Chapter IV

ANALYSIS OF DATA AND RESULTS OF THE STUDY

In this chapter, the collected data were analyzed statistically to reveal the purpose of the study. This chapter contains statistically treated data results, findings and discussions with regard to the talent identification and follow-up development programme on selected motor fitness and performance variables of track and field events in school boys.

For the purpose of the study 156 boys were selected randomly, form Tisaiyanvillai, Tirunelveli (Dt). They were in the age group of 12 to 14 years. The selected students underwent the talent identification programme and they were divided into two equal groups named as group A and group B (Group A=Group B=78 each). From the group A, thirty (30) (15- Sprint & Jumping talent, 15- Throwing talent) students were selected on the basis of talent screening test and they acted as the experimental group. Similarly thirty (30) (15- Sprint & Jumping talent, 15- Throwing talent) students were selected from the group B, who acted as the control group. They participated in the research voluntarily and cheerfully without any compulsion.

After the selection process experimental group (selected talented students) was assigned to the developmental anaerobic training for a period of 12 weeks for 4 sessions (60 min/sessions) per week. All the subjects tested prior and after the experimental treatment on selected motor fitness and performance variables in track and field events. The control group did not participated any training programme rather than their daily physical education programme and routine work. The suitable statistical tools were applied to evaluate the talent identification programme and test significance difference between pre and post test of experimental group and control groups.

The influence of the talent identification programme on selected motor fitness and performances in track and field event can be identified by using multiple regression analysis. The paired ‘t’ test and independent ‘t’ test were applied to test the significance difference at 0.05 level of confidence between pre and post test scores of experimental group and control group. All statistical analyses were carried out with the help of statistical package SPSS.16 for windows.

The statistical analysis pertaining to the evaluation of talent identification programme (sprint & jump model and throw model in track and field events) and to determine the impact of follow-up developmental programme (Anaerobic training) on selected motor fitness and performance variables of track and field events in school boys. To achieve the objectives of the study the chapter was further divided into two sections.

4.1 Analysis of Data

Section I

Evaluation of talent identification programme (sprint & jump model and throw model in track and field events)

Section II

Follow-up developmental programme (Anaerobic training) on selected motor fitness and performance variables of track and field events.

Testing Significance difference

This is the significant portion of the thesis in arriving at the conclusion by examining the hypothesis. The procedure of testing the hypothesis in accordance with the results obtained in relation to the level of confidence, which was fixed at 0.05 level, was considered necessary for this study. These tests (statistic) are usually called the tests of significance, since we test whether the independent variables influences the dependent variable of the samples are significant or not or test whether the difference between the pre-test and post-test scores of the samples are significant or not. In the present study the probability level less than the 0.05 level ($p<0.05$), then the null hypothesis was rejected at the same time our research hypothesis was accepted.

Level of Significance

The amount of evidence required to accept that an event is unlikely to have arisen by chance is known as the significance level or critical p-value. In traditional Fisherian statistical hypothesis testing, the p-value is the probability of observing data at least as extreme as that observed, given that the null hypothesis is true. If the obtained p-value is small, then it can be said either the null hypothesis is false or an unusual event has occurred. The obtained multiple regression (prediction of criterion variable) 01and't' ratio needed $p<0.05$ for significance at 0.05 level.

Section I

4.2 Evaluation of talent identification programme (Sprint & Jump model and Throw Model in Track and Field events)

In the first section give details about the talent identification evaluation procedure (Abbott and Collins, 2002). This process consists of key criteria, which was statistically analysed by the following steps.

The selected samples mean age, height and weight were 12.76 ± 0.54, 143.56 ±6.63 and 33.40±7.54 respectively. This result reveals that the age of the subjects shows the homogeneous characteristic, which ensures the reliable outcome for this study. Therefore, at the very least, if sport talent identification programme is to be employed with children age of 12 to 14 years, more appropriate to develop other physical qualities.

Normality test for Tests in Talent Identification Model

Normal distribution implies adequate discriminability between performances; non-normal distribution may not necessarily imply an inability to discriminate. The performances achieved in particular test that was not normal, the tasks was unable to adequately discriminate. The non-normal distribution of standard scores for the children, biased sport recommendations to scare the reliability. For testing the normality of the field tests in the talent identification model, the histogram with normal curve can be applied.

Normal Distribution Curve of selected Test

The normality test were conducted for performance variables 100 m dash, long jump and shot-put and independent variables namely, somatotypes components (endomorphy, mesomorphy, ectomorphy), height, weight, isometric leg strength, 50m speed, standing broad jump, vertical jump, standing triple jump, five consecutive hops, push-ups, and shot backward throw, which were contained in the sprint & jumping and throwing event model. The normality of the above tests were satisfied, the further statistical technique was applied to predict the performance of the children.

The mean and standard deviation of the all selected test have been presented in the following table.

Table 4.1

Descriptive Statistics of Selected Test in the Talent Identification Model and Performance Variables

Variables	N	Minimum	Maximum	Mean	S. Deviation
Height	156	129.90	165.00	143.56	6.63
Weight	156	22.30	59.40	33.40	7.54
Endomorphy	156	0.92	8.32	2.62	1.36
Mesomorphy	156	0.62	6.26	3.27	0.91
Ectomorphy	156	0.35	7.55	4.30	1.39
Isometric Strength	156	20.00	93.00	50.46	12.58
50 M Dash	156	7.12	11.84	8.92	0.81
Standing Broad Jump (S.B.J)	156	1.00	2.80	1.69	0.268
Vertical Jump (V.J)	156	21.00	45.00	31.01	5.31
Standing Triple Jump (S.T.J)	156	3.05	8.22	4.70	0.74
Five Consecutive Hops	156	5.15	11.10	8.07	1.13
Push-ups	156	1.00	26.00	9.76	5.97
Shot Backward Throw (S.B.T)	156	2.20	10.20	4.17	1.15
100 M Dash	156	13.50	22.75	17.07	1.71
Long Jump	156	2.07	4.80	3.07	0.46
Shot-put	156	2.20	10.20	4.95	1.18

Table 4.2

The Correlation between Dependent Variables and Independent Variables

Matrix Table	100 M	LONG JUMP	SHOT-PUT	Endo-morphy	Meso-morphy	Ecto-morphy	IS	50 M	SBJ	VJ	STJ	5 HOPS	Push-ups	SBT
100 M	1.000													
LONG JUMP	-0.656	1.000												
SHOT-PUT	-0.437	0.414	1.000											
Endo	0.510	-0.454	0.048	1.000										
Meso	0.114	-0.064	0.190	0.546	1.000									
Ecto	-0.296	0.224	-0.104	-0.737	**-0.817**	1.000								
IS	-0.222	0.158	0.581	0.131	0.302	-0.251	1.000							
50 M	0.612	-0.624	-0.369	0.428	0.129	-0.256	-0.146	1.000						
SBJ	-0.689	0.654	0.410	-0.478	-0.110	0.288	0.270	-0.509	1.000					
VJ	-0.635	0.695	0.473	-0.389	-0.083	0.239	0.207	-0.655	0.630	1.000				
STJ	-0.659	0.598	0.502	-0.300	-0.101	0.229	0.284	-0.595	0.673	0.600	1.000			
Five Hops	-0.649	0.694	0.377	-0.445	-0.114	0.261	0.212	-0.646	0.665	0.652	0.672	1.000		
Push-ups	-0.659	0.545	0.314	-0.456	-0.054	0.287	0.184	-0.604	0.518	0.676	0.524	0.626	1.000	
SBT	-0.242	0.319	0.669	0.119	0.340	-0.245	0.533	-0.286	0.309	0.315	0.447	0.272	0.207	1.000

Dependent Variables: 100 M, Long Jump and Shot-put

Developing the Prediction Equation for Sprint & Jumping and Throwing Events

The talent identification model of sprint & jumping events and throwing event contains the somatotypes and motor fitness scores as a raw format as well as standard scores. The multiple regression analysis was applied to predict the performance of track and field events because the selected test satisfied the normality test. The step wise regression method was applied to predict the performance of track and field events at 0.05 level of confidence ($p \leq 0.05$). If the independent variable β coefficient not significant ($p \geq 0.05$), the variable does not included in the model.

The multiple regression analysis can be applied to ensure the reliable prediction, where the relationship between the independent variables is not high. If the relationship between the two independent variable was greater than 0.80, the variable was removed from the stepwise regression model.

Table 4.2 indicated the correlation matrix pertaining to dependent variables and selected observed variables of the total samples. The correlation matrix suggested that ectomorphy component removed from the step wise regression due to the strong correlation (r=-0.817-multicolinearity) between other variables. The other variables were suitable for predict the dependent variables.

Predicting the Track and Field Event Performance

A stepwise multiple regression was used with the 100 m dash and long jump as the dependent variable and the 7 test measures as independent variables. The stepwise regression was used to predict the two dependent variables separately with the independent variables.

Regression Model for Sprint and Jump Talent

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + €_i$$

Where,

Y = 100 m Sprint, Long jump (Dependent variables)

α = Constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6,$ and $\beta 7$ = Regression coefficient of independent variables

$x_1, x_2, x_3, x_4, x_5, x_6$, and x_7 = Independent variables

x_1 = Endomorphy

x_2 = Mesomorphy

x_3 = Isometric Strength

x_4 = 50 M Dash

x_5 = Standing Broad Jump (S.B.J)

x_6 = Vertical Jump

x_7 = Five Consecutive Hops

$€_I$ =Error Term

Table 4.3

Multiple correlation coefficients for the predictors of 100 M Dash Performance

Dependent Variable Y=100 M Dash				
Model	R	R^2	Adjusted R^2	R^2 Change
Constant, Standing Broad Jump	0.689	0.474	0.471	0.474
Constant, Standing Broad Jump+50 M Dash	0.753	0.567	0.561	0.092
Constant, Standing Broad Jump+50 M Dash+ Five Hops	0.763	0.583	0.574	0.016

Table 4.3 shows that the multiple correlation coefficient for predictors, such as standing broad jump, 50 m dash and five consecutive hops is 0.763, which produce highest multiple correlation (influence) with 100 m performance of selected school boys. The R^2 values shows that the percentage of variation of 100 m performance explained by the variation of independent variables. The following results are found from the above table 4.3.

In terms of 100 m performance, about 48 % of variation is explained by the regression model with one predictor standing broad jump. The variation of 57% in the 100 m performance explained by the regression model with two predictors, standing broad jump and 50 m dash. An additional 9 % of variation is contributed by 50 m dash. The variation is about 58 % in the 100 m performance is explained by the three predictors, standing broad jump, 50 m dash and five consecutive hops,. An additional 1 % of variation is contributed by five consecutive hops.

Table 4.4

Regression Coefficient for the predicted variables with 100 M Dash Performances

Dependent Variable: 100 M Dash

Step	Model	B	t	sig	Tolerance	VIF
1	α	24.840	37.263	.000		
	S.B.J	-4.587	-11.790	.000	1.000	1.000
2	α	16.169	9.877	.000		
	S.B.J	-3.392	-8.237	.000	.741	1.349
	50m Dash	0.745	5.704	.000	.741	1.349
3	α	19.052	9.501	.000		
	S.B.J	-2.809	-5.955	.000	.547	1.827
	50m Dash	0.576	3.934	.000	.572	1.749
	Five Hops	-0.293	-2.416	.017	.431	2.321

From the table 4.4, the following regression models are derived for sprint & jump talent with 100 m performance.

Regression Equation in obtained scores form=X_R

X_R = 19.052 – (2.809) S.B.J+ (0.576) 50 m Dash – (0.293) Five Hops

Regression Equation in Standard scores form=X_T

X_T = 5.259 + (0.427) S.B.J+ (0.273) 50m Dash + (0.193) Five Hops

Table 4.4 reveals that prediction of 100 m performance from the sprint & jump model includes standing broad jump, 50 m dash and five consecutive hops. As the multiple correlations on 100 m performance with the combined effect of independent variables are significant at 0.05 level of confidence, it is apparent that the obtained regression equation has significant predictive validity. The variance inflation factor (VIF) value is not more than the critical value of 5 (VIF>5), so there is no multicolinearity exists; where VIF value shows that the standard error in the prediction model is less. So this equation may be successfully utilized in selecting talents at younger age with respect to sprint event (100 M dash).

