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A Comparative Analysis of Motor Fitness Components among Sprinters, Throwers and Jumpers

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Abstract

Thus the aim of this study was to determine the comparative analysis of motor fitness components among Sprinters, Throwers and Jumpers. To obtain data, the investigators had selected Sixty (N=60), Male Inter-College and Inter-University Level (Sprinters, Throwers and Jumpers) between the age group of 18-25 years (Mean ± SD: age 20.683±2.02 years, height 5.7449±26.3 m, body mass 76.400±14.3 kg) were selected. The subjects were purposively assigned into three groups: Group-A: Sprinters (n_1=60); Inter-College (n_{1a}=30) and Inter-University (n_{1b}=30); Group-B: Throwers (n_2=60); Inter-College (n_{2a}=30) and Inter-University (n_{2b}=30); Group-C: Jumpers (n_3=60); Inter-College (n_{3a}=30) and Inter-University (n_{3b}=30). One way Analysis of Variance (ANOVA) to find out the intra-group differences and where the 'F' ratio found significant then Post-hoc test Least Significant Difference (LSD) was applied to find out the direction and degree of differences. To test the hypothesis, the level of significance was set at 0.05. To conclude, it is significant to mention in relation to Motor Fitness Components that insignificant differences occur among Inter-College Sprinters, Thrower and Jumpers on the sub variable Explosive Strength. However, the significant differences occur among Inter-College Sprinters, Throwers and Jumpers on the sub variable Agility, Balance, Speed and Flexibility. To conclude, it is significant to mention in relation to Motor Fitness Components that insignificant differences occur among Inter-University Sprinters, Thrower and Jumpers on the sub variable Agility and Explosive Strength. However, the significant differences occur among Inter-University Sprinters, Throwers and Jumpers on the sub variable Balance, Speed and Flexibility.

Keywords: Motor fitness components, sprinters, throwers and jumpers.

Introduction

Today's many sports are played by the peoples in the world, but athletic is one of the most popular sports. Because of its tradition, its universality and prestige, as well as the wide range of skills and qualities that encompasses, it is the basic sports "par excellence". In addition, athletic constitute the most important element of the modern Olympic games. It is practices in all countries for the education values and its role in the improvement of physical condition. Often providing the necessary foundation for optimum performance in other sports, it is frequently regard as an example of country development. Athletic is a competitive physical activity made up of several separate events, based on the natural movement of running, jumping and throwing. The earliest form of athletics on an organised basis is generally recognised as taking place during the year of classical antiquity, notably in the ancient Olympic Games. Since those days athletic programme continuously modified and extended. Athletics is also known as track and field or track and field athletics. This name is derived from the Greek word 'Athlon' meaning 'contest'. Athletics was included in the first modern Olympic Games in 1896 and has formed its backbone since that time. An International governing body of athletics (IAAF) was founded in 1912 in order to determine the regulations of the competitions and to inspect the international competitions. Presently twenty three events are recognized by the (IAAF). The athletic events are divided into two categories: Track events and Field events. Track Events are the events which are held in between the marked lanes. Track events are also divided into different categories sprint races, middle distance races, long distance races, hurdle races, relay races, and walking. Track Events: Sprints: 100m, 200m, and 400m 110m Hurdles, 400m Hurdles, 100m Hurdles for women. 4X100m, 4X400m Relays. Middle Distance: 800m, 1500m, 3000m steeplechase. Long Distance: 5000m, 10000m, half-marathon, marathon, walking events and cross-country race. An athlete's motor fitness is a combination of five different components, each of which is essential for high levels of performance[1]. Motor fitness, also termed motor ability refers to a person's performance abilities as affected by the factors of agility, balance, speed, explosive strength, and flexibility[2]. All the five components of motor fitness are essential for competing at high levels of sports performance. That's why the concept is seen as an essential part of any athlete's training regime. Male players were taller, leaner, and had greater speed, agility, muscular power, and estimated maximal aerobic power than female players[3]. Based on our review in the study of physical and physiological attribute of female volleyball players, it was found that players of a higher skill level are taller,

somewhat heavier, and have higher vertical jump values than players of a lower level[4]. In the study, anthropometry and motor fitness in children aged 6-12 year was observed. The researcher observed that motor fitness significantly correlated with age, and performance was higher in males. Moreover, motor fitness tests positively correlated with each other, especially in females. In the 6-12 years period, motor performance of the athletes improves with age and improvement is partially sex-related; this correlation is higher in boys, possibly because of their lesser amount of fat. Results also suggest that explosive strength and velocity are related to 6-12 years age span, mainly because both are power events which involve horizontal movement of the centre of mass. The researcher feels that as far as sprinters, throwers and jumpers are concerned, these components of motor fitness contribute to the ability of the athlete's body to handle competition demand of the competition. Due to the importance of these motor fitness components, it has become an eye catching area for sports scientist. The investigator also feels that these components play important role in the performance of sprinters, throwers and jumpers; due to the importance of these components, the investigator of present study selected these components understudy.

