

Chapter IV

ANALYSIS OF THE DATA AND RESULTS OF THE STUDY

The purpose of the study was to find out the effect of varied yogic practices on selected skills and performance related variables namely short service, forehand clear, back hand clear, explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity, VO₂ max of badminton players. To achieve this purpose of the study, thirty junior badminton players in Hongkong, China were randomly selected as subjects were randomly selected as subjects. The age of the subjects were ranged between 14 to 17 years. The selected subjects were divided in to three equal groups of ten subjects each. Group I underwent pranayama practices, Group II underwent asana with pranayama practices and Group III acted as control who did not undergo any special training programme. The subjects were free to withdraw their consent incase they felt any discomfort during the period of the training programme. But, there were no such drop out in the study. The following skills related variables namely short service, forehand clear, back hand clear and the following performance related variables namely explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity and VO₂ max were selected as dependent variables. The varied yogic practices namely pranayama and asanas with pranayama were selected as independent variables. All the subjects of three groups were tested on selected dependent variables at prior to and immediately after the training programme. The analysis of covariance (ANCOVA)

was used to analyze the significant difference, if any among the groups. Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe'S test to find out the paired mean differences, if any. The .05 level of confidence was fixed as the level of significance to test the 'F' ratio obtained by the analysis of covariance, which was considered as an appropriate.

4.1 ANALYSIS OF THE DATA

The influence of varied yogic practices on each criterion variables were analysed separately and presented below.

4.1.1. Short Service

The analysis of covariance on short service of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table III.

TABLE III
ANALYSIS OF COVARIANCE OF THE DATA ON SHORT SERVICE OF
PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES,
ASANAS WITH PRANAYAMA PRACTICES AND CONTROL
GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	92.70	92.50	92.60	Between	0.20	2	0.10	0.04
S.D.	1.55	1.43	1.50	Within	67.00	27	2.48	
Post Test								
Mean	93.80	94.70	92.70	Between	20.07	2	10.03	4.53*
S.D.	1.17	1.49	1.55	Within	59.80	27	2.21	
Adjusted Post Test								
Mean	93.71	94.79	92.70	Between	21.81	2	10.91	42.93*
				Within	6.60	26	0.25	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table III shows that the pre-test mean values on short service of pranayama practices group, asanas with pranayama practices group and control group are 92.70, 92.50 and 92.60 respectively. The obtained "F" ratio of 0.04 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on short service. The post-test mean values on short service of pranayama practices group, asanas with pranayama practices group and control group are 93.80, 94.70 and 92.70 respectively. The obtained "F" ratio of 4.53 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on short service.

The adjusted post-test mean values on short service of pranayama practices group, asanas with pranayama practices group and control group are 93.71, 94.79 and 92.70 respectively. The obtained "F" ratio of 42.93 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on short service.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on short service.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table III-A.

TABLE III-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON SHORT SERVICE

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
93.71	94.79		1.08*	0.13
93.71		92.70	1.01*	0.13
	94.79	92.70	2.09*	0.13

* Significant at .05 level of confidence.

The table III-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on short service 1.08, 1.01 and 2.09 which were greater than the confidence interval value 0.13 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on short service.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on short service were graphically represented in figure I.

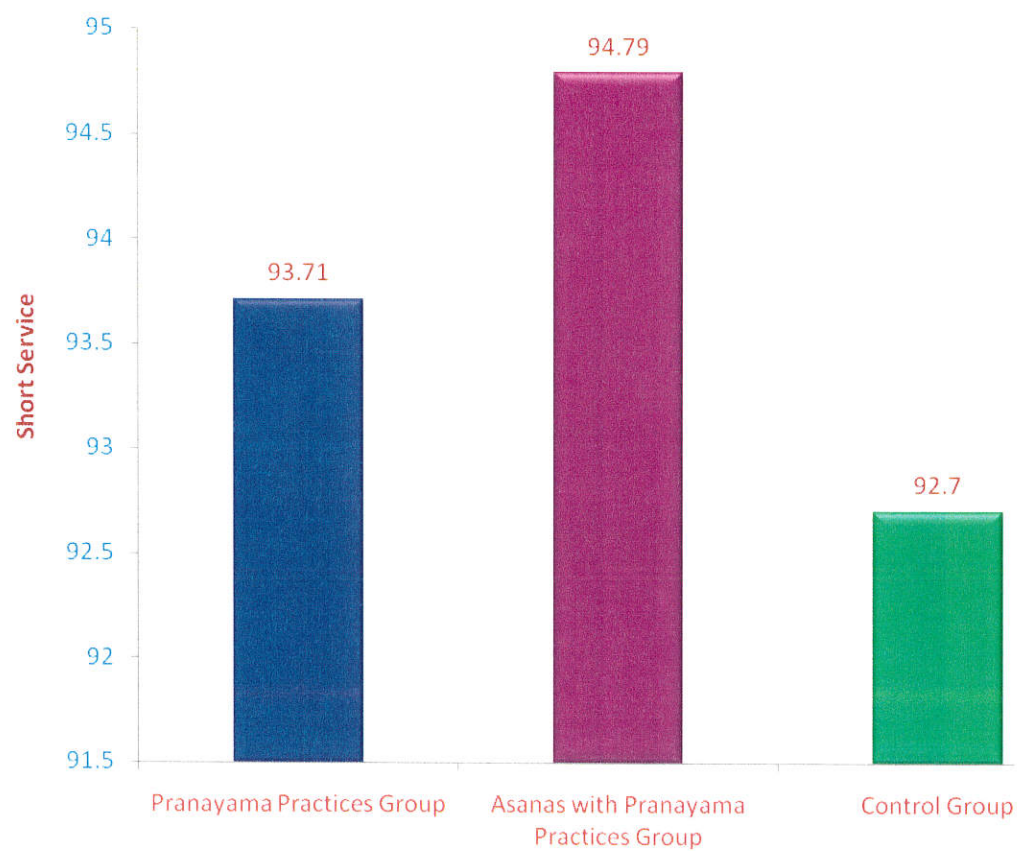


FIGURE I: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON SHORT SERVICE

4.1.2. Forehand Clear

The analysis of covariance on forehand clear of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table IV.

TABLE IV
ANALYSIS OF COVARIANCE OF THE DATA ON FOREHAND CLEAR OF PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES, ASANAS WITH PRANAYAMA PRACTICES AND CONTROL GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	31.40	31.60	31.30	Between	0.47	2	0.23	0.30
S.D.	0.80	0.80	0.90	Within	20.90	27	0.77	
Post Test								
Mean	32.70	35.90	31.50	Between	103.47	2	51.73	54.78*
S.D.	0.78	1.14	0.81	Within	25.50	27	0.94	
Adjusted Post Test								
Mean	32.71	35.84	31.55	Between	96.53	2	48.27	54.68*
				Within	22.95	26	0.88	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table IV shows that the pre-test mean values on forehand clear of pranayama practices group, asanas with pranayama practices group and control group are 31.40, 31.60 and 31.30 respectively. The obtained "F" ratio of 0.30 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on forehand clear. The post-test mean

values on forehead clear of pranayama practices group, asanas with pranayama practices group and control group are 32.70, 35.90 and 31.50 respectively. The obtained "F" ratio of 54.78 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on forehead clear.

The adjusted post-test mean values on forehead clear of pranayama practices group, asanas with pranayama practices group and control group are 32.71, 35.84 and 31.55 respectively. The obtained "F" ratio of 54.68 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on forehead clear.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on forehead clear.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table IV-A.