FIGURE 4.1

Normal P-P Plot of Regression Standardized Residual for 100 M Dash

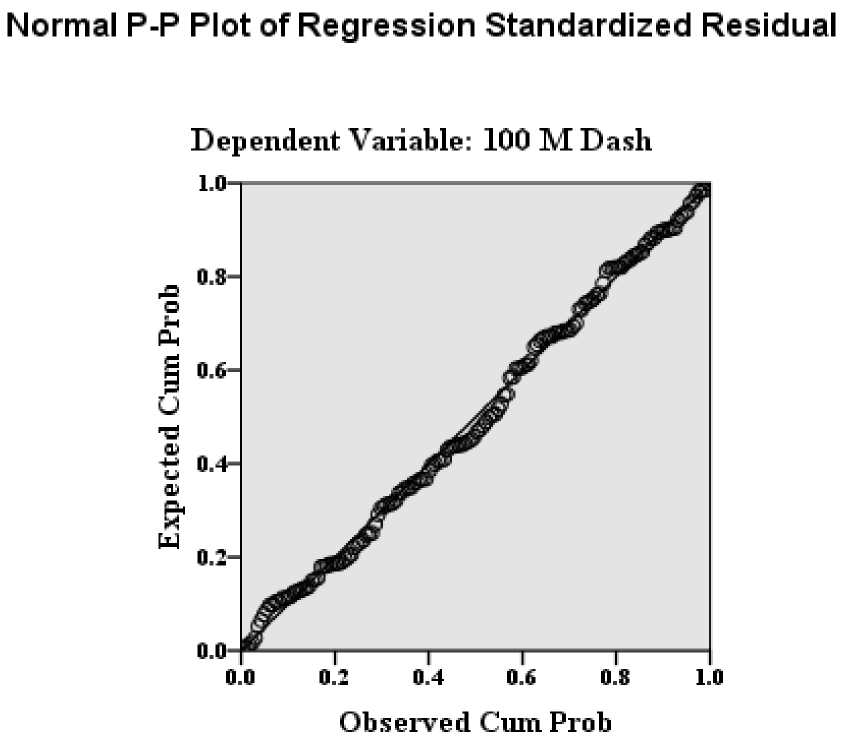


Figure 4.17 shows the majority of residuals at the center of the plot for each value of the predicted score. The plot of residuals fits the expected value well enough to support a conclusion that the residuals are normally distributed. The data are normally distributed, so residuals also normally distributed around the predicted variable scores.

Table 4.5

Multiple correlation coefficients for the predictors of Long Jump performance

Dependent Variable Y=Long Jump				
Model	R	R^2	Adjusted R^2	R^2 Change
Constant, Vertical Jump	0.695	0.483	0.480	0.483
Constant, Vertical Jump+ Five Hops	0.764	0.584	0.578	0.101
Constant, Vertical Jump+ Five Hops + Standing Broad Jump	0.780	0.609	0.601	0.025
Constant, Vertical Jump+ Five Hops + Standing Broad Jump + 50 M Dash	0.788	0.621	0.611	0.012

Table 4.5 also shows that the multiple correlation coefficients for predictors, such as vertical jump, five hops, standing broad jump and 50 m dash is 0.788, which produce highest multiple correlations (influence) with long jump performance of selected school boys. The R^2 values shows that the percentage of variation of long jump performance explained by the variation of independent variables. The following results are found from the above table 4.5.

In terms of long jump performance, about 48 % of variation is explained by the regression model with one predictor vertical jump. The variation of 58 % in the long jump performance is explained by the regression model with two predictors, vertical jump and five consecutive hops. An additional 10 % of variation is contributed by five consecutive hops. The variation is about 61 % in the long jump performance is explained by the three predictors, vertical jump, five consecutive hops and standing broad jump. An additional 3 % of variation is contributed by standing broad jump. The variation is about 62 % in the long jump performance is explained by the four predictors, vertical jump, five consecutive hops, standing broad jump and 50 m dash. An additional 1 % of variation is contributed by 50 m dash.

Table 4.6

Regression Coefficient for the predicted variables with Long Jump Performance

Dependent Variable: Long Jump

Step	Model	B	t	sig	Tolerance	VIF
1	α	1.200	7.598	.000		
	Vertical Jump	0.060	11.996	.000	1.000	1.000
2	α	0.556	3.138	.002		
	Vertical Jump	0.037	6.144	.000	.575	1.738
	Five Hops	0.170	6.082	.000	.575	1.738
3	α	0.408	2.282	.024		
	Vertical Jump	0.030	4.845	.000	.506	1.976
	Five Hops	0.130	4.300	.000	.468	2.136
	S.B.J	0.402	3.104	.002	.491	2.037
4	α	1.586	2.833	.005		
	Vertical Jump	0.024	3.679	.000	.431	2.318
	Five Hops	0.105	3.307	.001	.411	2.432
	S.B.J	0.402	3.146	.002	.491	2.037
	50 M Dash	-0.090	-2.217	.028	.487	2.051

From the table 4.6, the following regression models are derived for sprint & jump talent with long jump performance.

Regression Equation in obtained scores form=X_R

X_R = 1.586+ (0.024) V.J+ (0.105) Five Hops + (0.402) S.B.J- (0.090)50 M Dash

Regression Equation in Standard scores form=X_T

X_T = 3.597+ (0.281) V.J+ (0.259) Five Hops + (0.227) S.B.J- (0.159)50 M Dash

Table 4.6 reveals that prediction of long jump performance from the sprint & jump models includes vertical jump, five hops, standing broad jump and 50 m dash. As the multiple correlations on long jump performance with the combined effect of independent variables are significant at 0.05 level of confidence, it is apparent that the obtained regression equation has significant predictive validity. The variance inflation factor (VIF) value is not more than the critical value of 5 (VIF<5), so there is no multicolinearity exists; where VIF value shows that the standard error in the prediction model is less. So this equation may be successfully utilized in selecting talents at younger age with respect to jump event (Long Jump).

FIGURE 4.2

Normal P-P Plot of Regression Standardized Residual for Long Jump

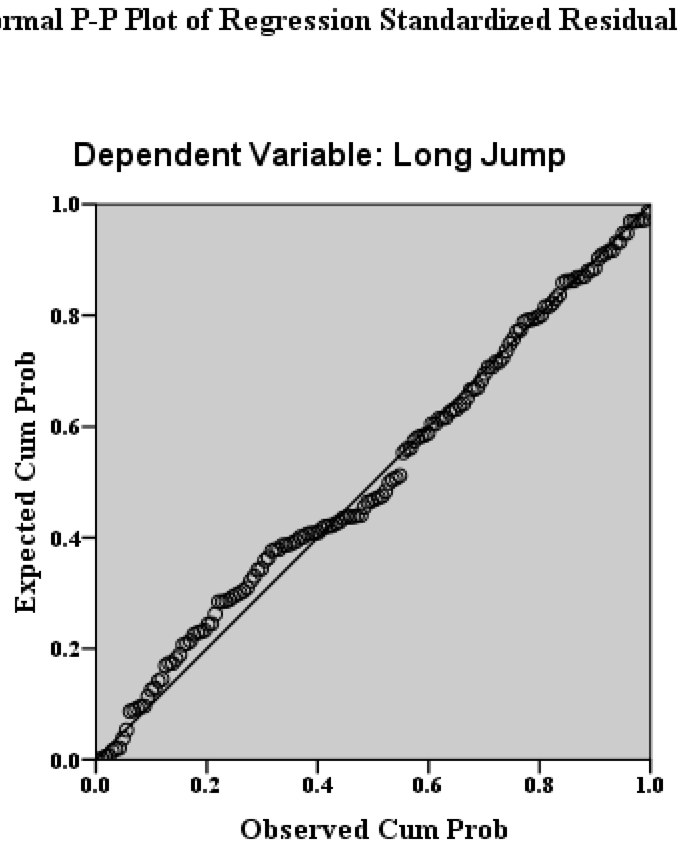


Figure 4.18 shows the majority of residuals at the center of the plot for each value of the predicted score. The plot of residuals fits the expected value well enough to support a conclusion that the residuals are normally distributed. The data are normally distributed, so residuals also normally distributed around predicted variable scores.

Regression Model for Throwing Events Talents

A stepwise multiple regression was used with the shot-put as the dependent variable and the 8 test measures as independent variables. The stepwise regression was used to predict the throwing event performance with the independent variables.

Regression Equation

$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + €_i$

Where,

Y = Shot-put Throw (Dependent variables)

α = Constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7,$ and β_8 = Regression coefficient of independent variables

$x_1, x_2, x_3, x_4, x_5, x_6, x_7,$ and $x_8,$ = Independent variables

x_1 = Endomorphy

x_2 = Mesomorphy

x_3 = Isometric Strength

x_4 = 50 M Dash

x_5 = Standing Broad Jump

x_6 = Standing Triple Jump

x_7 = Push-ups

x_8 = Shot Backward Throw

$€_I$ = Error Term

Table 4.7

Multiple correlation coefficients for the predictors Shot-put performances

Dependent Variable Y=Shot-Put				
Model	**R**	**R^2**	**Adjusted R^2**	**R^2 Change**
Constant, Shot Backward Throw	0.669	0.448	0.445	0.448
Constant, Shot Backward Throw+ Isometric Strength	0.720	0.519	0.512	0.070
Constant, Shot Backward Throw+ Isometric Strength + Standing Triple Jump	0.751	0.563	0.555	0.045

Table 4.7 shows that the multiple correlation coefficients for predictors, such as shot backward throw, isometric strength, and standing triple jump is 0.751, which produce moderately high multiple correlations (influence) with shot-put performance of selected school boys. The R^2 values shows that the percentage of variation of shot-put performances explained by the variation of independent variables. The following results are found from the above table 4.7.

In terms of shot-put performance, about 45 % of variation is explained by the regression model with one predictor shot backward throw. The variation of 52 % in the shot-put performance, explained by the regression model with two predictors, shot backward throw and isometric strength. An additional 7 % of variation is contributed by isometric strength. The variation is about 56 % in the shot-put performance is explained by the three predictors, shot backward throw, isometric strength, and standing triple jump. An additional 4 % of variation is contributed by standing triple jump.

Table 4.8

Regression Coefficient for the predicted variables with Shot-Put Performance

Dependent Variable: Shot-Put

Step	Model	β	t	sig	Tolerance	VIF
1	α	2.063	7.695	.000		
	S.B.T	0.693	11.182	.000	1.000	1.000
2	α	1.292	4.313	.000		
	S.B.T	0.520	4.574	.000	.716	1.397
	I.S	0.030	4.733	.003	.716	1.397
3	α	0.014	0.031	.975		
	S.B.T	0.418	5.945	.000	.621	1.610
	I.S	0.028	4.707	.000	.713	1.402
	S.T.J	0.377	3.948	.000	.798	1.254

From the table 4.8, the following regression models are derived for throwing talent with Shot-put performance.

Regression Equation in obtained scores form=X_R

X_R = 0.014 + (0.418) S.B.T + (0.028) I.S + (0.377) S.T.J

Regression Equation in Standard scores form=X_T

X_T = 3.024 + (0.404) S.B.T + (0.298) I.S + (0.238) S.T.J

Table 4.8 exposed that prediction of shot-put performance from the throwing model includes shot backward throw, isometric strength and standing triple jump. As the multiple correlations on shot-put performance with the combined effect of independent variables are significant at 0.01 level of confidence, it is apparent that the obtained regression equation has significant predictive validity. The variance inflation factor (VIF) value is not more than the critical value of 5 (VIF<5), so there is no multicolinearity exists; Where VIF value shows that the standard error in the prediction model is less. So this equation may be successfully utilized in selecting talents at younger age with respect to throw event (Shot-put).

FIGURE 4.3

Normal P-P Plot of Regression Standardized Residual for Shot-Put

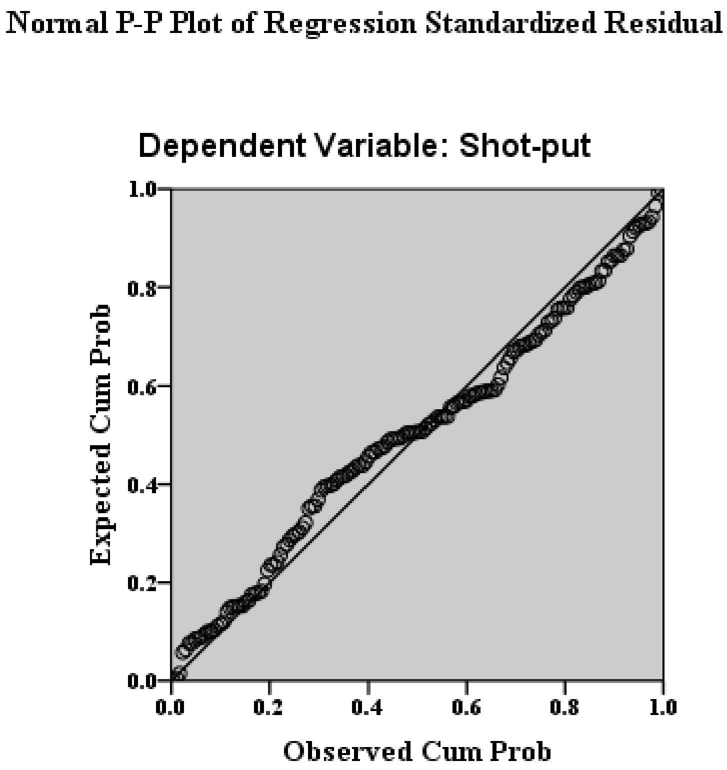


Figure 4.19 shows the majority of residuals at the center of the plot for each value of the predicted score. The plot of residuals fits the expected value well enough to support a conclusion that the residuals are normally distributed. The data are normally distributed, so residuals also normally distributed around predicted variable scores.