Methodology

Selection of Subjects: For the purpose of the present study, Sixty (N=60), Male Inter-College and Inter-University Level (Sprinters, Throwers and Jumpers) between the age group of 18-25 years (Mean ± SD: age 20.683±2.02 years, height 5.7449±26.3 m, body mass 76.400±14.3 kg) were selected. The subjects were purposively assigned into three groups: Group-A: Sprinters (n_1=60). Inter-College (n_{1a}=30) and Inter-University (n_{1b}=30). Group-B: Throwers (n_2=60). Inter-College (n_{2a}=30) and Inter-University (n_{2b}=30). Group-C: Jumpers (n_3=60). Inter-College (n_{3a}=30) and Inter-University (n_{3b}=30)

Selection of Variables: A feasibility analysis as to which of the variables could be taken up for the investigation, keeping in view the availability of tools, adequacy to the subjects and the legitimate time that could be devoted for tests and to keep the entire study unitary and integrated was made in consultation with experts. With the above criteria in mind, the following motor fitness components were selected for the present study:

Motor fitness components: Agility, Balance, Speed, Explosive Strength, Flexibility.

Statistical Technique Employed: One way Analysis of Variance (ANOVA) to find out the intra-group differences and where the 'F' ratio found significant then Post-hoc test Least Significant Difference (LSD) was applied to find out the direction and degree of differences. To test the hypothesis, the level of significance was set at 0.05.

Results and Discussion

The results of Motor Fitness Components of Inter-College and Inter-University level (Sprinters, Throwers and Jumpers) are presented in the following tables and their interpretations are given accordingly. Graphical representation of each variable is also presented for mean comparison. Further discussion of finding is initiated for better understanding of results.

Table-1
Analysis of Variance (ANOVA) Results With Regard to Motor Fitness Components among Inter-College (Sprinters, Throwers and Jumpers) on the Sub-Variable Agility

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	P-value (Sig.)
Between Groups	17.759	2	8.879	3.948*	.023
Within Groups	195.650	87	2.249		
Total	213.409	89			

F 0.05 (2, 87)

It can be judged from table-1 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable agility were found statistically significant (P<.05). Since the obtained F-ratio 3.948 was found statistically significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable agility. The results of Post-hoc test have been presented in table-2.

Table-2
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Agility

Mean values and groups		Mean Difference	P-value q (Sig.)
Sprinters (16.3203)	Throwers (17.0870)	.76667	.051
	Jumpers (16.0350)	.28533	.463
Throwers (17.0870)	Sprinters (16.3203)	.76667	.051
	Jumpers (16.0350)	1.05200	.008
Jumpers (16.0350)	Sprinters (16.3203)	.28533	.463
	Throwers (17.0870)	1.05200	.008

*Significant at 0.05

It has been observed from the table-2 that mean difference between sprinter and throwers group was found .76667. The sprinters (16.3203) group had demonstrated better on agility than their counterpart throwers (17.0870) group. The mean difference between sprinters and jumpers group was found .28533. The sprinter (16.3203) had demonstrated better on agility than their counterpart jumpers (16.0350) group. The mean difference between throwers and jumpers group was found 1.05200. The jumpers (16.0350) had exhibited significantly better on agility than their counterpart throwers (17.0870) group.

Table-3
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Balance

Source of Variation	Sum of Squares	Df	Mean Square	F-ratio	P-value (Sig.)
Between Groups	1168.586	2	584.293	8.937*	.000
Within Groups	5688.266	87	65.382		
Total	6856.852	89			

F- 0.05 (2, 87)

It can be judged from table-3 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable balance were found statistically significant (P<.05). Since the obtained F-ratio 8.937 was found statistically significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable Balance. The results of Post-hoc test have been presented in table-4.

Table-4
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter-College (Sprinters, Throwers and Jumpers) on the Sub-Variable Balance

Mean values and groups		Mean Difference	P-value (Sig.)
Sprinters (17.8173)	Throwers (26.5680)	8.75067	.000
	Jumpers (21.1933)	3.37600	.109
Throwers (26.5680)	Sprinters (17.8173)	8.75067	.000
	Jumpers (21.1933)	5.37467	.012
Jumpers (21.1933)	Sprinters (17.8173)	3.37600	.109
	Throwers (26.5680)	5.37467	.012

*Significant at 0.05

It has been observed from the table-4 that mean difference between sprinter and throwers group was found 8.75067. The throwers (26.5680) group had exhibited significantly better on balance than their counterpart sprinters (17.8173) group. The mean difference between sprinters and jumpers group was found 3.37600. The jumpers (21.1933) had demonstrated better on balance than their counterpart sprinters (17.8173) group. The mean difference between throwers and jumpers group was found 5.37467. The throwers (26.5680) had exhibited significantly better on balance than their counterpart jumpers (21.1933) group.