TABLE IV-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON FOREHAND CLEAR

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
32.71	35.84		3.13*	0.24
32.71		31.55	1.17*	0.24
	35.84	31.55	4.30*	0.24

* Significant at .05 level of confidence.

The table IV-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on forehand clear 3.13, 1.17 and 4.30 which were greater than the confidence interval value 0.24 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on forehand clear.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on forehead clear were graphically represented in figure II.

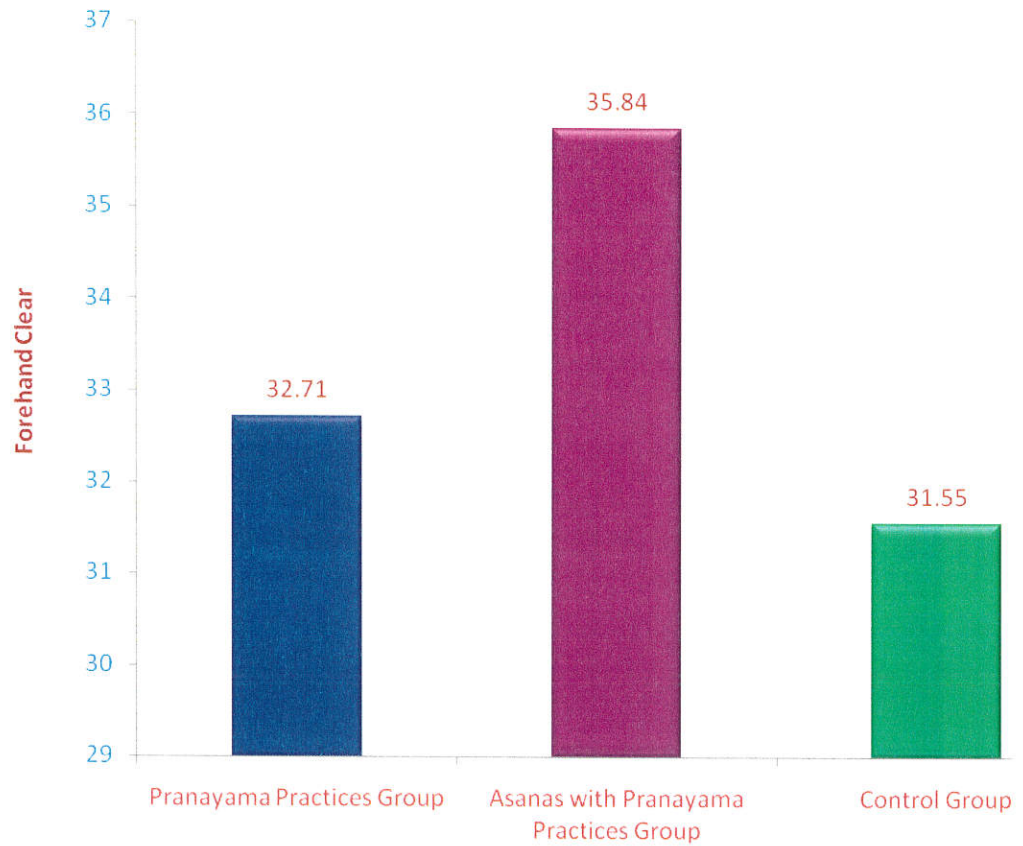


FIGURE II: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON FOREHAND CLEAR

4.1.1. Backhand Clear

The analysis of covariance on backhand clear of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table V.

TABLE V
ANALYSIS OF COVARIANCE OF THE DATA ON BACK HAND CLEAR OF PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES, ASANAS WITH PRANAYAMA PRACTICES AND CONTROL GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	28.50	28.40	28.60	Between	0.20	2	0.10	0.06
S.D.	1.20	1.28	1.11	Within	43.30	27	1.60	
Post Test								
Mean	30.20	31.10	28.80	Between	26.87	2	13.43	9.04*
S.D.	1.08	1.30	1.08	Within	40.10	27	1.49	
Adjusted Post Test								
Mean	30.20	31.18	28.72	Between	30.55	2	15.28	32.74*
				Within	12.13	26	0.47	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table V shows that the pre-test mean values on backhand clear of pranayama practices group, asanas with pranayama practices group and control group are 28.50, 28.40 and 28.60 respectively. The obtained "F" ratio of 0.06 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on backhand clear. The post-test mean

values on backhand clear of pranayama practices group, asanas with pranayama practices group and control group are 30.20, 31.10 and 28.80 respectively. The obtained "F" ratio of 9.04 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on backhand clear.

The adjusted post-test mean values on backhand clear of pranayama practices group, asanas with pranayama practices group and control group are 30.20, 31.18 and 28.72 respectively. The obtained "F" ratio of 32.74 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on backhand clear.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on backhand clear.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table V-A.

TABLE V-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON BACKHAND CLEAR

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
30.20	31.18	-	0.98*	0.18
30.20	-	28.72	1.48*	0.18
-	31.18	28.72	2.46*	0.18

* Significant at .05 level of confidence.

The table V-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on backhand clear 0.98, 1.48 and 2.46 which were greater than the confidence interval value 0.18 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on backhand clear.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on backhand clear were graphically represented in figure III.

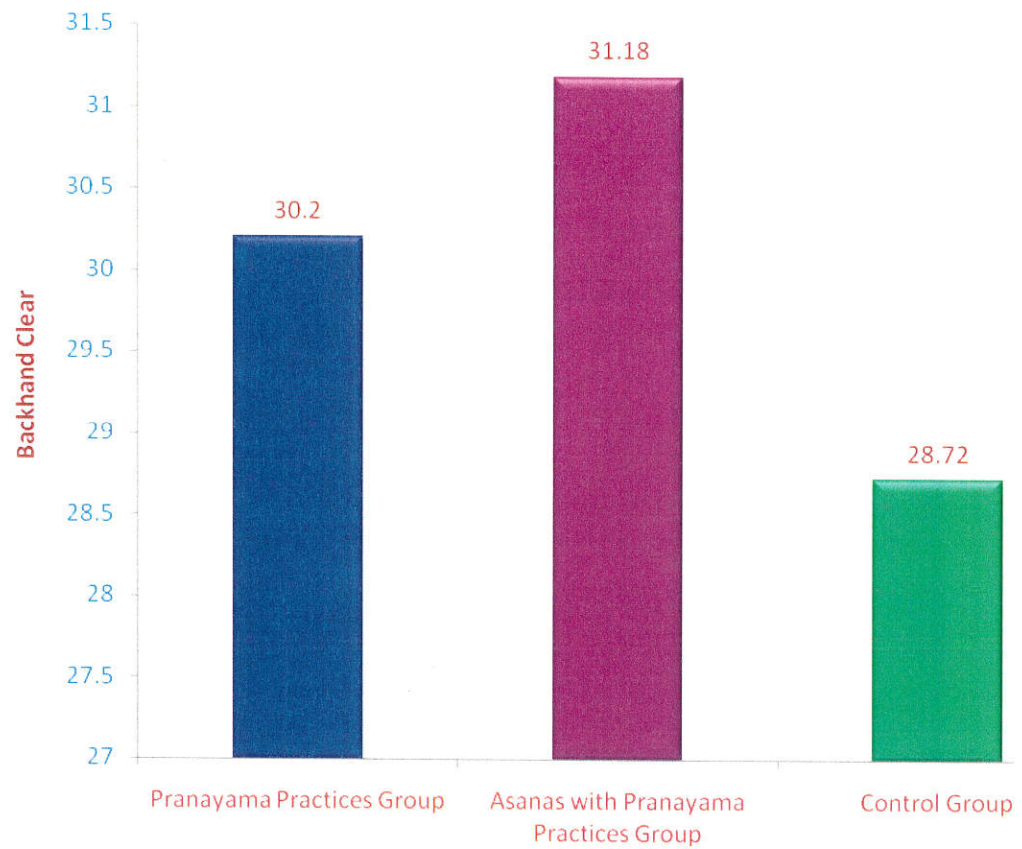


FIGURE III: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON BACK HAND CLEAR

4.1.4. Explosive Power

The analysis of covariance on explosive power of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table VI.