4.3 Discussion on Findings

The somatotypes and selected motor fitness components are not direct measures for any specific event or sports but the measures of variables are used as yardstick to suggest that a boy may have potential to excel within a particular sport (Don Gordan, 2009). In considering each variable, have reflecting both general and track & field performances.

The purpose of the first objective was to develop the sprint & jump and throw event model and evaluate the model by identify the predictive factor, which influence the track and field performances. In the present study, the talent identification programme was conducted on school boys.

The track and field performances of sprinting ability, jumping ability and throwing ability measured by using 100 m dash, long jump and shot-put respectively and the eleven predictor variables were used in the sprint & jump and throw event models.

The analysis of data reveals the following findings.

Discussion on Sprinting Ability

For 100 m performance, prediction of sprint & jump model includes, standing broad jump, 50 m dash and five consecutive hops, which produce high multiple correlations with 100 m performance. It is evident that the obtained regression equation has significant predictive validity. Thus the predictive equation may be used to select the potential talent for sprint events in track and field sports at the age of 12-14 years.

There is a significant relationship between the 100 m performance and predictor variables standing broad jump, 50 m dash and five consecutive hops at 0.05 level of confidence. But the remaining five variables in the sprint & jump model, endomorphy, mesomorphy, ectomorphy, isometric leg strength and vertical jump were not significantly influence the performance of 100 m dash at 0.05 level of confidence.

The significant relationship between the 100 m performance and predictor variables standing broad jump, 50 m dash and five consecutive hops may be justified as follows.

The above three predictor variables positively determine the sprinting performance. Sprinting ability is influenced by the athlete's mobility, special strength, strength endurance and technique. Range of motion of a certain joint depends on bone, muscle and connective tissue integrity as well as other factors such as pain and the ability to produce an adequate amount of muscle force.

The following studies done in western countries, which were coincide with the result of the present study.

Forman (1989) reported that the natural speed, power, stride cadence strength, movement time and low percent fat were considered important required component for sprinters.

Studies conducted at Indiana University USA revealed that it is possible to accurately predict performance in selected track and field events by using standing long jump, vertical jump, five bounds and standing 30 metres sprint. The West German model includes 30 m sprint, jump and reach, five hops for 100 m sprint prediction.

Kruger and pioneer (2009) indicated that anaerobic power, acceleration, body mass, reaction time, iliopsoas flexibility, speed endurance, sitting height and push-ups contributes to 86.5 % of total variation to performance in the 100 m sprints.

Tharp et al. (1985) found significant correlation between the vertical jump and 50 m dash. The researcher concluded that the field tests, Sargent vertical jump, standing broad jump and 50 m dash were used to measure the sprint relates ability without laboratory setting. The present prediction of sprinting ability is corresponding with the findings almost same as the Indiana University, Forman and Tharp.

Discussion on Jumping Ability

For long jump performance, prediction of sprint & jump model includes, vertical jump, five hops, standing broad jump and 50 m dash. As the multiple correlations on long jump performance with the combined effect of predictor variables are significant. It is apparent that the obtained regression equation has significant predictive validity. Thus the predictive equation may be used to select the potential talent for jump event in track and field sports at the age of 12-14 years.

There is a significant relationship between the long jump performance and predictor variables vertical jump, five hops, standing broad jump and 50 m dash at 0.05 level of confidence. But the remaining four variables in the sprint & jump model, endomorphy, mesomorphy, ectomorphy and leg isometric strength were not significantly influence the performance of long jump at 0.05 level of confidence.

The significant relationship between the long jump performance and predictor variables includes vertical jump, five hops, standing broad jump and 50 m dash may be justified as follows.

The above three predictor variables positively determine the jumping performance. The speed of movements depends on speed of muscle coordination and neuromuscular coordination (Grosser M. 1991). For jumpers, power, strength, morphological factors, natural speed, coordination and low percent fat were important factors (Forman, 1989).

The long jumper is to develop the most efficient technique possible while maximizing the performance of every muscle in the body. This can be accomplished by balancing speed, power, strength, jumping ability and coordination. To achieve perfection in the long jump, the athlete must generate high levels of force. An athlete's overall strength will determine how much force he or she can summon during a jump. Four aspects of strength that must be addressed in any effective training regimen include general strength, maximal strength, power, and elastic strength. Long jumpers must be able to maintain coordination at high speeds to continue running at top or near top speed (Matt Taylor and Patrick Beith, USA Track and Field Foundation).

Coordination serves a critical function in the long jump success. There are three basic subsets of coordination on which athletes and coaches should focus: agility, balance, and mobility (Matt Taylor and Patrick Beith, USA Track and Field Foundation).

From the above facts the predictor variables vertical jump, five hops, standing broad jump and 50 m dash were satisfied the important performance stimulants explosive strength, coordination and speed.

The following studies done in western countries, which were correspond with the result of the present study.

The simple field test such as standing long jump, vertical jump, 60 m sprint, sit-ups and bent arm hang reported by Recove, 1985 and Kruger & pioneer (2009) indicated that horizontal jump, age, acceleration and ankle flexibility contributed to 81.5% of the total variance in the performance of the long jump.

Discussion on Throwing Ability

For shot-put performance, prediction of throwing model includes, shot backward throw, isometric strength and standing triple jump. As the high multiple correlations on shot-put performance with the combined effect of independent variables are significant. It is apparent that the obtained regression equation has significant predictive validity. Thus the predictive equation may be used to select the potential talents for throw event at the age of 12-14 years.

There is a significant relationship between the shot-put performance and predictor variables shot backward throw, isometric leg strength and standing triple jump at 0.01 level of confidence. But the remaining six variables in throw model, endomorphy, mesomorphy, ectomorphy, 50 m dash, standing broad jump and push-ups were not significantly influence the performance of long jump at 0.01 level of confidence.

The significant relationship between the shot-put performance and predictor variables shot backward throw, isometric strength and standing triple jump may be justified as follows. The above three predictor variables positively determine the throwing performance. For throwers, the important factors were power, strength, morphological factors, coordination and natural speed for successful performance (Forman, 1989).

The following studies were corresponding with the result of the present study.

Swisher and Anna Meisinger (2009) found the parameters that best predictors of throwing performance were static vertical jump, and 7.20 kg shot over the head. Better thrower possesses greater explosive strength and power. Bourdin et al (2010) studied the performance in throwing events and muscular characteristics of both upper and lower limbs. The results of the study suggest that high strength and stiffness values for lower limbs and strength and velocity characteristics for upper limbs may be associated with athletic throwing performance.

Jarver provided talent identification model used in Soviet Unions and West German for 12-14 years of boys and girls. The USSR model includes height, 30 m sprint fly, 60 m sprint, standing long jump, standing triple jump, pull-ups and push-ups.

The result of the talent identification programme indicated that in early years sprint & jumping ability not differed significantly. Almost same field test (standing broad jump, five consecutive hops and 50 m dash) determine the performance of sprinting and jumping ability. But throwing ability has the specific characteristic, specific field tests at an early year of students.

Section II

4.4 Follow-up Developmental Programme (Anaerobic training) on selected Motor fitness and Performance variables of Track and Field events.

The follow-up development programme (Anaerobic training) was put into practice to the experimental group consist of sprint, jump and throwing talents. The purpose of the anaerobic program to develops the motor fitness and performance variables of track and field events in school boys. The pre and post test were taken before and immediate after the anaerobic training for experimental and control groups. The paired 't' test was applied to test the significance difference between the pre test and post test mean across both groups at 0.05 level of confidence. The independent 't' test was applied to test the mean gain difference between the experimental group and control group.

DESCRIPTIVE STATISTICS AND 't' RATIO FOR MOTOR FITNESS AND PERFORMANCE VARIABLES OF EXPERIMENTAL GROUP AND CONTROL GROUP FOR SPRINT, JUMP AND THROW TALENTS

Table 4.9

Descriptive Statistics and 't' Ratio for Isometric Leg Strength of Experimental and Control Groups for Sprint, Jump and Throw Talents

Isometric Leg Strength	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**'t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	55.30±16.22	69.40±16.93	14.10	3.02	4.66*	.000
	Con	30	58.60±12.41	59.40±12.27	0.80	0.59	1.36	.186

Difference of Mean Gain

Isometric Leg Strength	**Mean Gain Exp**	**Mean Gain Con**	**Mean Difference**	**'t' ratio**	**Sig (p)**
	14.10	0.80	13.30	4.32	0.000

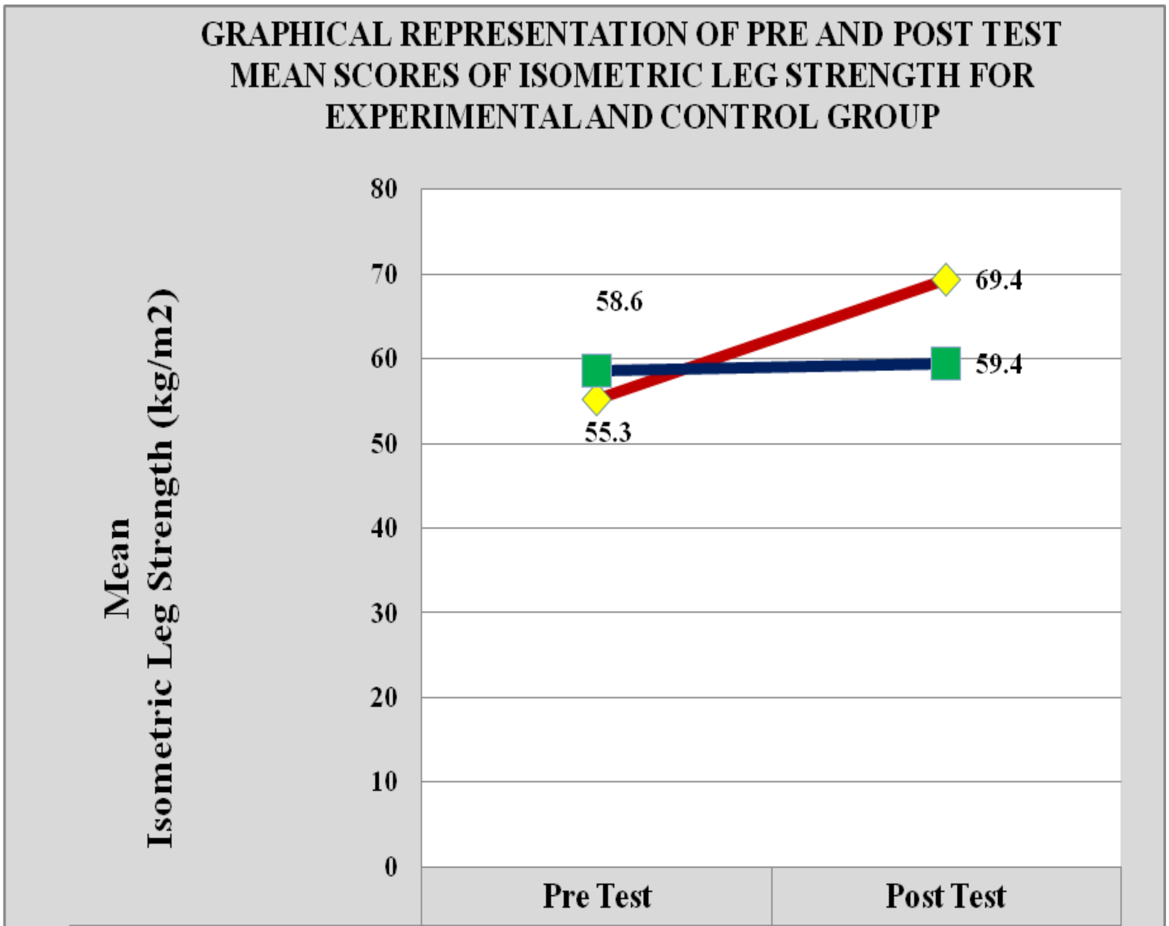
* Significant at 0.05 level

The table 4.9 shows the results of mean, standard deviation, mean difference standard error and ‘t’ ratio for the experimental group and control group of talented sprint, jump and throw individuals on selected motor fitness and performance variables in track and field events.

