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# A comparative study of motor fitness between sprinter and long-distance runner in Bangladesh

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**Abstract**
Fitness is the ability of the individual to live a healthy, satisfying, useful, and more productive life. The term motor has been defined as the relationship between central nervous system and the muscle. Motor fitness is sometimes referred to as skill-related fitness. The significant of this study would indicate the motor fitness difference between sprinter and long-distance runner. The motor fitness measured as speed was measured by 50m dash test, agility was measured by 4x10m shuttle run test, leg explosive strength was measured by standing broad jump test, and basic endurance was measured by 800-meter run test. The raw data were analyzed following standard statistical technique. In result sprinter group appeared to be significantly better than the long-distance group in speed, agility and leg explosive strength but the long-distance runner group is better than the sprinter group in endurance test.

**Keywords:** comparison, motor fitness, sprinter, runner

## Introduction
Fitness is the ability of the individual to live a healthy, satisfying, useful, and more productive life. Fitness is understood as the ability to do some work. Fitness is the ability to live a full and balanced life. The totally fit person has a healthy and happy outlook towards life. The term motor has been defined as the relationship between central nervous system and the muscle. This is also referred as the neuromuscular co-ordination. Thus, it is a neuromuscular component of fitness, which enable a person to perform successfully at a particular motor skill, game, or activity. Specific motor fitness components include agility, balance, coordination, power, reaction time, and speed.
Motor fitness is sometimes referred to as skill-related fitness. Motor fitness is considered as a part of physical fitness which is responsible for doing any movement activity. There are different components of motor fitness. These components are strength, speed, endurance, and agility. These are considered as the conditional components of motor fitness. The present idea about motor fitness also includes some coordinative components such as orientation ability, balance, adaptation, reaction ability, coupling, rhythm and differentiation ability.

## Components of Motor Fitness
1. **Speed:** Speed is the rate of motion, or equivalently the rate of change in position, often expressed as distance traveled per unit of time. A subcategory of speed is quickness, which is the ability of the central nervous system to contract, relax or control muscle function without involvement of any preliminary stretch.
2. **Agility:** Agility is the ability to apply explosive movements to rapidity change direction. It is the ability to make quick and accurate shifts in body position during movement.
3. **Endurance:** Endurance is considered as the ability to do a muscular activity for longer duration without minimizing speed. It is also considered as the ability to resist fatigue.
4. **Explosive strength:** Explosive strength is the power. It is the ability to release maximum force in the fastest possible time. It is considered as the explosive strength of a particular muscle group.
5. **Reaction time:** Reaction time means the amount of elapsed time from the signal or stimulus to the first movement of the body for reaction. Reaction time is the interval of time between the presentation of the stimulus and the initiation of the response.
6. **Flexibility:** The ability to achieve an extended range of motion without being impeded by excess tissue, i.e. fat or muscle.
7. **Balance:** Balance is the ability to maintain the equilibrium of one's body when it is placed in various positions.

## Definition of terms
In order to understand the nature and concept of the present investigation the following terms should be understood especially as follows:
1. **Motor Fitness**- motor fitness is a term that describes a person's ability to perform effectively during sports or other physical activity. In the present study speed, agility, explosive strength and basic endurance were considered as the motor fitness variables.
2. **Spprinter-**In the present study ten (10) sprinter athletes of Khulna BJMC academy were considered National level athletic players.
3. **Long Distance Runner-** in the present study ten long distance player of Khulna BJMC academy were considered National level athletics player.

## Delimitations
The present study was delimited to following condition:
a. Only 10 sprinter were selected as subject.
b. Only 10 long distance runner selected as subject.
c. The test was conducted on natural grassy surface.

d. Motor fitness was assessed by testing speed, agility, leg explosive strength and basic endurance.

**Limitations**

The present study was conducted under the following limiting conditions:

a. Motivation and willingness of the subject to perform during the test was genuine limitation for the present study.
b. Time and finance were also limiting factors for the present study.
c. The instrument used for measuring different fitness components were not of very high standard.

**Procedure**

**1. Selection of subjects**

A total of twenty (20) male subjects were selected for the present study. Among then ten (10) were National level sprinters and (10) were National level long distance runners.

**2. Criterion Measure**

In the present study motor fitness was the main criterion for measurement. Motor fitness of the subject was measured by assessing different components of motor fitness. Speed was measured by 50m dash test, agility was measured by 4x10m shuttle run test, leg explosive strength was measured by standing broad jump test, and basic endurance was measured by 800 meter run test.

**3. Test Administration**

Researcher lead of the institutions and were contacted for the purpose of the study and ways. All the test items were explained and demonstrated before test got underway. An appropriate amount of warm-up was given to all subjects before test begun.