TABLE VI
ANALYSIS OF COVARIANCE OF THE DATA ON EXPLOSIVE POWER OF PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES, ASANAS WITH PRANAYAMA PRACTICES AND CONTROL GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	31.10	28.50	25.70	Between	145.87	2	72.93	2.57
S.D.	3.91	2.33	7.47	Within	765.50	27	28.35	
Post Test								
Mean	37.00	34.50	27.00	Between	541.67	2	270.83	9.57*
S.D.	4.56	2.50	7.03	Within	764.50	27	28.31	
Adjusted Post Test								
Mean	34.47	34.44	29.60	Between	137.63	2	68.81	24.47*
				Within	73.11	26	2.81	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table VI shows that the pre-test mean values on explosive power of pranayama practices group, asanas with pranayama practices group and control group are 31.10, 28.50 and 25.70 respectively. The obtained "F" ratio of 2.57 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on explosive power. The post-test mean

values on explosive power of pranayama practices group, asanas with pranayama practices group and control group are 37.00, 34.50 and 27.00 respectively. The obtained "F" ratio of 9.57 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on explosive power.

The adjusted post-test mean values on explosive power of pranayama practices group, asanas with pranayama practices group and control group are 34.47, 34.44 and 29.60 respectively. The obtained "F" ratio of 24.47 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on explosive power.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on explosive power.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table VI-A.

TABLE VI-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON EXPLOSIVE POWER

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
34.47	34.44	-	0.03	0.44
34.47	-	29.60	4.87*	0.44
-	34.44	29.60	4.84*	0.44

* Significant at .05 level of confidence.

The table VI-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group on explosive power 0.03 which was lesser than the confidence interval value 0.44 required for significance at .05 level of confidence. And also the table shows that the mean difference values between pranayama practices group and control group and asanas with pranayama practices group and control group on explosive power 4.87 and 4.84 which were greater than the confidence interval value 0.44 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and control group and asanas with pranayama practices group and control group on explosive power. And there

was no significant difference exist between pranayama practices group and asanas with pranayama practices group on explosive power.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on explosive power were graphically represented in figure IV.

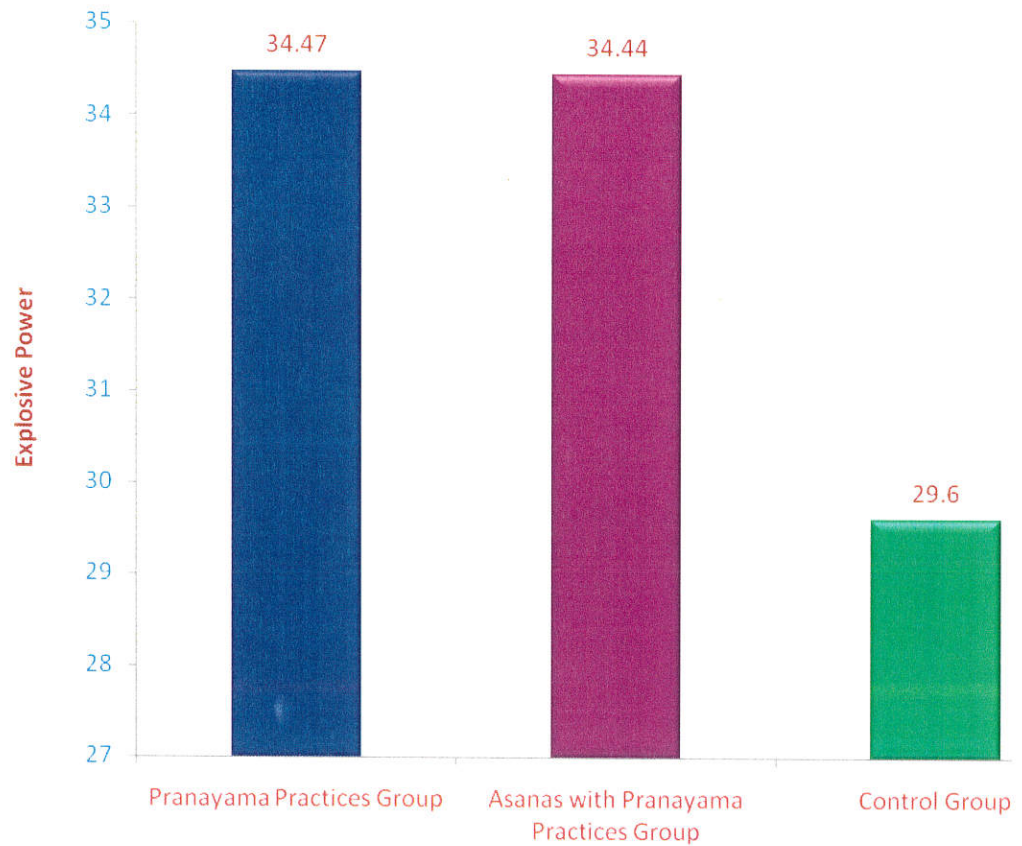


FIGURE IV: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON EXPLOSIVE POWER

4.1.5. Grip Strength

The analysis of covariance on grip strength of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table VII.

TABLE VII
ANALYSIS OF COVARIANCE OF THE DATA ON GRIP STRENGTH OF
PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES,
ASANAS WITH PRANAYAMA PRACTICES AND CONTROL
GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	27.40	31.60	27.90	Between	105.27	2	52.63	3.03
S.D.	3.10	3.87	4.73	Within	469.70	27	17.40	
Post Test								
Mean	32.35	36.40	28.00	Between	352.95	2	176.48	7.64*
S.D.	4.18	4.69	4.78	Within	623.92	27	23.11	
Adjusted Post Test								
Mean	34.07	33.51	29.17	Between	141.46	2	70.73	30.69*
				Within	59.91	26	2.30	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table VII shows that the pre-test mean values on grip strength of pranayama practices group, asanas with pranayama practices group and control group are 27.40, 31.60 and 27.90 respectively. The obtained "F" ratio of 3.03 for

pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on grip strength. The post-test mean values on grip strength of pranayama practices group, asanas with pranayama practices group and control group are 32.35, 36.40 and 28.00 respectively. The obtained "F" ratio of 7.64 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on grip strength.

The adjusted post-test mean values on grip strength of pranayama practices group, asanas with pranayama practices group and control group are 34.07, 33.51 and 29.17 respectively. The obtained "F" ratio of 30.69 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on grip strength.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on grip strength.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table VII-A.

TABLE VII-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON GRIP STRENGTH

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
34.07	33.51	-	0.55*	0.39
34.07	-	29.17	4.90*	0.39
-	33.51	29.17	4.35*	0.39

* Significant at .05 level of confidence.