The table 4.9 revealed that the mean scores of pre and post test of isometric leg strength for experimental group are 55.30 and 69.40. The mean difference between the post test and pre test score is 14.10 and for control group, the pre and post test scores are 58.60 and 59.40 respectively. The mean difference between the post test and pre test score for control group is 0.80. The calculated ‘t’ ratio between pre and post test scores of experimental group are 4.37 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre and post scores of experimental group due to the anaerobic training. The obtained‘t’ ratio between pre and post test scores of control group are 0.80 with df 29 ($P \geq 0.05$) and there is no statistical significance difference before and after the twelve weeks period. The results show that the anaerobic training significantly improves the performance of isometric strength for experimental group than the control group.

The table 4.9 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for isometric leg strength is 13.30. The obtained ‘t’ ratio is 4.32, where $p \leq .0.01$, therefore the experimental and control group significantly differed on the performance of isometric leg strength for selected talents. The difference may be attributed to the anaerobic training. The graphical representation clearly explained the mean value of both experimental and control group on isometric leg strength concerning with prior and after the anaerobic training in figure 4.20.

FIGURE 4.4



	Pre Test	Post Test
Experimental Group	55.3	69.4
Control Group	58.6	59.4

Table 4.10

Descriptive Statistics and 't' Ratio for Muscular Endurance of Experimental and Control Groups for Sprint, Jump and Throw Talents

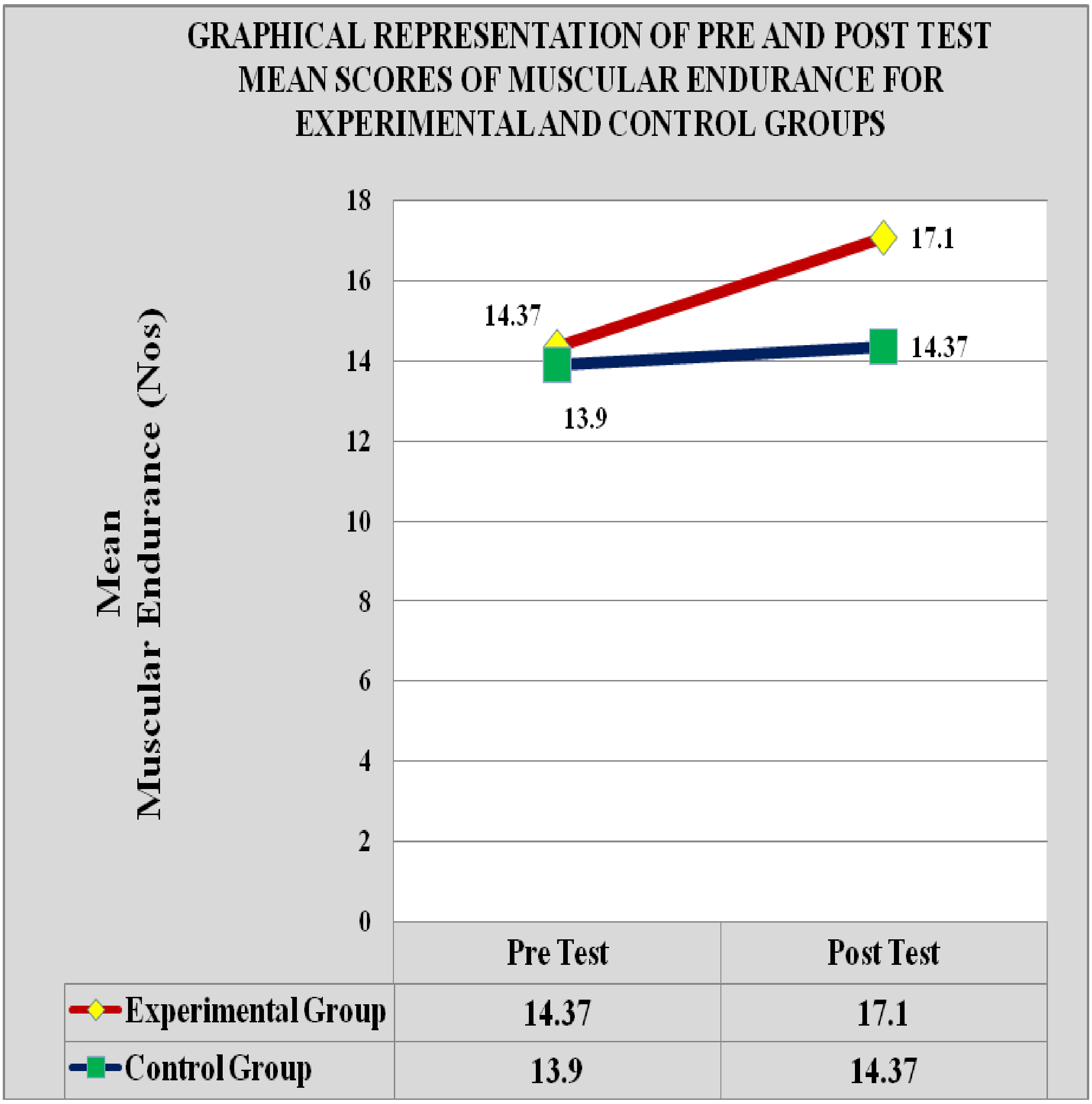
Muscular Endurance	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**'t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	14.37±5.93	17.10±4.94	2.73	0.62	4.37*	.000
	Con	30	13.90±4.50	14.37±4.23	0.47	0.25	1.85	.075
Difference of Mean Gain								
Muscular Endurance	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**'t' ratio**	**Sig (p)**			
	2.73	0.47	2.27	3.36	0.001			

* Significant at 0.05 level

The table 4.10 revealed that the mean scores of pre and post test scores of muscular endurance for experimental group are 14.37 and 17.10. The mean difference between the post test and pre test score is 2.73 and for control group, the pre and post test scores are 13.90 and 14.37 respectively. The mean difference between the post test and pre test score for control group is 0.47. The calculated 't' ratio between pre and post test scores of experimental group are 4.37 with df 29 ($P \leq 0.01$, there is a statistical significance difference between pre and post test scores of experimental group due to the anaerobic training. The obtained 't' ratio between pre and post test scores of control group are 1.85 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of muscular endurance for experimental group than the control group.

The table 4.10 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for muscular endurance is 2.27, the obtained 't' ratio for the two group is 3.36, where $p \leq 0.01$. Therefore the experimental and control group are significantly differed on the performance of muscular endurance for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control group on muscular endurance concerning with prior and after the anaerobic training.

FIGURE 4.5



GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEAN SCORES OF MUSCULAR ENDURANCE FOR EXPERIMENTAL AND CONTROL GROUPS
Mean Muscular Endurance (Nos)
18
16
14
12
10
8
6
4
2
0
14.37
17.1
14.37
13.9
Pre Test
Post Test
Experimental Group
14.37
17.1
Control Group
13.9
14.37

Table 4.11

Descriptive Statistics and 't' Ratio for Speed of Experimental and Control Groups for Sprint, Jump and Throw Talents

Speed	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**'t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	8.62±0.91	8.42±0.79	-0.19	0.09	2.08*	.046
	Con	30	8.53±0.65	8.51±0.62	-0.02	0.04	0.53	.599

Difference of Mean Gain

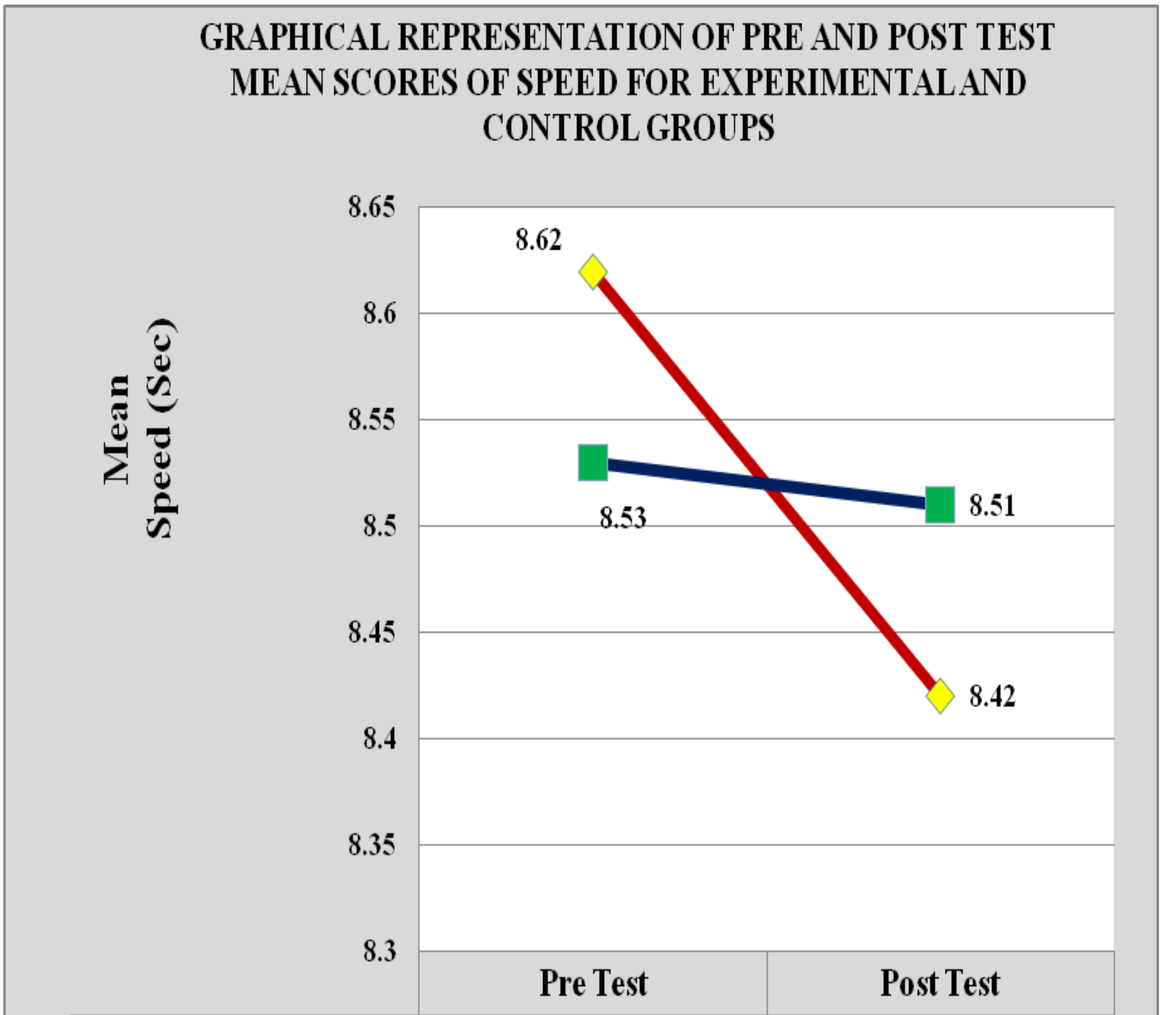
Speed	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**'t' ratio**	**Sig (p)**
	-0.19	-0.02	-0.17	1.71	0.093

* Significant at 0.05 level

The table 4.11 revealed that the mean scores of pre and post test of speed for experimental group are 8.62 and 8.42. The mean difference between the post test and pre test score is -0.19 and for control group, the pre and post tests mean score are 8.53 and 8.51 respectively. The mean difference between the post test and pre test score for control group is -0.02. The calculated 't' ratio between pre and post tests scores of experimental group are 2.08 with df 29 ($P \leq 0.05$), there is a statistical significance difference between the pre and post test scores of experimental group due to the anaerobic training. The obtained 't' ratio between pre and post test scores of control group are 0.53 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of speed for experimental group than the control group.

The table 4.11 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for speed is -0.17, the obtained 't' ratio for the two group is 1.71, where $p \geq 0.05$. Therefore the experimental and control groups are not significantly differed on the performance of speed for selected talents. The anaerobic training did not influenced significantly on the performance of speed. The following graphical representation clearly explained the mean value of both experimental and control groups on speed concerning with prior and after the anaerobic training.