Table-5
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Speed

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	P-value (Sig.)
Between Groups	12.555	2	6.277	136.997*	.000
Within Groups	3.986	87	.046		
Total	16.541	89			

F- 0.05 (2, 87)

It can be judged from table-5 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable speed were found statistically significant (P<.05). Since the obtained F-ratio 136.997 was found statistically significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable speed. The results of Post-hoc test have been presented in table-6.

Table-6
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Speed

Mean values and groups		Mean Difference	P-value (Sig.)
Sprinters (5.9990)	Throwers (6.7993)	.80033	.000
	Jumpers (6.0153)	.01633	.768
Throwers (6.7993)	Sprinters (5.9990)	.80033	.000
	Jumpers (6.0153)	.78400	.000
Jumpers (6.0153)	Sprinters (5.9990)	.01633	.768
	Throwers (6.7993)	.78400	.000

*Significant at 0.05

It has been observed from the table-6 that mean difference between sprinters and throwers group was found .80033. The sprinters (5.9990) group had exhibited significantly better on speed than their counterpart throwers (6.7993) group. The mean difference between sprinters and jumpers group was found .01633. The sprinters (5.9990) had demonstrated better on speed than their counterpart jumpers (6.0153) group. The mean difference between throwers and jumpers group was found .78400. The jumpers (6.0153) had exhibited significantly better on speed than their counterpart throwers (6.7993) group.

Table-7
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Explosive Strength

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	P-value (Sig.)
Between Groups	61.156	2	30.578	1.985	.144
Within Groups	1340.133	87	15.404		
Total	1401.289	89			

F- 0.05 (2, 87)

It can be judged from table-7 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable explosive strength were found statistically insignificant (P>.05).

Table-8
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Flexibility

Source of Variation	Sum of Squares	Df	Mean Square	F-ratio	P-value (Sig.)
Between Groups	402.422	2	201.211	14.992*	.000
Within Groups	1167.633	87	13.421		
Total	1570.056	89			

F- 0.05 (2, 87)

It can be judged from table-8 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable flexibility were found statistically significant (P<.05). Since the obtained F-ratio 14.992 was found statistically significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable flexibility. The results of Post-hoc test have been presented in table-20 below.

Table-9
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter - College (Sprinters, Throwers and Jumpers) on the Sub-Variable Flexibility

Mean values and groups		Mean Difference	P-value (Sig.)
Sprinters (15.9333)	Thrower (13.0333)	2.90000	.003
	Jumpers (18.2000)	2.26667	.019
Thrower (13.0333)	Sprinters (15.9333)	2.90000	.003
	Jumpers (18.2000)	5.16667	.000
Jumpers (18.2000)	Sprinters (15.9333)	2.26667	.019
	Thrower (13.0333)	5.16667	.000

*Significant at 0.05

It has been observed from the table-9 that mean difference between sprinters and throwers group was found 2.90000. The sprinters (15.9333) group had exhibited significantly better on flexibility than their counterpart throwers (13.0333) group. The mean difference between sprinters and jumpers group was found 2.26667. The jumpers (18.2000) had exhibited significantly better on flexibility than their counterpart sprinters (15.9333) group. The mean difference between throwers and jumpers group was found 5.16667. The jumpers (18.2000) had exhibited significantly better on flexibility than their counterpart throwers (13.0333) group.

Table-10
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Agility

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig.
Between Groups	9.786	2	4.893	1.414	.249
Within Groups	301.142	87	3.461		
Total	310.928	89			

F- 0.05 (2, 87)

It can be judged from table-10 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable agility were found statistically insignificant (P>.05).

Table- 11
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Balance

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig.
Between Groups	618.156	2	309.078	6.107*	.003
Within Groups	4402.967	87	50.609		
Total	5021.122	89			

F- 0.05 (2, 87)

It can be judged from table-11 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable balance were found statistically significant (P<.05). Since the obtained F-ratio 6.107 was found statistically significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable balance. The results of Post-hoc test have been presented in table-12.

Table-12
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Balance

Mean values and groups		Mean Difference	P-value (Sig.)
Sprinters (20.4000)	Thrower (26.8000)	6.40000	.001
	Jumpers (24.0333)	3.63333	.051
Thrower (26.8000)	Sprinters (20.4000)	6.40000	.001
	Jumpers (24.0333)	2.76667	.136
Jumpers (24.0333)	Sprinters (20.4000)	3.63333	.051
	Thrower (26.8000)	2.76667	.136

*Significant at 0.05

It has been observed from the table-12 that mean difference between sprinters and throwers group was found 6.40000. The throwers (26.8000) group had exhibited significantly better on balance than their counterpart sprinters (20.4000) group. The mean difference between sprinters and jumpers group was found 3.63333. The jumpers (24.0333) had exhibited significantly better on balance than their counterpart sprinters (20.4000) group. The mean difference between throwers and jumpers group was found 2.76667. The throwers (26.8000) had demonstrated better on balance than their counterpart jumpers (24.0333) group.