The table VII-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on grip strength 0.55, 4.90 and 4.35 which were greater than the confidence interval value 0.39 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on grip strength.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on grip strength were graphically represented in figure V.

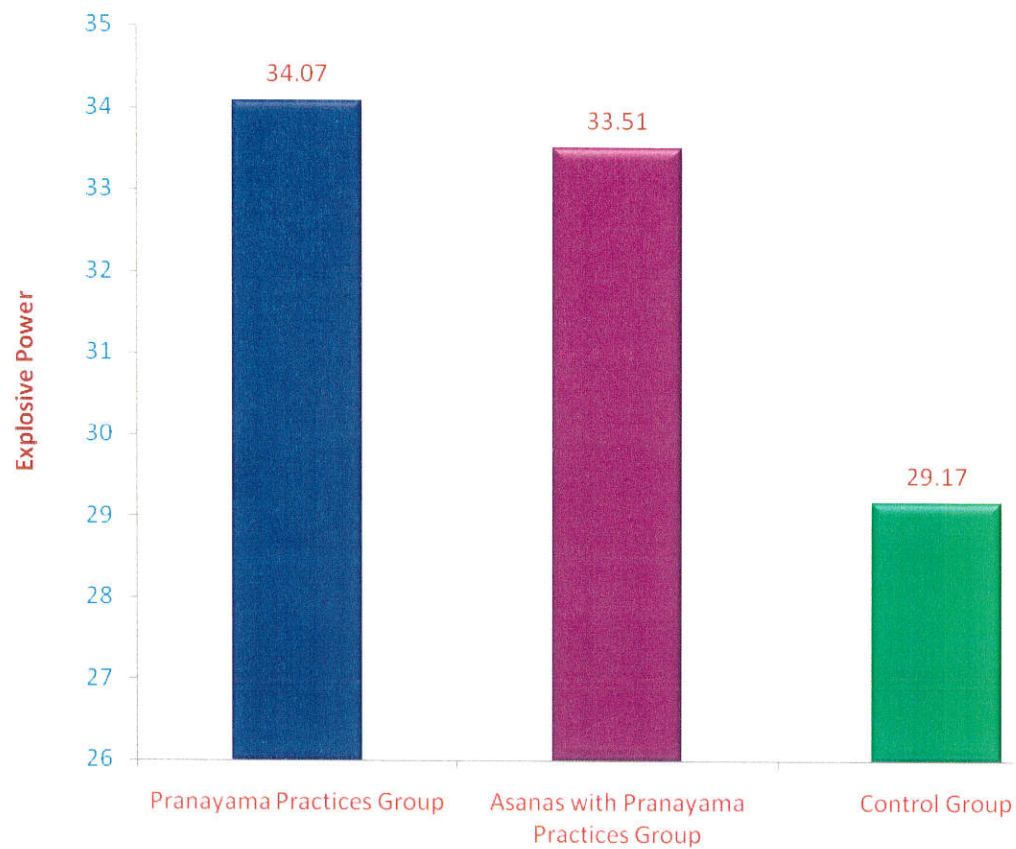


FIGURE V: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON GRIP STRENGTH

4.1.6. Wrist Flexion

The analysis of covariance on wrist flexion of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table VIII.

TABLE VIII
ANALYSIS OF COVARIANCE OF THE DATA ON WRIST FLEXION OF
PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES,
ASANAS WITH PRANAYAMA PRACTICES AND CONTROL
GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	64.90	64.70	66.50	Between	19.47	2	9.73	0.05
S.D.	11.38	13.04	13.93	Within	4935.50	27	182.80	
Post Test								
Mean	66.00	72.20	66.80	Between	227.47	2	113.73	5.49*
S.D.	11.69	13.27	13.90	Within	559.20	27	20.71	
Adjusted Post Test								
Mean	66.47	72.87	65.67	Between	311.01	2	155.51	35.01
				Within	115.50	26	4.44	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table VIII shows that the pre-test mean values on wrist flexion of pranayama practices group, asanas with pranayama practices group and control group are 64.90, 64.70 and 66.50 respectively. The obtained "F" ratio of 0.05 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on wrist flexion. The post-test mean values

on wrist flexion of pranayama practices group, asanas with pranayama practices group and control group are 66.00, 72.20 and 66.80 respectively. The obtained “F” ratio of 5.49 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on wrist flexion.

The adjusted post-test mean values on wrist flexion of pranayama practices group, asanas with pranayama practices group and control group are 66.47, 72.87 and 65.67 respectively. The obtained “F” ratio of 35.01 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on wrist flexion.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on wrist flexion.

Since, three groups were compared, whenever the obtained ‘F’ ratio for adjusted post test was found to be significant, the Scheffe’s test to find out the paired mean differences and it was presented in Table VIII-A.

TABLE VIII-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON WRIST FLEXION

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
66.47	72.87	-	6.40*	0.55
66.47	-	65.67	0.80*	0.55
-	72.87	65.67	7.20*	0.55

* Significant at .05 level of confidence.

The table VIII-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on wrist flexion 6.40, 0.80 and 7.20 which were greater than the confidence interval value 0.55 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on wrist flexion.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on wrist flexion were graphically represented in figure VI.

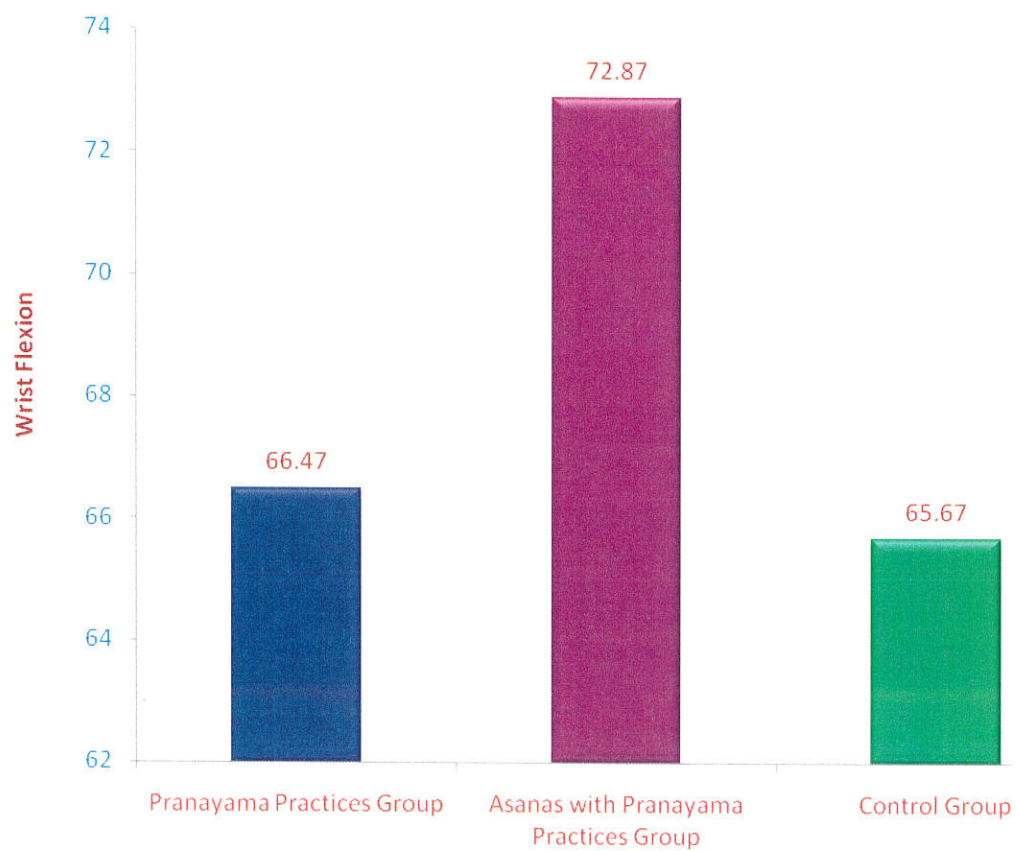


FIGURE VI: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON WRIST FLEXION

4.1.7. Hip Flexion

The analysis of covariance on hip flexion of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table IX.