FIGURE 4.6



	Pre Test	Post Test
Experimental Group	8.62	8.42
Control Group	8.53	8.51

Table 4.12

Descriptive Statistics and ‘t’ Ratio for Explosive Power of Experimental Group and Control Group for Sprint, Jump and Throw Talents

Explosive Power	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**‘t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	33.93±5.76	36.80±6.22	2.87	0.68	4.19*	.000
	Con	30	33.77±5.44	34.16±5.13	0.40	0.26	1.56	.130

Difference of Mean Gain

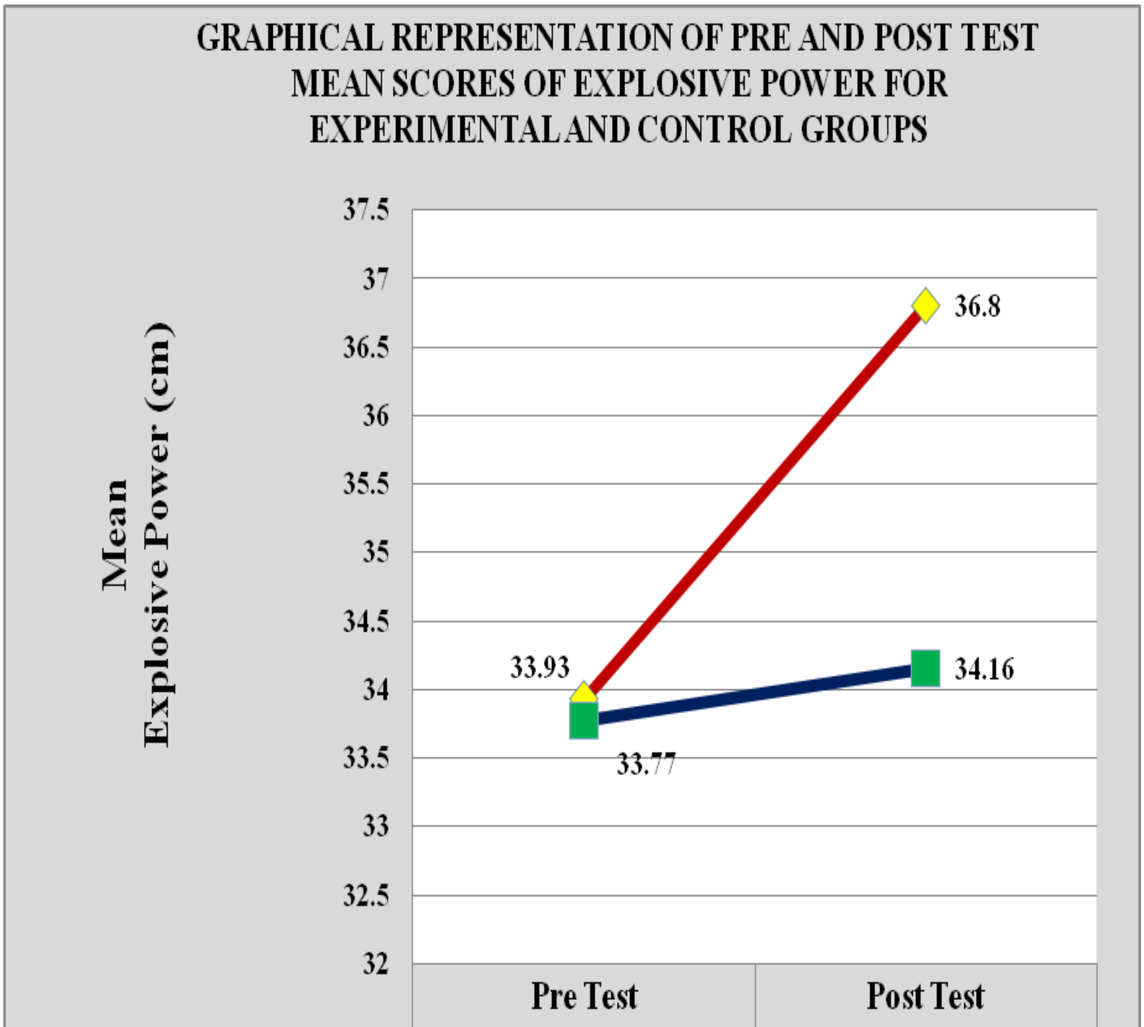
Explosive Power	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**‘t’ ratio**	**Sig (p)**
	2.87	0.40	2.47	3.37	0.001

* Significant at 0.05 level

The tables 4.12 explained that the mean scores of pre and post test of explosive power for experimental group are 33.93 and 36.80. The mean difference between the post test and pre test score is 2.87 and for control group, the pre and post test mean scores are 33.77 and 34.16 respectively. The mean difference between the post test and pre test score for control group is 0.40. The calculated ‘t’ ratio between pre and post test scores of experimental group are 4.19 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre and post test scores of experimental group due to the anaerobic training. The obtained ‘t’ ratio between pre and post test scores of control group are 1.56 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of explosive power for experimental group than the control group.

The table 4.12 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for explosive power is 2.47, the obtained ‘t’ ratio for the two group is 3.37, where $p \leq 0.01$. Therefore the experimental group and control group are significantly differed on the performance of explosive power for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control groups on explosive power concerning with prior and after the anaerobic training.

FIGURE 4.7



	Pre Test	Post Test
Experimental Group	33.93	36.8
Control Group	33.77	34.16

Table 4.13

Descriptive Statistics and 't' Ratio for Cardio Respiratory Endurance of Experimental and Control Groups for Sprint, Jump and Throw Talents

Cardio-respiratory Endurance	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**'t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	167.13±25.57	162.93±22.40	-4.20	1.36	3.08*	.005
	Con	30	168.90±24.37	168.03±23.41	-0.87	1.14	0.76	.454

Difference of Mean Gain

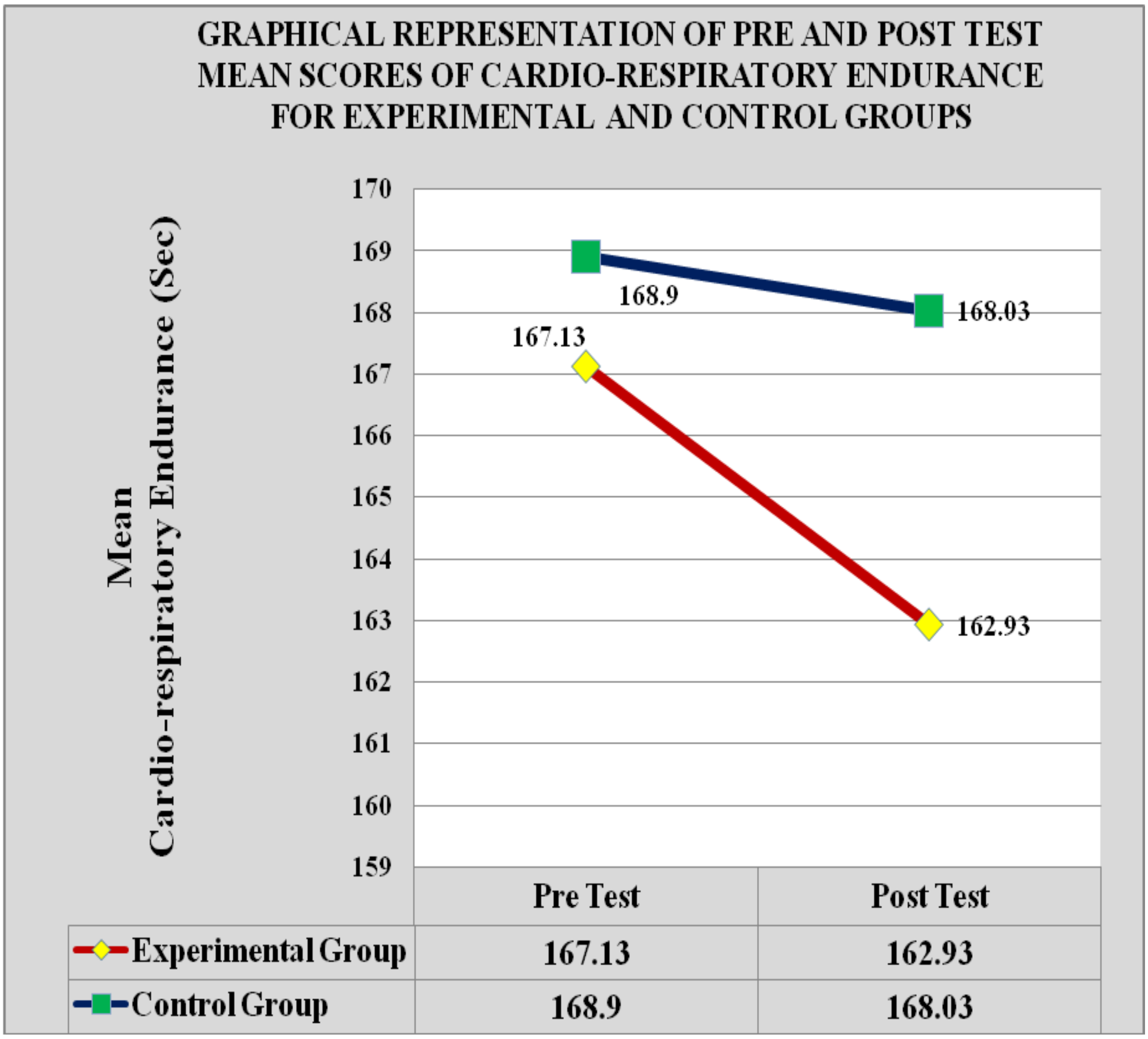
Cardio-respiratory Endurance	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**'t' ratio**	**Sig (p)**
	-4.20	-0.87	-3.33	1.87	0.066

* Significant at 0.05 level

The table 4.13 revealed that the mean scores of pre and post test of cardio-respiratory endurance for experimental group are 167.13 and 162.93. The mean difference between the post test and pre test score is -4.20 and for control group, the pre test and post test scores are 168.90 and 168.03 respectively. The mean difference between the post test and pre test score for control group is -0.87. The calculated 't' ratio between pre test and post test scores of experimental group is 3.08 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre test and post scores of experimental group due to the anaerobic training. The obtained 't' ratio between pre and post test scores of control group are 0.76 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of cardio-respiratory endurance for experimental group than the control group.

The table 4.13 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for cardio-respiratory endurance is –3.33, the obtained 't' ratio for the two group is 1.87, where $p \geq 0.05$. Therefore the experimental group and control group are not significantly differed on the performance of cardio-respiratory endurance for selected talents. The anaerobic training not influenced significantly on the performance of cardio-respiratory endurance. The following graphical representation clearly explained the mean value of both experimental and control groups on cardio-respiratory endurance concerning with prior and after the anaerobic training.

FIGURE 4.8



GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEAN SCORES OF CARDIO-RESPIRATORY ENDURANCE FOR EXPERIMENTAL AND CONTROL GROUPS
Mean
Cardio-respiratory Endurance (Sec)
170
169
168
167
166
165
164
163
162
161
160
159
168.9
168.03
167.13
162.93
Pre Test
Post Test
Experimental Group
Control Group
167.13
162.93
168.9
168.03

Table 4.14

Descriptive Statistics and 't' Ratio for Flexibility of Experimental and Control Groups for Sprint, Jump and Throw Talents

Flexibility	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**'t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	24.38±4.74	25.82±5.48	1.43	0.43	3.31*	.002
	Con	30	24.46±3.91	24.63±3.82	0.17	0.25	0.66	.515

Difference of Mean Gain

	Mean Gain Exp	**Mean Gain Con**	**M.D**	**'t' ratio**	**Sig (p)**
Flexibility	1.43	0.17	1.27	2.53	0.014

* Significant at 0.05 level

The table 4.14 revealed that the mean scores of pre and post test of flexibility for experimental group are 24.38 and 25.82. The mean difference between the post test and pre test score is 1.43 and for control group, the pre nd post test scores are 24.46 and 24.63 respectively. The mean difference between the post test and pre test score for control group is 0.17. The calculated 't' ratio between pre and post test scores of experimental group are 3.31 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre and post scores of experimental group due to the anaerobic training. The obtained 't' ratio between pre and post test scores of control group are 0.66 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of flexibility fpr experimental group than the control group.

The table 4.14 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for flexibility is 1.27, the obtained 't' ratio for the two group is 2.53, where $p \leq 0.01$. Therefore the experimental group and control group are significantly differed on the performance of flexibility for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control groups on flexibility concerning with prior and after the anaerobic training.