**3.1. 50 m. Dash**

**Purpose:** To measure speed

**Facilities and Equipment:** Athletics track with starting line of a 50 meter course and finish line. Two stop watches.

**Procedure:** After a short warm up the subject took a position behind the starting line. The subject started the race with command of the starter and ran as fast as possible to finish the course of 50 m.

**Scoring:** The elapsed time form the starting signal until the runner crossed the finish line was measured to the nearest tenth of a second. This time was considered as the performance in this test.

**3.2. 4X10 m. Shuttle Run Test**

**Purpose:** To measure speed and agility

**Facilities and Equipment:** Two lines parallel to each other at 30 feet apart. Stop watch, wooden blocks and whistle.

**Procedure:** The subject stood behind one of the lines with two wooden blocks beyond the other line. On the signal the subject started to run to the blocks collected one and returned to the second was carried and ran through the starting line to finish the test.

**Scoring:** The score was the total time taken to complete the course recorded to $1/10^{th}$ of a second.

**3.3. Standing Broad Jump**

**Purpose:** To measure leg explosive strength

**Facilities and Equipment:** Measuring tape and outdoor jumping pit.

**Procedure:** The subject stood behind a take-off line with his feet several inches apart. Before, jumping the student flexed the knees and jump the arms backward. He then jumped forward by simultaneously extending the knees and swinging the arms forward. Two trails were permitted. Measurement was from the closer heel mark to the take-off line as the jumping distance.

**Scoring:** The score was the distance jumped best out of two trials recorded in meters.

**3.4. 800m run test**

**Purpose:** To measure the basic Endurance test.

**Facilities and equipment:** The test was conducted in a grassy football ground.

**Procedure:** The subject start the run behind from a starting line with the signal of whistle and run 800m of the football ground as the shortest time as possible.

**Scoring:** The eclipsed time will be recorded as a score.

**4. Statistical Model**

To compare the Motor Fitness between sprinter and long distance runner was used standard statistical procedure for calculation. Mean was calculated as a measure of central tendency by using the formula:

$$\overline{X} = \frac{\sum X}{N}$$

Where, Where, $\overline{X}$donates the mean, $\sum$ X denote the sum total of scores and N denotes the number of scores.

The standard deviation (SD) was calculated as the measure of variability by using the formula:

$$\text{SD } (\sigma) = \sqrt{\frac{(X-\overline{X})^2}{N}}$$

Where, σ denotes the standard deviation, $\sum(X-\overline{X})^2$ denote the total of square of the deviation and N denote the number of scores.

The formula used for t-test

$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}}$$

The raw data were analyzed following standard statistical technique. The central tendency of the different motor fitness parameters for professional sprinter and long-distance runner were found out by calculating mean and their variability was expressed by standard deviation. For better understanding the data have been presented separately for motor fitness parameters in the following section.

The mean and standard deviation of different motor fitness components for sprinter have been presented in table: 1

**Table 1:** Mean and standard deviation of different motor fitness components for sprinter

| Parameters | Sprinter | |
|---|---|---|
| | Mean | SD |
| 50m.dash (s) | 5.84 | ±0.13 |
| 4x10m shuttle run (s) | 9.28 | ±0.23 |
| Standing broad jump (cm) | 262.9 | ±4.96 |
| 800m run (s) | 152.6 | ±2.05 |

From this table it is seen that the sprinter had a mean value of 5.84 for 50m dash, 9.28 for 4x10m shuttle run, 262.9cm

for standing broad jump and 152.6 for 800m run.
The mean and standard deviation of different motor fitness components for sprinter have been presented in table: 2

**Table 2:** Mean and standard deviation of different motor fitness components for long distance runner

| Parameters | Long distance runner | |
|---|---|---|
| | Mean | SD |
| 50m.dash (s) | 6.93 | ±0.19 |
| 4x10m shuttle run (s) | 9.92 | ±0.27 |
| Standing broad jump (cm) | 235.2 | ±10.6 |
| 800m run (s) | 134.1 | ±3.11 |

From this table it is seen that the sprinter had a mean value of 6.93 for 50m dash, 9.92 for 4x10m shuttle run, 235.2cm for standing broad jump and 134.1 for 800m run.

**50M Dashes**

From table-1 and table-2 it is understood that the mean values of different motor fitness parameters for sprinter and long-distance group of subjects were exactly not same.
There were differences. In order to understand this differences statistical significant, statistical't' test was used, table-3 shows the results.