TABLE IX
ANALYSIS OF COVARIANCE OF THE DATA ON HIP FLEXION OF PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES, ASANAS WITH PRANAYAMA PRACTICES AND CONTROL GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	95.80	90.50	85.70	Between	510.47	2	255.23	0.88
S.D.	16.69	15.76	16.00	Within	7828.20	27	289.93	
Post Test								
Mean	97.80	100.20	86.00	Between	1155.47	2	577.73	18.58*
S.D.	17.01	16.17	15.91	Within	839.20	27	31.08	
Adjusted Post Test								
Mean	92.65	100.37	90.98	Between	500.72	2	250.36	41.70*
				Within	156.10	26	6.00	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table IX shows that the pre-test mean values on hip flexion of pranayama practices group, asanas with pranayama practices group and control group are 95.80, 90.50 and 85.70 respectively. The obtained "F" ratio of 0.88 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on hip flexion. The post-test mean values

on hip flexion of pranayama practices group, asanas with pranayama practices group and control group are 97.80, 100.20 and 86.00 respectively. The obtained "F" ratio of 18.58 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on hip flexion.

The adjusted post-test mean values on hip flexion of pranayama practices group, asanas with pranayama practices group and control group are 92.65, 100.37 and 90.98 respectively. The obtained "F" ratio of 41.70 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on hip flexion.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group are on hip flexion.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table IX-A.

TABLE IX-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON HIP FLEXION

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
92.65	100.37	-	7.72*	0.64
92.65	-	90.98	1.66*	0.64
-	100.37	90.98	9.38*	0.64

* Significant at .05 level of confidence.

The table IX-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on hip flexion 7.72, 1.66 and 9.38 which were greater than the confidence interval value 0.64 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on hip flexion.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on hip flexion were graphically represented in figure VII.

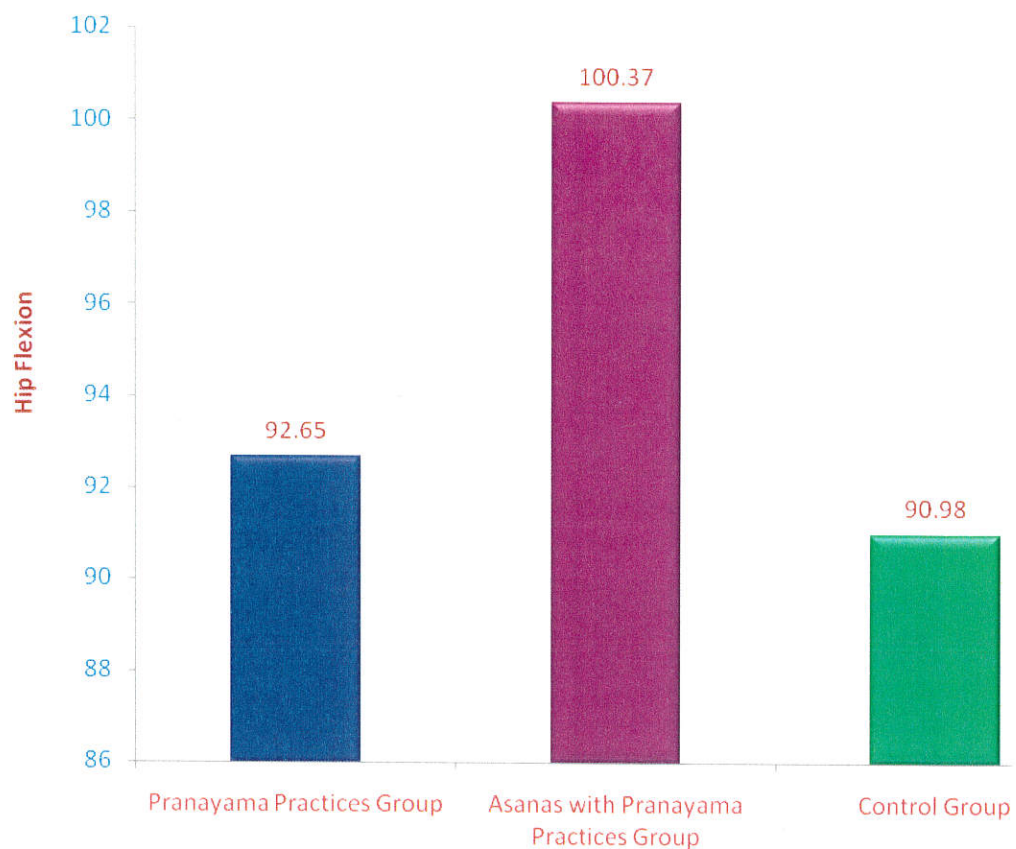


FIGURE VII: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON HIP FLEXION

4.1.8. Ankle – Range of Movement

The analysis of covariance on ankle – range of movement of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table X.

TABLE X
ANALYSIS OF COVARIANCE OF THE DATA ON ANKLE – RANGE OF MOVEMENT OF PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES, ASANAS WITH PRANAYAMA PRACTICES AND CONTROL GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	90.80	107.50	119.10	Between	4047.80	2	2023.90	1.73
S.D.	27.92	34.99	34.03	Within	31619.00	27	1171.07	
Post Test								
Mean	92.25	92.00	119.50	Between	4996.25	2	2498.13	20.18*
S.D.	27.97	40.55	34.75	Within	3342.13	27	123.78	
Adjusted Post Test								
Mean	103.46	90.73	119.56	Between	1836.21	2	918.10	14.24*
				Within	1675.86	26	64.46	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table X shows that the pre-test mean values on ankle – range of movement of pranayama practices group, asanas with pranayama practices group and control group are 90.80, 107.50 and 119.10 respectively. The obtained “F” ratio of 1.73 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on ankle – range of movement.

The post-test mean values on ankle – range of movement of pranayama practices group, asanas with pranayama practices group and control group are 92.25, 92.00 and 119.50 respectively. The obtained “F” ratio of 20.18 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on ankle – range of movement.

The adjusted post-test mean values on ankle – range of movement of pranayama practices group, asanas with pranayama practices group and control group are 103.46, 90.73 and 119.56 respectively. The obtained “F” ratio of 14.24 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on ankle – range of movement.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on ankle – range of movement.

Since, three groups were compared, whenever the obtained ‘F’ ratio for adjusted post test was found to be significant, the Scheffe’s test to find out the paired mean differences and it was presented in Table X-A.

TABLE X-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON ANKLE – RANGE OF MOVEMENT

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
103.46	90.73	-	12.73*	6.96
103.46	-	119.56	16.10*	6.96
-	90.73	119.56	28.83*	6.96

* Significant at .05 level of confidence.