FIGURE 4.9

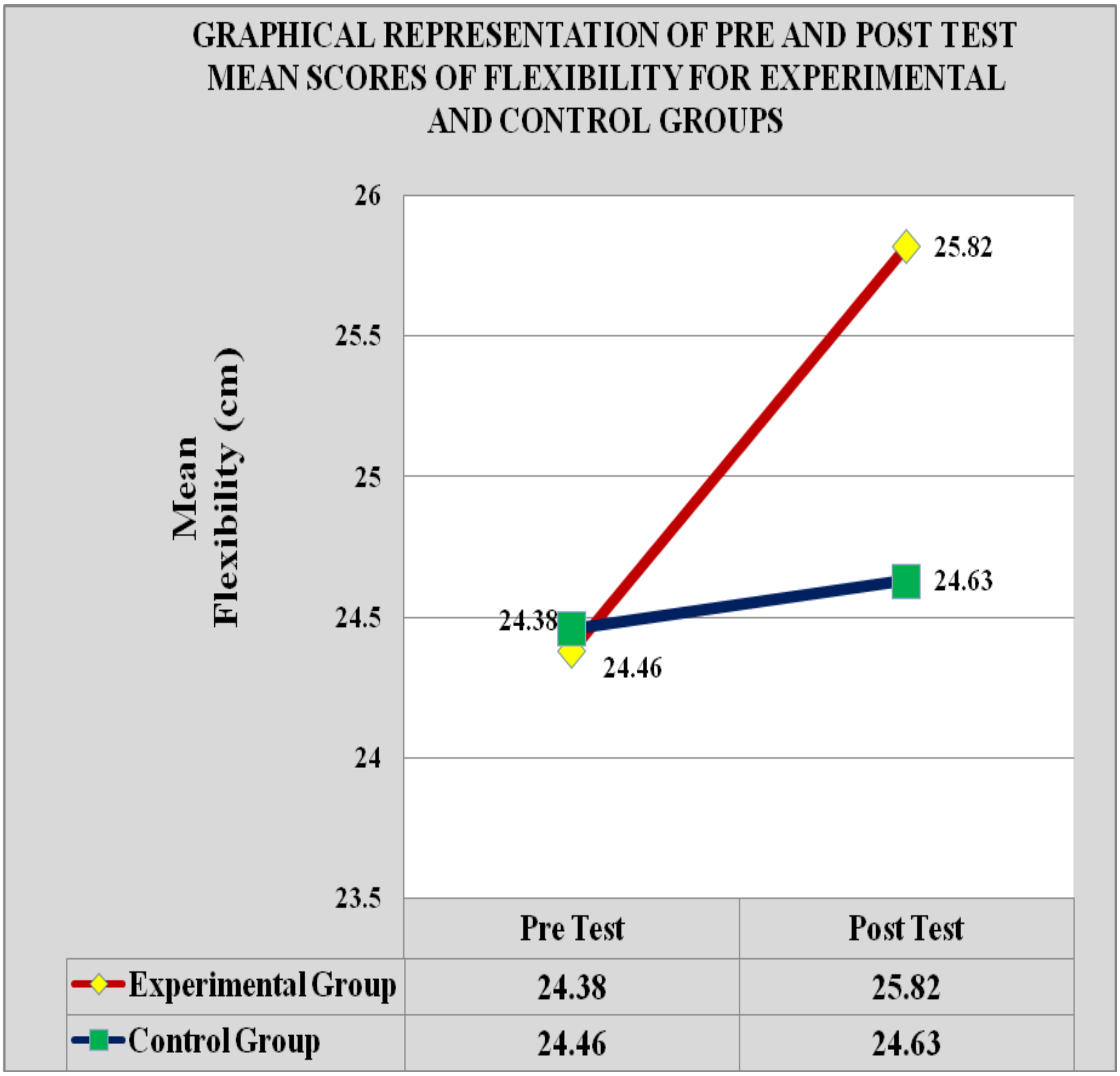

GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEAN SCORES OF FLEXIBILITY FOR EXPERIMENTAL AND CONTROL GROUPS
Mean Flexibility (cm)
26
25.5
25
24.5
24
23.5
25.82
24.63
24.38
24.46
Pre Test
Post Test
Experimental Group
24.38
25.82
Control Group
24.46
24.63

Table 4.15

Descriptive Statistics and 't' Ratio for Coordination of Experimental and Control Groups for Sprint, Jump and Throw Talents

Coordination	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**'t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	54.70±15.18	48.13±11.27	-6.57	2.09	3.13*	.004
	Con	30	51.97±11.44	52.77±9.58	0.80	1.24	0.64	.524

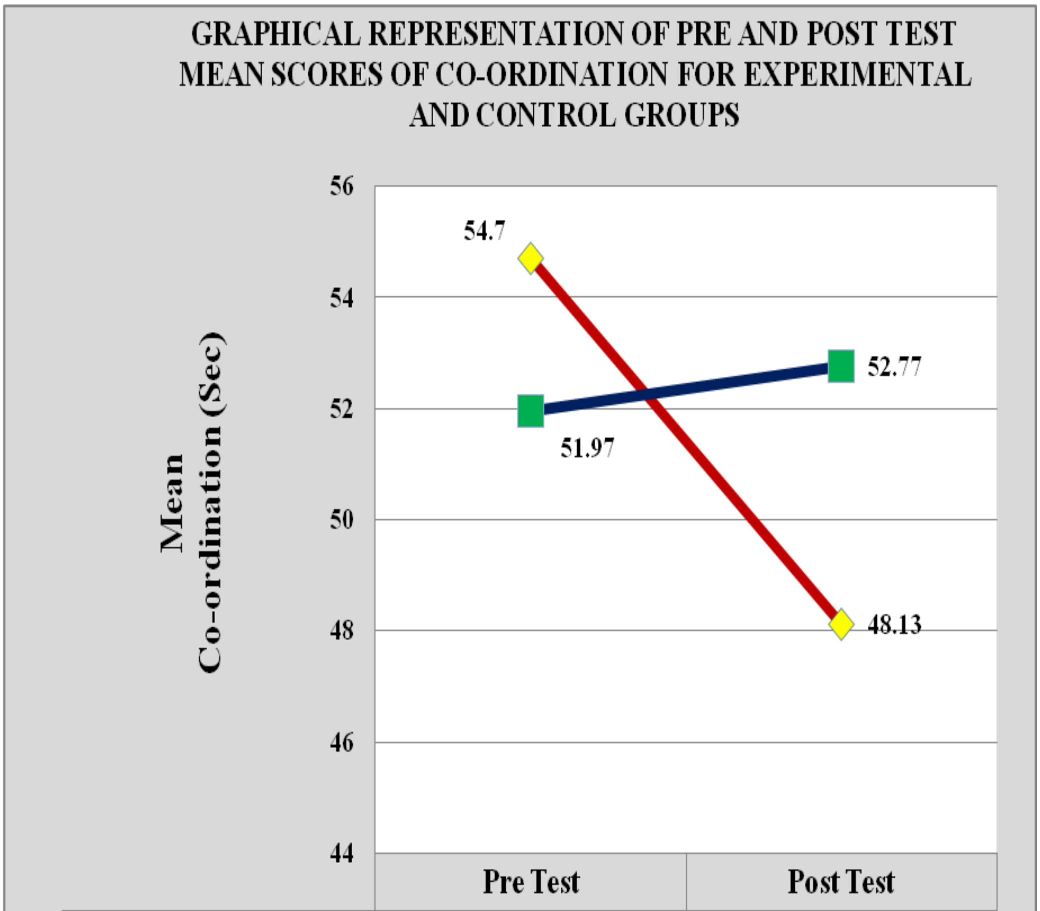
Difference of Mean Gain					
Coordination	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**'t' ratio**	**Sig (p)**
	-6.57	0.80	-7.37	3.03	0.004

* Significant at 0.05 level

The table 4.15 revealed that the mean scores of pre and post test of coordination for experimental group are 54.70 and 48.13. The mean difference between the post test and pre test mean score is -6.57 and for control group, the pre and post test scores are 51.97 and 52.77 respectively. The mean difference between the post test and pre test score for control group is 0.80. The calculated 't' ratio between pre and post test scores of experimental group are 3.13 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre and post test scores of experimental group due to the anaerobic training. The obtained 't' ratio between pre and post test scores of control group is 0.64 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of coordination for experimental group than the control group.

The table 4.15 also reveals that the mean gain difference between experimental and control groups of sprint, jump and throw talents for coordination is -7.37, the obtained 't' ratio for the two group is 3.03, where $p \leq 0.01$. Therefore the experimental and control group are significantly differed on the performance of coordination for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control groups on coordination concerning with prior and after the anaerobic training.

FIGURE 4.10



	Pre Test	Post Test
Experimental Group	54.7	48.13
Control Group	51.97	52.77

Table 4.16

Descriptive Statistics and ‘t’ Ratio for 100 M Dash of Experimental and Control Groups for Sprint, Jump and Throw Talents

100 m Dash	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**‘t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	16.49±1.76	15.98±1.41	-0.51	0.11	4.55*	.000
	Con	30	16.12±1.41	16.27±1.50	0.15	0.11	1.44	.160

Difference of Mean Gain

100 m Dash	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**‘t’ ratio**	**Sig (p)**
	-0.51	0.15	-0.66	4.30	0.000

* Significant at 0.05 level

The table 4.16 revealed that the mean scores of pre and post test of 100 m dash for experimental group are 16.49 and 15.98. The mean difference between the post test and pre test score is -0.51 and for control group, the pre and post test scores mean scores are 16.12 and 16.27 respectively. The mean difference between the post test and pre test score for control group is 0.15. The calculated ‘t’ ratio between pre and post test scores of experimental group is 4.55 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre test and post scores of experimental group due to the anaerobic training. The obtained ‘t’ ratio between pre test and post test scores of control group is 1.44 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results show that the anaerobic training significantly improves the performance of 100 m dash for experimental group than the control group.

The table 4.16 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for 100 m dash is -0.66, the obtained ‘t’ ratio for the two group is 4.30, where $p \leq 0.01$. Therefore the experimental and control group are significantly differed on the performance of 100 m dash for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control groups on 100 m dash concerning with prior and after the anaerobic training.

FIGURE 4.11

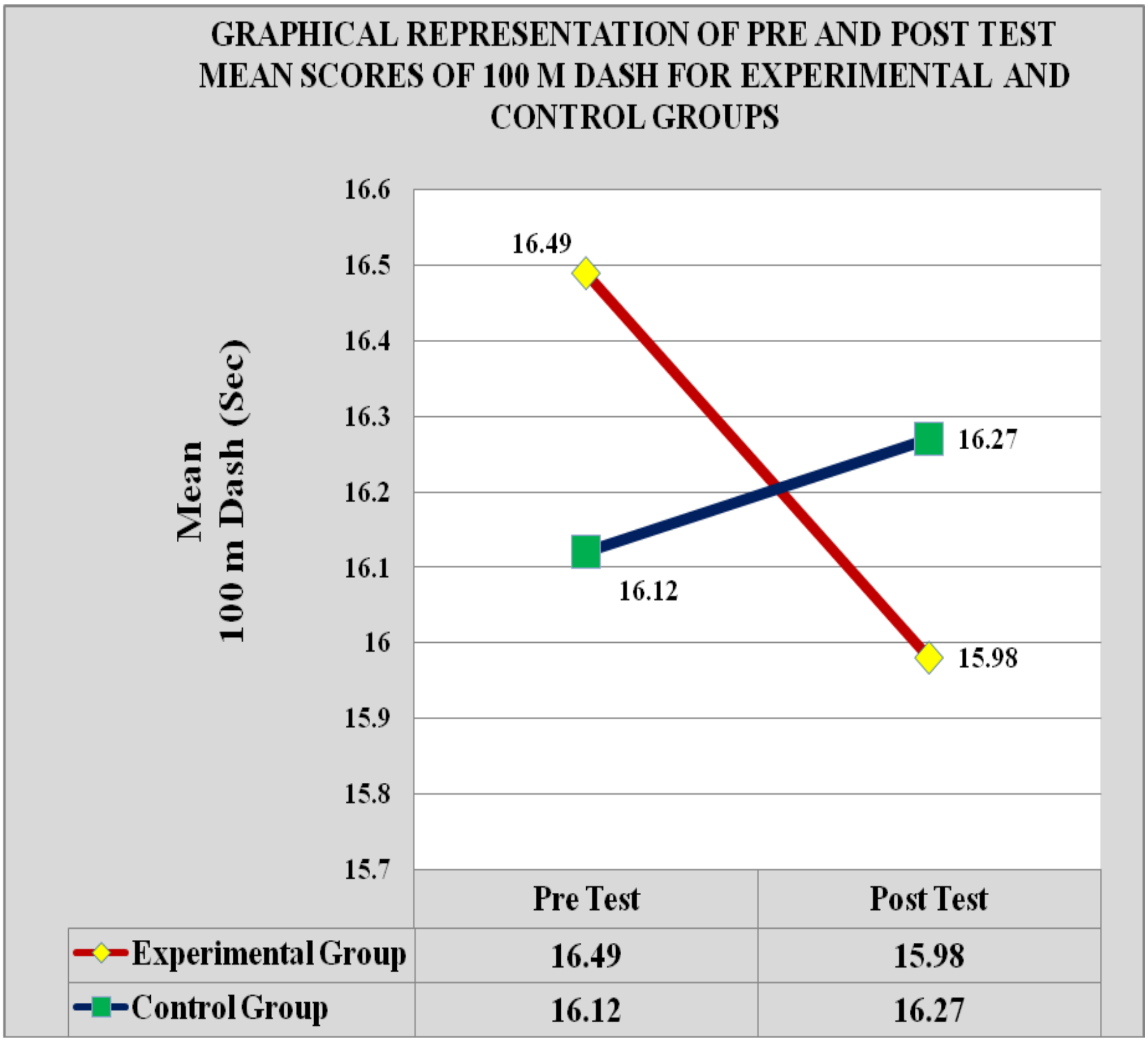

GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEAN SCORES OF 100 M DASH FOR EXPERIMENTAL AND CONTROL GROUPS
Mean
100 m Dash (Sec)
16.6
16.5
16.4
16.3
16.2
16.1
16
15.9
15.8
15.7
16.49
16.27
16.12
15.98
Pre Test
Post Test
Experimental Group
16.49
15.98
Control Group
16.12
16.27