**Table 3:** The't' table of 50 m Dash

| Component | Mean value for | | Mean Difference | df | t Value | Remarks |
|---|---|---|---|---|---|---|
| 50m dash (s) | Sprinter | Long Distance | | | | |
| | 5.84 | 6.93 | 1.09 | 18 | 14.72 | Significant |

*Table value of't' for df – 18 at 0.05 level = 2.10

From the above table, it is clearly understood that the sprinter were better than the long distance runner counterpart in 50m dash with greater mean time and the mean difference was statistical significant. So, the difference in speed performance between sprinter and long-distance runner group of subjects was to be accepted as significant and this result was plotted in figure -1.

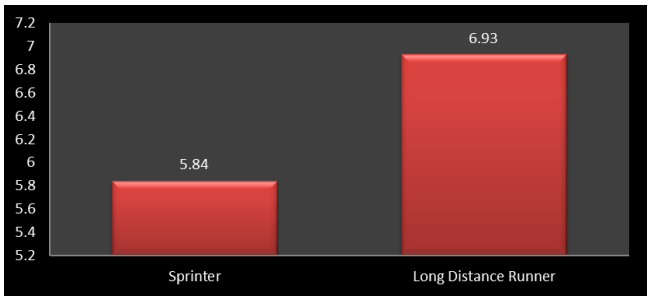


**Fig 1:** The mean difference of 50m dash between sprinters and long-distance runners

From the above figure it is clear that long distance runner took more time to run distance of 50m than sprinter. So, Sprinter was apparently faster in speed and it was statistically significant.

**4×10M Shuttle Run**

From table-1 and table-2 it is understood that the mean values of 4x10m shuttle run for sprinter and long-distance group of subjects were exactly not same.
There were differences. In order to understand this differences statistical significant, statistical't' test was used, table-4 shows the results.

**Table 4:** The't' table of 4x10m shuttle run

| Component | Mean value for | | Mean Difference | df | t Value | Remarks |
|---|---|---|---|---|---|---|
| 4×10m shuttle run (s) | Sprinter | Long Distance | | | | |
| | 9.28 | 9.92 | 0.64 | 18 | 5.64 | Significant |

*Table value of't' for df – 18 at 0.05 level = 2.10

It is clearly understood that the sprinter were better than the long distance runner counterpart in 4×10m shuttle run with greater mean time and the mean difference was statistical significant. So, the difference in agility performance between sprinter and long-distance runner groups of subjects were to be accepted as significant and this result was plotted in figure -2.

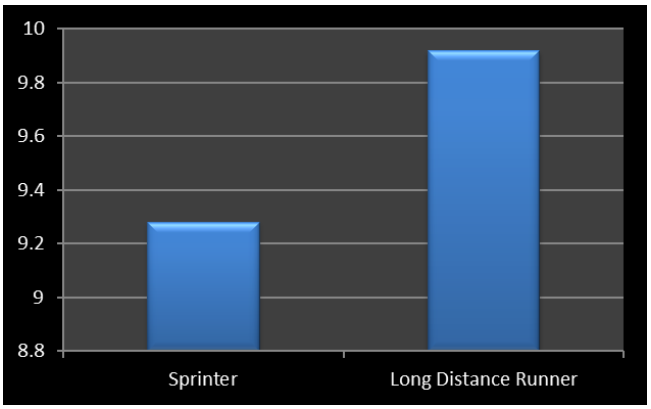


**Fig 2:** The mean difference of 4x10m runs between sprinters and long-distance runners

From the above figure it is clear that long distance runner took more time to run distance of 4×10m shuttle run than sprinter. So, Sprinter was apparently faster in agility and it was statistically significant.

**Standing Broad Jump**

From table-1 and table-2 it is understood that the mean values of standing broad jump for sprinter and long-distance runner groups of subjects were exactly not same.
There were differences. In order to understand this differences statistical significant, statistical't' test was used, table-5 shows the results.

**Table 5:** The 't' table of standing broad jump

| Component | Mean value for | | Mean Difference | df | t Value | Remarks |
|---|---|---|---|---|---|---|
| standing broad jump (cm) | Sprinter | Long Distance | | | | |
| | 262.9 | 235.2 | 27.7 | 18 | 1.21 | Not Significant |

*Table value of't' for df – 18 at 0.05 level = 2.10

It is clearly understood that the sprinter were better than the long distance runner counterpart in standing broad jump with greater mean distance and the mean difference was not statistical significant. So, the difference in standing broad jump performance between sprinter and long distance runner groups of subjects was not to be accepted as significant and this result was plotted in figure -3.