The table X-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on ankle – range of movement 12.73, 16.10 and 28.83 which were greater than the confidence interval value 6.96 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on ankle – range of movement.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on ankle – range of movement were graphically represented in figure VIII.

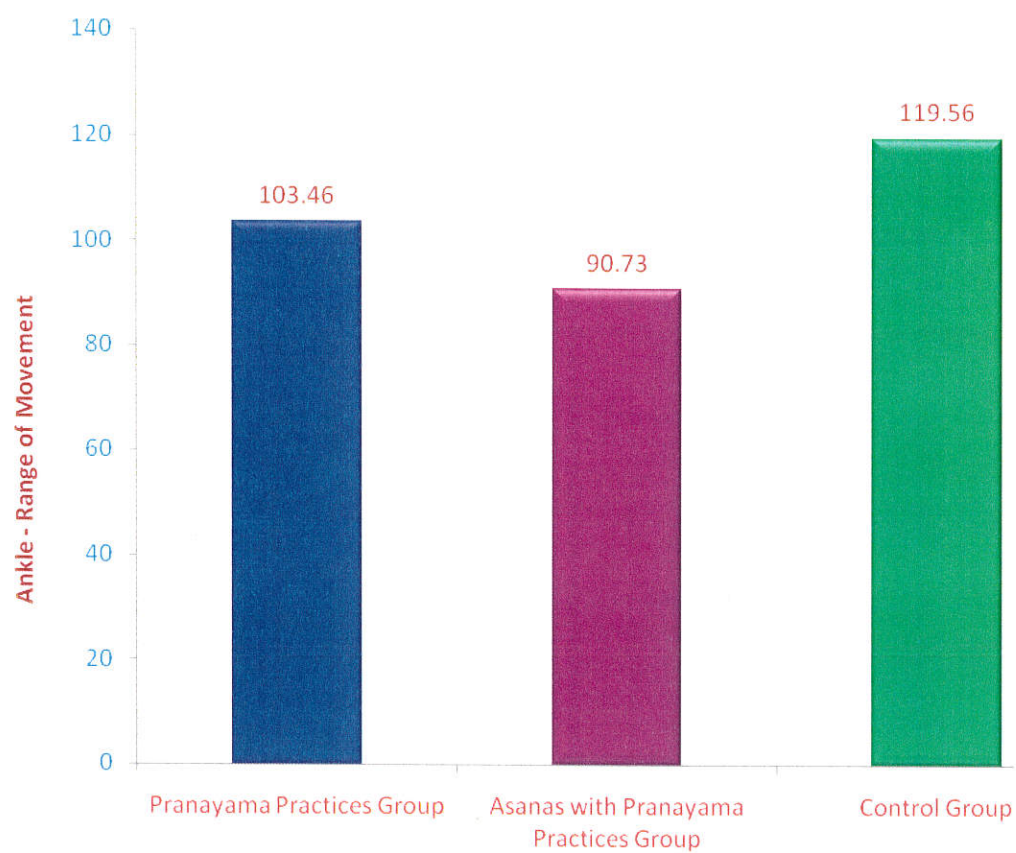


FIGURE VIII: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON ANKLE – RANGE OF MOVEMENT

4.1.9. Vital Capacity

The analysis of covariance on vital capacity of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table XI.

TABLE XI
ANALYSIS OF COVARIANCE OF THE DATA ON VITAL CAPACITY OF
PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES,
ASANAS WITH PRANAYAMA PRACTICES AND CONTROL
GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	2806.00	2780.00	2867.00	Between	39886.67	2	19943.33	0.52
S.D.	124.27	266.42	129.62	Within	1032250.00	27	38231.48	
Post Test								
Mean	3441.00	3087.00	2867.00	Between	1677306.67	2	838653.33	21.48*
S.D.	188.12	234.91	121.91	Within	1054310.00	27	39048.52	
Adjusted Post Test								
Mean	3451.12	3119.66	2824.22	Between	1935410.04	2	967705.02	90.43*
				Within	278224.26	26	10700.93	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table XI shows that the pre-test mean values on vital capacity of pranayama practices group, asanas with pranayama practices group and control group are 2806.00, 2780.00 and 2867.00 respectively. The obtained "F" ratio of 0.52 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on vital capacity. The post-test mean

values on vital capacity of pranayama practices group, asanas with pranayama practices group and control group are 3441.00, 3087.00 and 2867.00 respectively. The obtained "F" ratio of 21.48 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on vital capacity.

The adjusted post-test mean values on vital capacity of pranayama practices group, asanas with pranayama practices group and control group are 3451.12, 3119.56 and 2824.22 respectively. The obtained "F" ratio of 90.43 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on vital capacity.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on vital capacity.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table XI-A.

TABLE XI-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON VITAL CAPACITY

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
3451.12	3119.66	-	331.46*	26.86
3451.12	-	2824.22	626.89*	26.86
-	3119.66	2824.22	295.44*	26.86

* Significant at .05 level of confidence.

The table XI-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on vital capacity 331.46, 626.89 and 295.44 which were greater than the confidence interval value 26.86 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on vital capacity.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on vital capacity were graphically represented in figure IX.

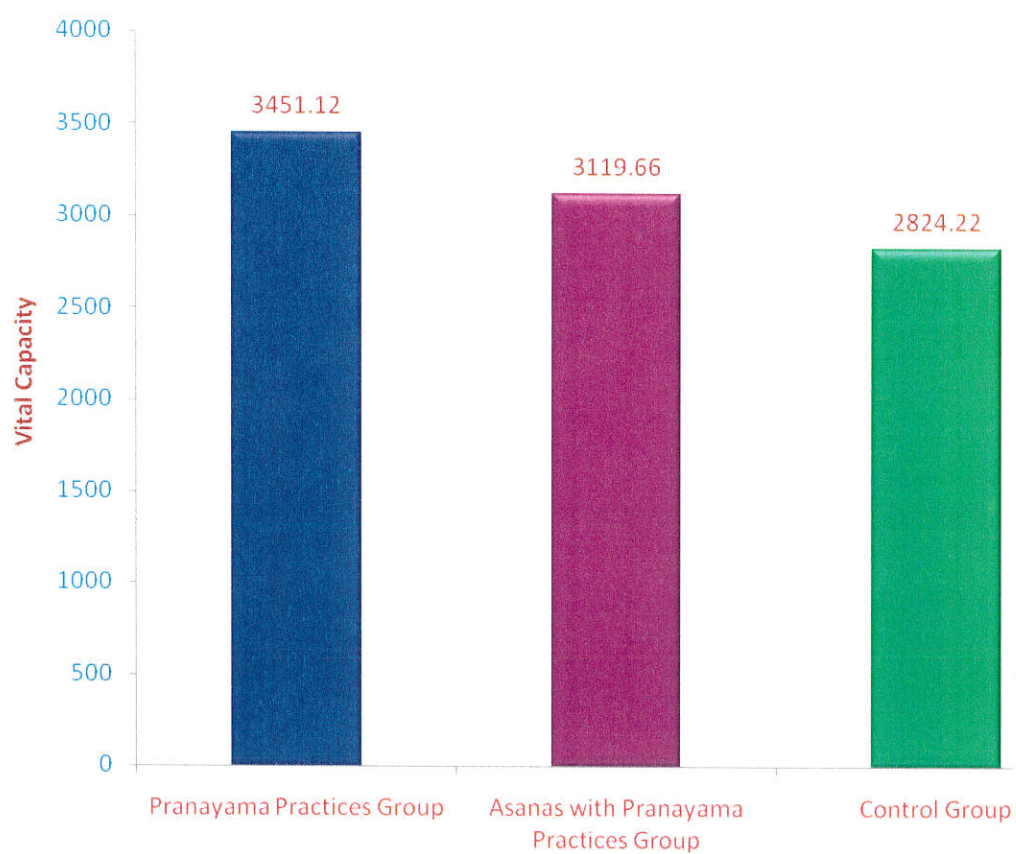


FIGURE IX: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON VITAL CAPACITY

4.1.10. VO₂ MAX

The analysis of covariance on VO₂Max of the pre and post test scores of pranayama practices group, asanas with pranayama practices group and control group have been analyzed and presented in Table XII.