Table 4.17

Descriptive Statistics and ‘t’ Ratio for Long Jump of Experimental and Control Groups for Sprint, Jump and Throw Talents

<table>
<tr><td>Long Jump</td><td>Group</td><td>N</td><td>Pre-test Mean±SD</td><td>Post-test Mean±SD</td><td>M.D</td><td>S.E</td><td>‘t' ratio</td><td>Sig. (2 tailed)</td></tr>
<tr><td rowspan="2">Groups</td><td>Exp</td><td>30</td><td>3.21±0.49</td><td>3.42±0.51</td><td>0.21</td><td>0.04</td><td>5.33*</td><td>.000</td></tr>
<tr><td>Con</td><td>30</td><td>3.20±0.56</td><td>3.25±0.55</td><td>0.04</td><td>0.02</td><td>1.85</td><td>.074</td></tr>
<tr><td colspan="9">Difference of Mean Gain</td></tr>
<tr><td rowspan="2">Long Jump</td><td colspan="2">Mean Gain Exp</td><td colspan="2">Mean Gain Con</td><td colspan="2">M.D</td><td>‘t’ ratio</td><td>Sig (p)</td></tr>
<tr><td colspan="2">0.21</td><td colspan="2">0.04</td><td colspan="2">0.17</td><td>3.58</td><td>0.001</td></tr>
</table>

* Significant at 0.05 level

The table 4.17 revealed that the mean scores of pre and post test of long jump for experimental group are 3.21 and 3.42. The mean difference between the post test and pre test score is 0.21 and for control group, the pre and post test scores are 3.20 and 3.25 respectively. The mean difference between the post test and pre test score for control group is 0.04. The calculated ‘t’ ratio between pre and post test scores of experimental group is 5.33 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre and post test scores of experimental group due to the anaerobic training. The obtained ‘t’ ratio between pre and post test scores of control group is 1.85 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The result shows that the anaerobic training significantly improves the performance of long jump for experimental group than the control group.

The table 4.17 also reveals that the mean gain difference between experimental and control group of sprint, jump and throw talents for long jump is 0.17, the obtained ‘t’ ratio for the two group is 3.58, where $p \leq 0.01$. Therefore the experimental and control groups are significantly differed on the performance of long jump for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control groups on long jump concerning with prior and after the anaerobic training.

FIGURE 4.12

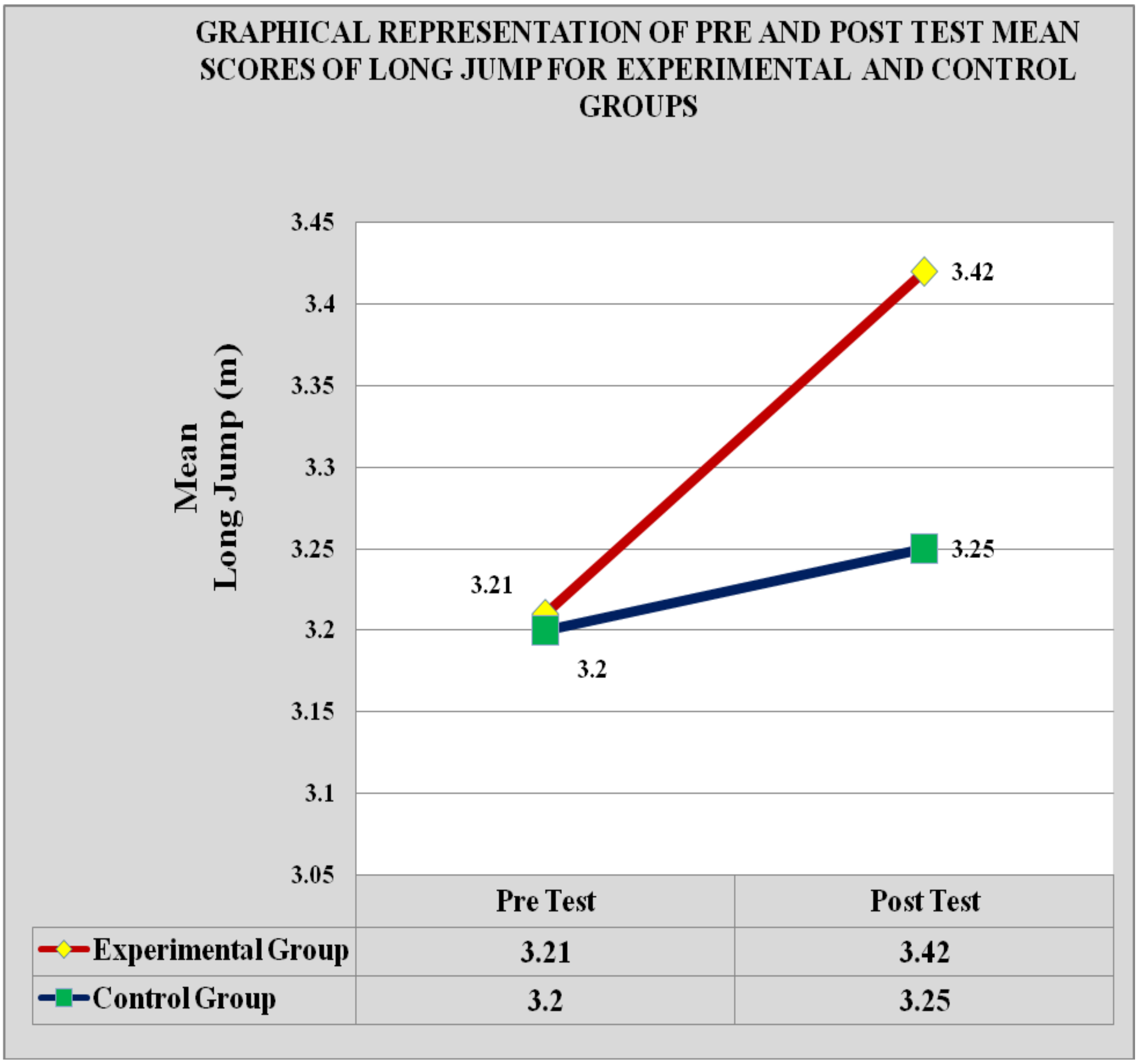

GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEAN SCORES OF LONG JUMP FOR EXPERIMENTAL AND CONTROL GROUPS
Mean Long Jump (m)
3.45
3.4
3.35
3.3
3.25
3.2
3.15
3.1
3.05
3.42
3.25
3.21
3.2
Pre Test
Post Test
Experimental Group
3.21
3.42
Control Group
3.2
3.25

Table 4.18

Descriptive Statistics and ‘t’ Ratio for Shot-put Performance of Experimental and Control Groups for Sprint, Jump and Throw Talents

Shot - put	**Group**	**N**	**Pre-test Mean±SD**	**Post-test Mean±SD**	**M.D**	**S.E**	**‘t' ratio**	**Sig. (2 tailed)**
Groups	Exp	30	5.46±0.97	6.18±0.94	0.71	0.10	6.88*	.000
	Con	30	5.80±1.38	5.86±1.36	0.05	0.04	1.43	.164

Difference of Mean Gain

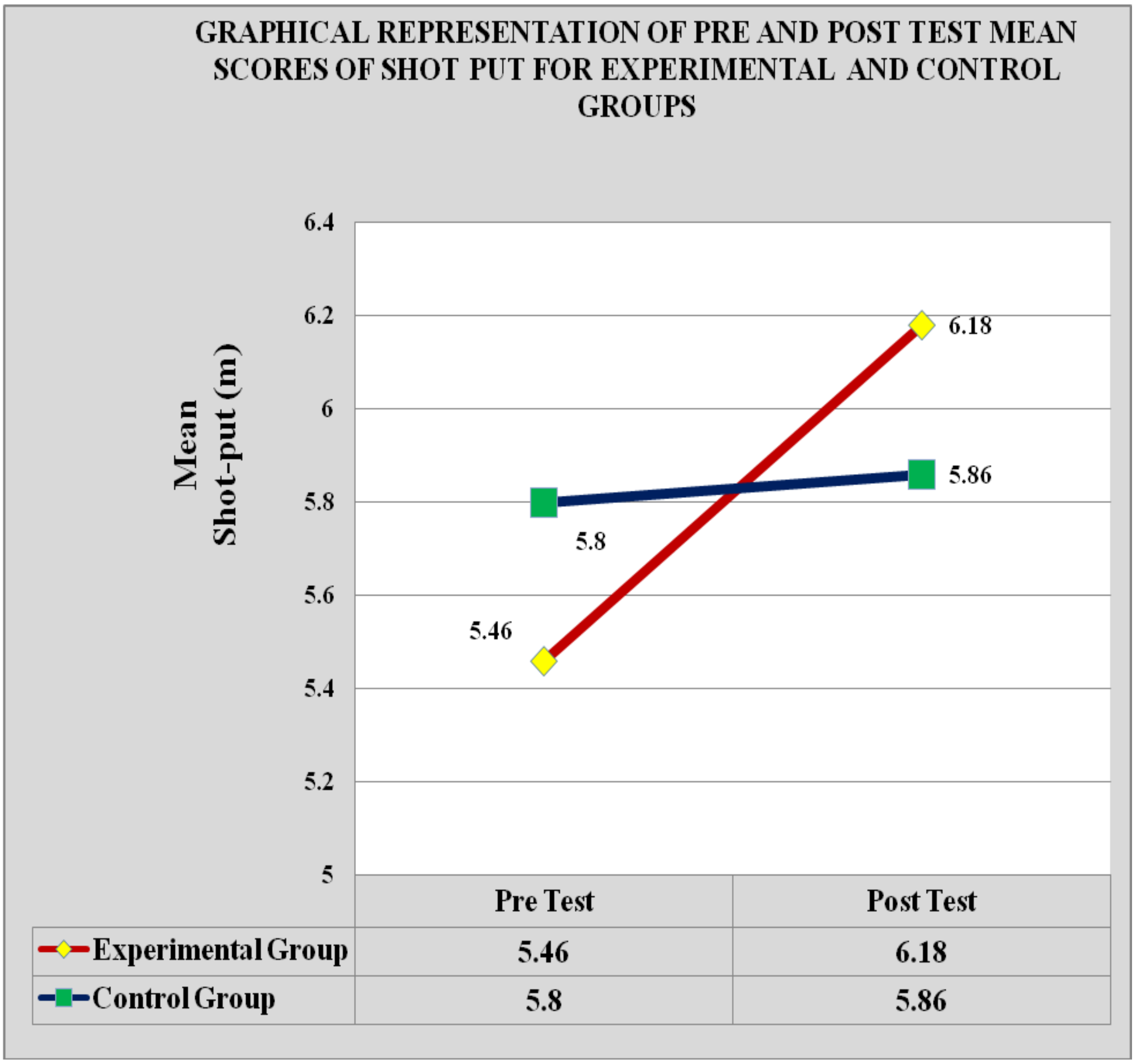
Shot - put	**Mean Gain Exp**	**Mean Gain Con**	**M.D**	**‘t’ ratio**	**Sig (p)**
	0.71	0.06	0.65	5.84	0.000

* Significant at 0.05 level

The table 4.18 revealed that the mean scores of pre and post test of shot-put for experimental group are 5.46 and 6.18. The mean difference between the post test and pre test score is 0.71 and for control group, the pre and post test scores are 5.80 and 5.86 respectively. The mean difference between the post test and pre test score for control group is 0.05. The calculated ‘t’ ratio between pre and post test scores of experimental group is 6.88 with df 29 ($P \leq 0.01$), there is a statistical significance difference between pre and post test scores due to the anaerobic training. The obtained ‘t’ ratio between pre and post test scores of control group is 1.43 with df 29 ($P \geq 0.05$), there is no statistical significance difference before and after the twelve weeks period. The results shows that the anaerobic training significantly improves the performance of shot-put for experimental group than the control group.

