150	15.463	B 125.937 W1174.574	2 117	62.969 10.039	6.272*
Adjusted post-test means	12.400	14.267	14.796	B 134.763 W1074.867	2 116	67.382 9.266	7.272*

* Significant at 0.05 level of confidence, N = 120. B = Between group variance, W = Within group variance

The analysis of covariance for percentage of fat showed that the resultant 'F' ratio of 0.092 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 6.272 and 7.272, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df2, 117) was 3.09. As differences between adjusted final means for the groups were found significant, the critical differences for adjusted means was applied to find out which of the differences were most significant.

Table – 6: Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and the Control Group in Percentage of Fat

ED group	SD group	Control group	Difference between means	Critical differences for adjusted mean
12.400	14.267		1.867*	0.481
12.400		14.796	2.396*	0.481
	14.267	14.796	0.529*	0.481

* Significant at 0.05 level of confidence

It is clearly evident from Table 6 that the performance in percentage of fat of both ED and SD groups were found to be significantly greater than that of control group. Significant difference between ED and SD group was also found with respect to percentage of fat making ED group most efficient group in reduction of fat.

Table – 7: Significance of Difference Between Pre-Test and Post-Test Means of the two Experimental Groups and the Control Group in Lean Body Weight

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
ED	41.929±1.296	41.262±1.189	0.667	1.612	0.414
SD	39.935±1.206	42.835±1.589	2.900	1.305	2.222*
Control	40.187±0.632	40.931±0.739	0.743	0.541	1.374

* Significant at 0.05 level of confidence, 't' 0.05 (39) = 2.023

Table 7 very clearly reveals that, SD group improved significantly yielding 't' value of 2.222, whereas, ED and control group did not show any significant improvement in lean body weight of subjects indicating 't' values of 0.414 and 1.374, respectively. The needed 't' value for significance at 0.05 level of confidence with 39 degrees of freedom was 2.023. With respect to lean body weight, it was found that the differences between the means existed and the experimental group improved and no significant changes were observed in the control group. As the experimental group showed a significant increase, the data were analysed by applying variance and covariance to find out if there was significant differences among the groups.

Table – 8: Analysis of Variance and Covariance of the Means of two Experimental Groups and the Control Group in Lean Body Weight

	ED group	SD group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	41.929	39.935	40.187	B 94.296 W5513.915	2 117	47.148 47.127	1.001
Post-test means	41.262	42.835	40.931	B 382.864 W6996.567	2 117	191.432 59.800	3.201*
Adjusted post-test means	40.659	43.198	41.171	B 342.955 W5702.030	2 116	171.477 49.155	3.488*

* Significant at 0.05 level of confidence, N = 120, B = Between group variance, W = Within group variance

The analysis of covariance for lean body weight showed that the resultant 'F' ratio of 1.001 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 3.201 and 3.488, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df2, 117) was 3.09. As differences between adjusted final means for the groups were found significant, the critical differences for adjusted means was applied to find out which of the differences were most significant.

Table – 9: Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Lean Body Weight

ED group	SD group	Control group	Difference between means	Critical differences for adjusted mean
40.659	43.198		2.539*	1.115
40.659		41.171	1.488*	1.115
	43.198	41.171	2.027*	1.115

* Significant at 0.05 level of confidence

It is clearly evident from Table 9 that the performance in lean body weight of SD group was found to be significantly greater than that of both ED and control group. No significant difference between ED and control group was found with respect to lean body weight performance.

Table – 10: Significance of Difference Between Pre-Test and Post-Test Means of the two Experimental Groups and the Control Group in Body Density

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
ED	1.088±0.001	1.081±0.003	0.007	0.003	2.313*
SD	1.083±0.002	1.086±0.001	0.003	0.002	1.672
Control	1.060±0.025	1.086±0.001	0.026	0.025	1.028

* Significant at 0.05 level of confidence, 't' 0.05 (39) = 2.023

Table 10 very clearly reveals that, ED group improved significantly yielding 't' value of 2.313, whereas, SD and control group did not show any significant improvement in body density of subjects indicating 't' values of 1.672 and 1.028, respectively. The needed 't' value for significance at 0.05 level of confidence with 39 degrees of freedom was 2.023. With respect to static balance, it was found that the differences between the means existed and the experimental group improved and no significant changes were observed in the control group. As the experimental group showed a significant increase, the data were analysed by applying variance and covariance to find out if there was significant differences among the groups.

Table – 11: Analysis of Variance and Covariance of the Means of two Experimental Groups and the Control Group in Body Density

	ED group	SD group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	1.088	1.083	1.060	B 0.018 W 0.991	2 117	0.009 0.008	1.034
Post-test means	1.081	1.086	1.086	B 0.002 W 0.114	2 117	0.001 0.001	10.000*
Adjusted post-test means	1.081	1.086	1.086	B 0.002 W 0.014	2 116	0.001 0.00012	8.333*

* Significant at 0.05 level of confidence, N = 120, B = Between group variance, W = Within group variance

The analysis of covariance for body density showed that the resultant 'F' ratio of 1.034 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 10.000 and 8.333, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 117) was 3.09. As differences between adjusted final means for the groups were found significant, the critical differences for adjusted means was applied to find out which of the differences were most significant.

Table – 12: Paired Adjusted Final Means and Differences between Means for the two Experimental Groups and the Control Group in Body Density

ED group	SD group	Control group	Difference between means	Critical differences for adjusted mean
1.081	1.086		0.005*	0.002
1.081		1.086	0.005*	0.002
	1.086	1.086	0.000	0.002

* Significant at 0.05 level of confidence

It is clearly observed from Table 12 that the performance in body density of ED group was found to be significantly lower than that of

both SD and control group. No significant difference between SD and control group was found with respect to body density.

Discussion on Findings: The analysis of data revealed that the two experimental groups, administered with endurance dominated training and strength dominated training showed significant gains in performance of almost all physiological components after administration of training for a duration of 10 weeks. The control group did not show any significant increase in the performance of any variable under study. The endurance dominated (ED) training showed significant gain in performance of subjects in, Cardio-respiratory Endurance and Body Density, whereas both ED and SD training showed significant increase in performance in Hyman's Cardio-pulmonary Index and Percentage of Fat of the subjects.

It was also observed from the results of the study that both the experimental groups had significant gain in Hyman's cardio-pulmonary index and percentage of fat. The reason for these findings may be attributed to the fact that both the groups were trained with combined loads of anaerobic and aerobic form (more of aerobic from ED group and more anaerobic for SD group), which might have caused these improvement.

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