TABLE XII
ANALYSIS OF COVARIANCE OF THE DATA ON VO₂MAX OF PRE AND POST TESTS SCORES OF PRANAYAMA PRACTICES, ASANAS WITH PRANAYAMA PRACTICES AND CONTROL GROUPS

Test	Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	11.55	10.50	8.45	Between	49.72	2	24.86	1.30
S.D.	2.04	2.36	1.42	Within	517.85	27	19.18	
Post Test								
Mean	12.49	12.32	8.72	Between	90.67	2	45.34	11.85*
S.D.	1.70	2.30	1.47	Within	103.24	27	3.82	
Adjusted Post Test								
Mean	11.24	12.02	10.27	Between	13.19	2	6.60	22.67*
				Within	7.57	26	0.29	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.37 and 3.35 respectively).

The table XII shows that the pre-test mean values on VO₂Max of pranayama practices group, asanas with pranayama practices group and control group are 11.55, 10.50 and 8.45 respectively. The obtained "F" ratio of 1.30 for pre-test scores is less than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on VO₂Max. The post-test mean values on VO₂Max of

pranayama practices group, asanas with pranayama practices group and control group are 12.49, 12.32 and 8.72 respectively. The obtained "F" ratio of 11.85 for post test scores is more than the table value of 3.37 for df 2 and 27 required for significance at .05 level of confidence on VO₂Max.

The adjusted post-test mean values on VO₂Max of pranayama practices group, asanas with pranayama practices group and control group are 11.24, 12.02 and 10.27 respectively. The obtained "F" ratio of 22.67 for adjusted post-test means is more than the table value of 3.35 for df 2 and 26 required for significance at .05 level of confidence on VO₂Max.

The results of the study indicated that there was a significant difference between the adjusted post-test means of pranayama practices group, asanas with pranayama practices group and control group on VO₂Max.

Since, three groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table XII-A.

TABLE XII-A
THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED
MEANS ON VO₂Max

Pranayama Practices Group	Asanas with Pranayama Practices Group	Control Group	Mean Differences	Confidence Interval Value
11.24	12.02	-	0.78*	0.14
11.24	-	10.27	0.98*	0.14
-	12.02	10.27	1.75*	0.14

* Significant at .05 level of confidence.

The table XII-A shows that the mean difference values between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on VO₂Max 0.78, 0.98 and 1.75 which were greater than the confidence interval value 0.14 required for significance at .05 level of confidence.

The results of this study showed that there was a significant difference exist between pranayama practices group and asanas with pranayama practices group, pranayama practices group and control group and asanas with pranayama practices group and control group on VO₂Max.

The adjusted post-test mean values of pranayama practices group, asanas with pranayama practices group and control group on $VO_2\text{Max}$ were graphically represented in figure X.

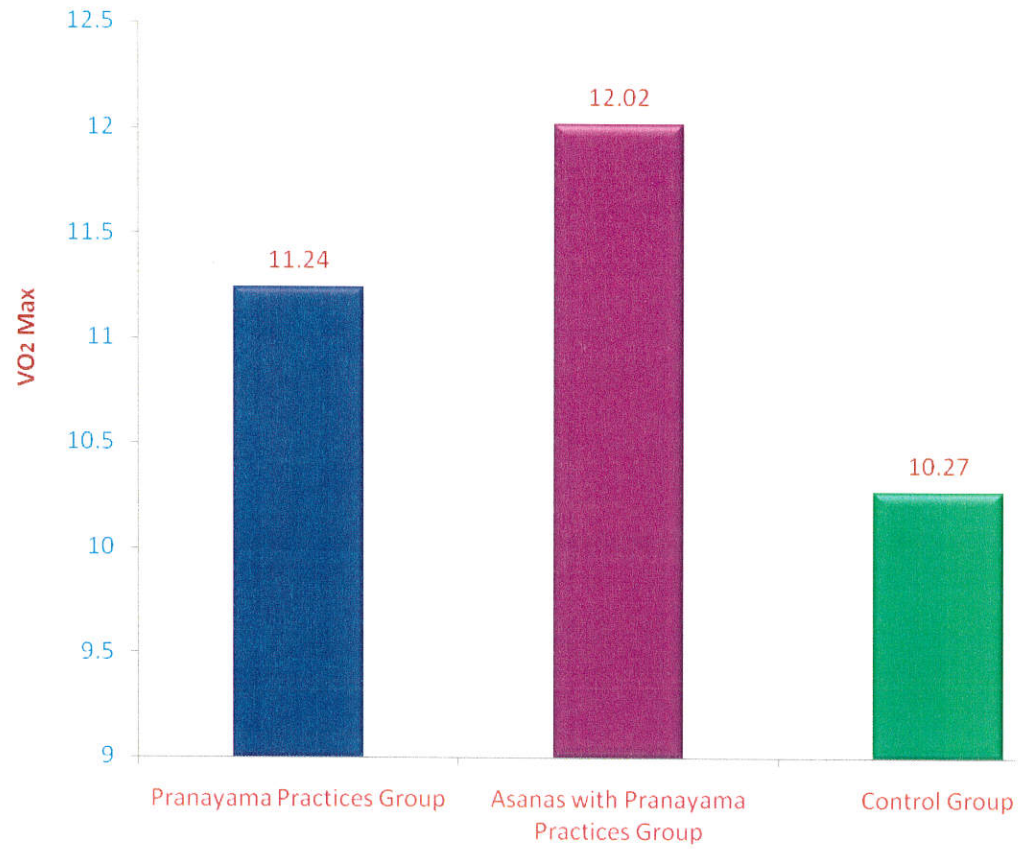


FIGURE X: THE ADJUSTED POST-TEST MEAN VALUES OF PRANAYAMA PRACTICES GROUP, ASANAS WITH PRANAYAMA PRACTICES GROUP AND CONTROL GROUP ON VO_2 MAX

4.2. RESULTS OF THE STUDY

4.2.1. Skill Related Variables

(Short service, Forehand Clear and Backhand Clear)

There was a significant difference among pranayama practices group, asanas with pranayama practices group and control group on selected skill related variables namely short service, forehand clear and backhand clear. And there was a significant improvement on selected skill related variables namely short service, forehand clear and backhand clear due to varied yogic practices namely pranayama practices and asanas with pranayama practices.