The table 4.18 also reveals that the mean gain difference between experimental and control groups of sprint, jump and throw talents for shot-put performance is 0.65, the obtained ‘t’ ratio for the two group is 5.84, where $p \leq 0.01$. Therefore the experimental and control groups are significantly differed on the performance of shot-put for selected talents. The difference may be attributed to the anaerobic training. The following graphical representation clearly explained the mean value of both experimental and control groups on shot-put performance concerning with prior and after the anaerobic training.

FIGURE 4.13


GRAPHICAL REPRESENTATION OF PRE AND POST TEST MEAN SCORES OF SHOT PUT FOR EXPERIMENTAL AND CONTROL GROUPS
Mean
Shot-put (m)
6.4
6.2
6
5.8
5.6
5.4
5.2
5
6.18
5.86
5.8
5.46
Pre Test
Post Test
Experimental Group
5.46
6.18
Control Group
5.8
5.86

4.5 Discussion on Findings

Motor fitness variables and performance variables in track and field events development can be influenced by the different type of sports training, which was given to the individuals in specific period of their sports life. Anaerobic training is one of the training method, which influenced by the anaerobic energy sources. The training becomes predominant only at the highest exercise intensities, such as short bursting sprint, plyometric and weight training.

Many researchers pointed out, anaerobic training greatly improves the motor fitness components. In this research the results shows that selected motor fitness and performance variables, namely isometric leg strength, muscular endurance, speed, explosive power, cardio-respiratory endurance, flexibility, coordination, 100 m dash, long jump and shot-put performances in track and field events improved after the anaerobic training for experimental group. But control group, there is no significant difference between pre test and post test scores on selected motor fitness and performance variables.

The mean gain difference between experimental and control group of sprint, jump and throw talents for isometric leg strength, muscular endurance, explosive power, flexibility, coordination, 100 m dash, long jump and shot-put performance is significantly differed due to the anaerobic training but 50 m speed and cardio-respiratory endurance does not show any significant difference.

The anaerobic training major energy source is anaerobic but the contribution from the aerobic pathways will make progressively greater contribution to the total as the duration of the exercise up to 2 minutes (Soliman, 2002). The anaerobic training can trigger a dramatic increase in glycolitic enzyme activity, improves efficiency of movement, aerobic energetic and buffering capacity (Wilomre and Costill, 1994).

Skeletal muscle adapts to anaerobic training primarily by increasing its size, facilitating fiber type transitions, and enhancing its biochemical and ultra-structural components. These changes result in enhanced muscular strength, power, and muscular endurance. Anaerobic training may enhance the reflex response, thereby enhancing the magnitude and rate of force development. Anaerobic training enhances motor performance and the magnitude of change is based on the specificity of the exercises or modalities performed.

The isometric leg strength, muscular endurance, speed, explosive power, 100 m dash, long jump and shot-put performances were related to the anaerobic metabolism. Through the anaerobic training the muscles get energy anaerobically, increases the bounciness of the stride, so that the feet come off the ground faster and more forcefully. The reason for these changes can be discussed as follows.

Discussion on Isometric Leg Strength

Muscular strength is the capacity of an individual to exert muscular force against a resistance. The physiological and mechanical factors such as size and number of muscle fibers, proportion of the muscle fibers activated, coordination of the muscle groups, condition of the muscles and action of the lever can determine the force in any particular movement (Herbert and Terry, 1994).

The result of the present study shows that the anaerobic training significantly influences the performance of muscular strength, where the neural adaptation take place and muscle size and strength increased in progressive way. The training programmme includes whole body strengthening exercises, which provide explosive energy and burst speed to legs and arms.

The present study showed that both sprint, jump and throw talents increased in strength after anaerobic training. The reason may be related to the levels of serum testosterone initiated by the training. It is also believable that part of the difference in strength may result from a better mastery of the neuromuscular system in the talents caused by the training schedule that the talented boys were exposed to from an early age. The fact that the trained talent boys were stronger than the control group boys.

Discussion on Muscular Endurance

Muscular endurance represents the capacity of the individual for continuous performance of relatively heavy localized activity. Muscular endurance depends to a large extent upon strength, but also upon other qualities among them the efficiency of the blood supply in the muscles involved, and the viscosity of the muscle tissue.

The present study showed that both sprint, jump and throw talents increased in muscular endurance after anaerobic training. When training consists predominantly of bouts of exercise lasting between 30 seconds and 2 minutes, improves "short-term" muscular endurance. This is the main reason for improving muscular endurance through sustained strength capacity through anaerobic training.

The result of the study related with the many findings. Individuals with greater muscular strength usually have greater muscular endurance. Strength and power are interrelated. It has been shown that stronger subjects generally produce a greater maximum power output. Recent Studies shows athletes with high leg and hip strength produce high power output in the vertical jump (Micheal, 1963).

Discussion on Speed

The coordinated movements of the muscle, technique and economy of the movement are the crucial element to determine the speed. The present study showed that both sprint, jump and throw talents not increased in 50 m speed after anaerobic training, but 100 m speed significantly improved.

The fifty m sprint is the event completed within 9 seconds in this age group; therefore the athletes have to perform from the first second. But 100 m sprint running athletes generate the greater force, if he has the poor start. During the 50 m sprint many factors determines the performance, such as motor fitness requirements, biomechanics of running, heredity, training schedules and motivation.

When considering 50 m speed it is important to include reaction time and motivation. Reaction time is the time between a stimulus and the first movement by the athlete, such as the start signal and the athlete's movement from the start. There are many factors both physiological and psychological which influence reaction time and the initiation of movement. In addition the development of short distance speed needs time and patience. The present training schedule not much concentrated on reaction time and motivational factor. So the researcher suggested that the anaerobic training program can contain some reaction training.

The 100 m running speed, improved by application of anaerobic training, where runs over short distances at maximum effort. The skill of moving at speed should, like all skills, be practiced before the athlete becomes fatigued.

Discussion on Explosive Power

In terms of explosive power (vertical jump, shot put and long jump performance), the improvements takes place when the frequencies of impulses should be high but the number of impulses should be low. The reason behind this result was the maximum shortening velocity of an unloaded muscle is proportional to the length of the muscle. When the muscle length is increased by increasing the number of sarcomers in series, the maximum shortening velocity will increase proportionally to the change in length (Herbert and Terry, 1994).

The present study showed that both sprint, jump and throw talents increased in vertical jump, long jump and shot-put performance after anaerobic training. The training generally results in very high power outputs, which is why, talent individuals have an effect on explosive power.

The reason may be the neural adaptations which occur during anaerobic training provide the greatest explanation for their effectiveness. Improved motor unit recruitment may account for the most important adaptation encountered during anaerobic training. Since larger motor units have higher neural thresholds than do smaller motor units, therefore they are stimulated only under greater intensity training.

Discussion on Flexibility

Flexibility is the range of motion of a certain joint depends on bone, muscle and connective tissue integrity as well as other factors such as pain and the ability to produce an adequate amount of muscle force.

The present study showed that both sprint, jump and throw talents increased in flexibility after anaerobic training. The training includes the pre and post flexibility exercise each session, which enhance the quality of the training without injury. This factor may be influences other motor fitness components.

The improvement of flexibility may be the body's involuntary response to an external stimulus that stretches the muscle and causes a reflexive increase in muscular activity.

Discussion on Co-ordination

The coordination involves the coordinated vision and hand movement to execute a task. It has been shown the proprioception of limbs, both active and passive movements of the limbs are result in eye saccades overshoots when the hands are being used to guide eye movements. As a result, limb based proprioception has been determined to be capable of being transformed into visual motor coordinates to guide eye saccades, which allows for the guidance of the saccades by the hands and feet.

The present study showed that both sprint, jump and throw talents increased in coordination after anaerobic training. The training includes ABC exercises, which enhance the quality of the movement and coordination.

The result of the study related with many studies, it can be given as follows

Kruger et.al (2009) tested the talent identification protocol and evaluates the development programme for 10 weeks. The development programme contributed statistically significant to the improvement in flexibility, muscular endurance, 40 m speed, and long jump ability. Explosive power, and speed endurance did not improved. The result revealed that an anaerobic training of 12 weeks had appositive effect on the motor and performance qualities for sprint jump and throw talents of 12-14 years age.

Bernasconi et al. (1995) reported that running training of either type at aerobic workloads had no effect on the co-ordination between running and breathing rhythms. At anaerobic intensities, however, the degree of co-ordination between running and breathing rhythms was higher in the endurance trained athletes than in the sprinters or in the untrained subjects. The degree of co-ordination increased with increasing regularity of breathing. The ability to increase intentionally the degree of co-ordination by paced breathing was independent of running training and was lowest at anaerobic exercise intensities.

There is much published literature that studies the motor fitness qualities of a sprinter, jumper and thrower. However little research is available that seeks to show the amount of anaerobic work should be implemented across a wide variety of events in track and field.

4.6 Discussion on Hypotheses

H_1: The talent identification program would be meaningful way to select the students respect to sprint & jumping and throwing events.

The result of the study revealed that the sprint, jump and throw talents can be selected on the basis of the selected predicted model and T- scores from the 11 tests.

The percentage of T scores ranked for all individual, which is appropriately same as the predicted model. So the talent identification programme influenced the sprint & jump and throw events performances in track and field events. So the null hypothesis was rejected at 0.05 level of confidence.

H_2: The separate talent identification model would be predictors of sprint & jumping events and throwing event performances.

In connection with the sprint & jump and throw event performances in track and field events, specific prediction equations were found from the result of the study. The field test in the model were somatotypes components (endomorphy, mesomorphy, ectomorphy), isometric leg strength, 50 m speed, standing broad jump, vertical jump, standing triple jump, five consecutive hops, push-ups, and shot backward throw.

There is a significant relationship between the 100 m performance and predictor variables standing broad jump, 50 m dash and five consecutive hops at 0.05 level of confidence. So the null hypothesis was rejected at 0.05 level of confidence. But the remaining five variables in the sprint & jump model, endomorphy, mesomorphy, ectomorphy, isometric leg strength and vertical jump were not significantly influence the performance of 100 m dash at 0.05 level of confidence. So there is no evidence to reject the null hypothesis.

There is a significant relationship between the long jump performance and predictor variables vertical jump, five hops, standing broad jump and 50 m dash at 0.05 level of confidence. So the null hypothesis was rejected at 0.05 level of confidence. But the remaining four variables in the sprint & jump model, endomorphy, mesomorphy, ectomorphy and leg isometric strength were not significantly influence the performance of long jump at 0.05 level of confidence. So there is no evidence to reject the null hypothesis.

There is a significant relationship between the shot-put performance and predictor variables shot backward throw, isometric leg strength and standing triple jump at 0.05 level of confidence. So the null hypothesis was rejected at 0.05 level of confidence. But the remaining six variables in throw model, endomorphy, mesomorphy, ectomorphy, 50 m dash, standing broad jump and push-ups were not significantly influence the performance of long jump at 0.05 level of confidence. So there is no evidence to reject the null hypothesis.

H_3: The Anaerobic training would significantly improves the selected motor fitness and performance variables in track and field events for experimental group than control group of sprint, jumping and throwing talents.

The result of the anaerobic training on all motor fitness variables and performance variables were significantly improved from pre test to post test than the control group. So the null hypothesis was rejected at 0.05 level of confidence.

The mean gain difference between experimental and control group of isometric leg strength, muscular endurance, explosive power, flexibility, coordination, 100 m dash, long jump and shot-put performance is significantly differed due to the anaerobic training at 0.05 level of confidence. So the null hypothesis was rejected at 0.05 level of confidence. Anaerobic training does not show any significant difference on 50 m speed and cardio-respiratory endurance. Therefore there is no evidence to reject the null hypothesis.