Table-13
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Speed

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	P-value (Sig.)
Between Groups	2.931	2	1.465	48.481*	.000
Within Groups	2.630	87	.030		
Total	5.560	89			

F- 0.05 (2, 87)

It can be judged from table-13 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable speed were found highly statistically significant (P<.05). Since the obtained F-ratio 48.481 was found statistically highly significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable speed. The results of Post-hoc test have been presented in table-14.

Table-14
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Speed

Mean values and groups		Mean Difference	P-value (Sig.)
Sprinters (5.8837)	Throwers (6.2833)	.39967	.000
	Jumpers (5.9200)	.03633	.420
Throwers (6.2833)	Sprinters (5.8837)	.39967	.000
	Jumpers (5.9200)	.36333	.000
Jumpers (5.9200)	Sprinters (5.8837)	.03633	.420
	Throwers (6.2833)	.36333	.000

*Significant at 0.05

It has been observed from the table-14 that mean difference between sprinters and throwers group was found .39967. The sprinters (5.8837) group had exhibited significantly better on

speed than their counterpart throwers (6.2833) group. The mean difference between sprinters and jumpers group was found .03633. The sprinters (5.8837) had demonstrated better on speed than their counterpart jumpers (5.9200) group. The mean difference between throwers and jumpers group was found .36333. The jumpers (5.9200) had exhibited significantly better on speed than their counterpart throwers (6.2833) group.

Table-15
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter-University (Sprinters, Throwers and Jumpers) on the Sub-Variable Explosive Strength

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig.
Between Groups	20.867	2	10.433	.747	.477
Within Groups	1215.633	87	13.973		
Total	1236.500	89			

F- 0.05 (2, 87)

It can be judged from table-15 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable explosive strength were found statistically insignificant (P>.05).

Table-16
Analysis of Variance (ANOVA) Results with Regard to Motor Fitness Components among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Flexibility

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig.
Between Groups	232.500	2	116.250	9.600*	.000
Within Groups	1053.565	87	12.110		
Total	1286.065	89			

F- 0.05 (2, 87)

It can be judged from table-16 that results of Analysis of Variance (ANOVA) among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable flexibility were found statistically significant (P<.05). Since the obtained F-ratio 9.600 was found statistically significant, therefore, Post-hoc test (LSD) was applied to find out the degree and direction of differences between paired means among various groups (sprinters, throwers and jumpers) with regard to motor fitness components on the sub-variable flexibility. The results of Post-hoc test have been presented in table-17.

Table-17
Analysis of Least Significant Difference (LSD) Post Hoc Test with Regard to Motor Fitness Components Among Inter - University (Sprinters, Throwers and Jumpers) on the Sub-Variable Flexibility

Mean values and groups		Mean Difference	P-value (Sig.)
Sprinters (14.9000)	Throwers (13.3167)	1.58333	.082
	Jumpers (17.2300)	2.33000	.011
Throwers (13.3167)	Sprinters (14.9000)	1.58333	.082
	Jumpers (17.2300)	3.91333	.000
Jumpers (17.2300)	Sprinters (14.9000)	2.33000	.011
	Throwers (13.3167)	3.91333	.000

*Significant at 0.05

It has been observed from the table-17 that mean difference between sprinters and throwers group was found 1.58333. The sprinters (14.9000) group had demonstrated better on flexibility than their counterpart throwers (13.3167) group. The mean difference between sprinters and jumpers group was found 2.33000. The jumpers (17.2300) had exhibited significantly better on flexibility than their counterpart sprinters (14.9000) group. The mean difference between throwers and jumpers group was found 3.91333. The jumpers (17.2300) had exhibited significantly better on flexibility than their counterpart throwers (13.3167) group.

Conclusions

Based on the findings of this study, the following conclusions were drawn: To conclude, it is significant to mention in relation to Motor Fitness Components that insignificant differences occur among Inter-College Sprinters, Thrower and Jumpers on the sub variable Explosive Strength. However, the significant differences occur among Inter-College Sprinters, Throwers and Jumpers on the sub variable Agility, Balance, Speed and Flexibility. To conclude, it is significant to mention in relation to Motor Fitness Components that insignificant differences occur among Inter-University Sprinters, Thrower and Jumpers on the sub variable Agility and Explosive Strength. However, the significant differences occur among Inter-University Sprinters, Throwers and Jumpers on the sub variable Balance, Speed and Flexibility.

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