4.2.2. Performance Related Variables

(Explosive Power, Grip Strength, Wrist Flexion, Hip Flexion, Ankle –Range of Movement, Vital capacity and VO₂ Max)

There was a significant difference among pranayama practices group, asanas with pranayama practices group and control group on selected performance related variables namely Explosive Power, Grip Strength, Wrist Flexion, Hip Flexion, Ankle –Range of Movement, Vital capacity and VO₂ Max. And there was a significant improvement on selected performance related variables namely Explosive Power, Grip Strength, Wrist Flexion, Hip Flexion, Ankle – Range of Movement, Vital capacity and VO₂ Max due to varied yogic practices namely pranayama practices and asanas with pranayama practices.

4.3. DISCUSSION ON FINDINGS

The results of the study showed that significant improvements were noticed on selected skills and performance related variables namely short service, forehand clear, backhand clear, explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity, VO₂ max due to varied yogic practices namely pranayama practices and asanas with pranayama practices of badminton players.

There is no questioning the many benefits of yoga which include reduced stress, reduced risk of lower back pain, and improvements in flexibility among both fit and unfit populations. In sedentary populations and untrained populations, studies have indicated some improvements in strength and mild improvements in cardiovascular conditioning. However it is important to note that although these benefits certainly can contribute to an improved quality of life, using yoga as one's only form of exercise may leave some physical deficiencies. Yoga and flexibility go hand in hand. It increases the range of motion in joints and also the lubrication in the joints.

The result is enhanced fluidity throughout your body and a sense of ease and comfort. Apart from stretching the muscles, it also stretches the ligaments, tendons and the fascia sheath that surrounds the muscles. The best part of yoga is that it acts on those joints as well, that were never really moved, leave alone exercising. It helps get rid of muscle soreness and promotes faster recovery.

Instead of feeling weary or tired out after performing yogic asanas, a person feels much relaxed and enthusiastic.

Constant practice of yoga will result in enhanced flexibility. A body part, which was rigid at the beginning of learning yoga, would experience a remarkable flexibility in all parts, with regular practice. If done in a correct form, yogic stretching helps develop the entire body. With stretching, the body develops a sense of harmony and balance. Also, with increased flexibility many tensions and conflicts are erased on their own. The more flexible a body, the better it is for that individual as it saves the body from unnecessary torture and pain. The pain and stress we feel while stretching are nothing, but blocked, jammed, misplaced and misused energy. Increased flexibility opens these energy blockages and releases the energy circulation. Know for sure that neglect is the root cause of all pains. Problems of toothaches, backaches and headaches are all symptoms of such neglect or abuse.

These need to deal with rather than ignored. So many literatures which analyzed studies comparing the effects of yoga and exercise seem to indicate that, in both healthy and diseased populations; yoga may be as effective as or better than exercise at improving a variety of health-related measures. Although more research is necessary to discern the distinctions between exercise and yoga and the different types of yoga on the SNS/HPA axis, it is evident both can be used to improve measures of mental health.

Sarang, PS and Telles, S. (2006) in their study examined the consumption of oxygen, breath rate and breathe volume in 50 male participants during two yogic practices: (1) cyclic meditation (CM), which combined yoga postures and restful awareness and (2) relaxation in shavasana. The reduced oxygen consumption following the cyclic yoga suggests that there is no such rebound effect for moderately active yoga when the poses are practiced with rest periods.

Cysarz, D., & Bussing, A (2005) in their study examined the effects of meditation on a specific aspect of breathing: **Czamara, Joli Michele (2003)** designed a study to determine whether a 10-week yoga practice of postures, breathing and relaxation can increase a person's strength, balance, functional flexibility and mental and physical quality of life. **Joshi, L. N., V. D. Joshi and L. V. Gokhale (1993)** studied thirty three normal male and forty two normal female subjects, of average age of 18. 5 years, underwent six weeks course in "Pranayam" and their functions of lung ventilators were studied before and after this practice. They had improved functions of ventilators in the form of lowered respiratory rate (RR) and increases in the forced vital capacity (FVC), forced expiratory volume at the end of 1st second (FEV1%), maximum voluntary ventilation (MW), peak expiratory flow rate (PEFR-lit/sec) and prolongation of breath holding time.

Malhotra, V., S. Singh, K. P. Singh, P. Gupta, S. B. Sharma, S. V. Madhu and O, P. Tandon (2002), in thier study opined that certain yoga asanas if practiced regularly are known to have beneficial effects on the human body.

Ray, U. S., B. Sinha, O. S. Tomer, A. Pathak, T. Dasgupta and W. Selvamurthy (2001) in their study examined the effect of yogic exercises on

aerobic capacity. Forty men from the Indian army (aged 19-23 yr) were administered maximal exercise on a bicycle ergo meter in a graded work load protocol.

R. Nagarathna, H. R. Nagendra and T. Desiraju (1993) conducted a study and report shows that in a group of 40 physical education teachers who already had an average of 8.9 years physical training, 3 months of yogic training produced significant improvement in general health (in terms of body weight and BP reduction and improved lung functions). **Kristal AR, Littman AJ, Benitez D, White E. Division (2005)**, conducted a study to examine whether yoga practice is associated with lower mean 10-year weight gain after age 45. Participants included 15,550 adults, aged 53 to 57 years, recruited to the Vitamin and Lifestyle (VITAL) cohort study between 2000 and 2002. **Wilson and Robert (1997)** in their study opined that combining yoga and breathing exercises helped teens shed unwanted pounds. The decrease in the pranayama group could be attributed to two factors: the pranayama and yoga exercises themselves and a possible decrease in daily caloric intake by the participants in the pranayama group because of decreased stomach size.

Prasad.K. V., Sunita.M. , Raju. P. S., Reddy. M, V., Sahay. B. K. and Murthy. K. J. Y (2006) in their study, examined 41 men and 23 women participating in a three months training program for 30 days, the pranayama sequence was practiced. **Madanmohan (1992)** studied the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP). 40 mmHg test, breath holding time after

expiration (BHTexp), breath holding time after inspiration (BHTinsp), and hand grip strength <HGS). The results show that yoga practice for 12 weeks results in significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS.

Samraj (1991) conducted a study on the effect of practice of asanas alone and a combination of asanas, pranayama and meditation on anxiety and aggression. In this study, ninety school boys were selected at random by lot. Subjects were tested on anxiety and aggression before and after ten weeks of yogic training. In using analysis of covariance, he observed that anxiety level was significantly reduced but there was no significant decrease in aggression after practicing yoga.

Moorthy (1982) compared the influence of yogic exercise and non-yogic exercise to find out the minimum muscular fitness on school children. He concluded that yogic exercises, were more beneficial than the non-yogic exercises to improve minimum muscular fitness of the school children.

4.4. DISCUSSION ON HYPOTHESES

In the earlier, the researcher had formulated the following hypothesis,

At first, it was hypothesised that there would be significant difference among the experimental groups on selected skills related variables (short service, fore hand clear and back hand clear), performance related variables (explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity, VO₂ max) of badminton players. The results of the study showed that

there was a significant difference among the experimental groups on selected skills related variables (short service, fore hand clear and back hand clear), performance related variables (explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity, VO₂ max) of badminton players. Hence, the researcher's first hypothesis was accepted.

In second, it was hypothesized that there would be significant improvement on selected criterion variables such as short service, forehand clear, back hand clear, explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity, VO₂ max of badminton players due to varied of yogic practices. The results of the study showed that there was a significant improvement on selected criterion variables such as short service, forehand clear, back hand clear, explosive power, grip strength, wrist flexion, hip flexion, ankle range of movements, vital capacity, VO₂ max of badminton players due to varied of yogic practices. Hence, the researcher's second hypothesis was also accepted.