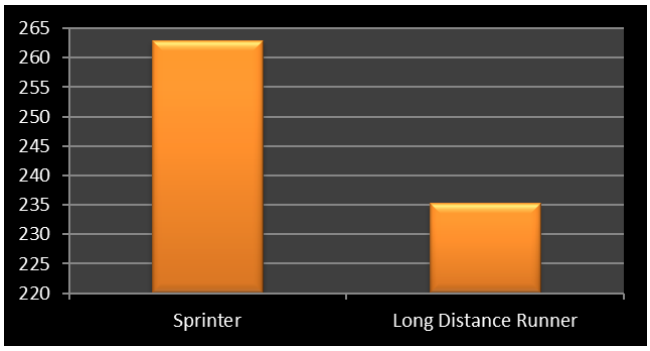


**Fig 3:** The mean difference of standing broad jump between sprinters and long-distance runners

*Table value of't' for df – 18 at 0.05 level = 2.10

From the above figure it is clear that the sprinter cover more distance in standing broad jump than the long distance runner. So, Sprinter was apparently better in leg explosive power and it was not statistically significant.

### 800M Run

From table-1 and table-2 it is understood that the mean values of 800m run for sprinter and long-distance groups of subjects were exactly not same.

There were differences. In order to understand this differences statistical significant, statistical't' test was used, table-6 shows the results.

**Table 6:** The't' table of 800m run

| Component | Mean value for | | Mean Difference | df | t Value | Remarks |
|---|---|---|---|---|---|---|
| 800m run (s) | Sprinter | Long Distance | | | | |
| | 152.6 | 134.1 | 18.5 | 18 | 15.81 | Significant |

*Table value of't' for df – 18 at 0.05 level = 2.10

It is clearly understood that the long-distance runner were better than the sprinter counterpart in 800m run with leaser mean time and the mean difference was statistical significant. So, the difference in 800m run performance between sprinter and long-distance runner groups of subjects were to be accepted as significant and this result was plotted in figure -4.

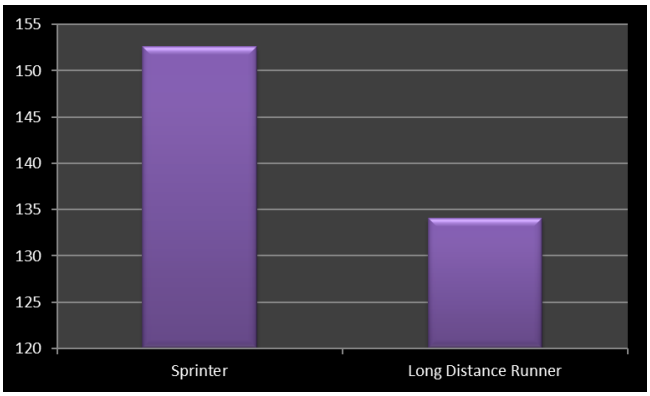


**Fig 4:** The mean difference of 800m run sprinters and long-distance runners

From the above figure it is clear that the sprinter take more time in endurance test than the long-distance runner. So, the long-distance runner was apparently better in endurance test and it was statistically significant.

### Analysis of results

On the basis of analysis of data the following results of the study were obtained:

1. The sprinter group appeared to be significantly better than the long-distance group in speed on the basis of 50m dash.
2. In agility the sprinter groups were significantly better than the long-distance group as measured by the performance of 4×10m shuttle run.
3. In leg explosive strength though the sprinter group covers a better distance than the long-distance group by measuring standing broad jump but it hasn't any statistically significant difference.
4. In endurance test the long-distance runner group was significantly better than the sprinter group measured by 800m run.

## Summary, conclusions and recommendations

### Summary

Fitness is the ability of the individual to live a healthy, satisfying, useful, and more productive life. Fitness is understood as the ability to do some work.

Components of health-related fitness have been considered important for all individual throughout life and are essential to maintain healthy lifestyle (Bucher &Wuest, 1991), which was further supported by Davis (2000) who defined general fitness as ability to carry out task without fatigue.

Motor fitness is sometimes referred to as skill-related fitness. Motor fitness is considered as a part of physical fitness which is responsible for doing any movement activity. Motor Fitness according to Barrow (1968) is "a readiness or preparedness with special regards for big muscle activity without undue fatigue".

The purpose of the present study was to compare the motor fitness between sprinters and long-distance runners. A total of 20 subjects were selected as subjects for the present study among them 10 were national level sprinters and 10 were national level long distance runners. Motor fitness was measured by analyzing the performance in 50y dash, 4x10 m shuttle run, standing broad jump and 800 m run.

The data were analyzed following standard statistical procedure. Mean was calculated as a measure of central tendency and standard deviation was calculated as a measure of variability. For testing significance between mean difference t- test was used.

### Conclusions

Within the limitations of the present study and basis of the results the following conclusions were drawn: -

1. In speed: The sprinters are better than their counterpart of long-distance runners.
2. In agility: the sprinters are better than their counterpart of long-distance runners.
3. In leg explosive strength: the sprinters are better than their counterpart of long-distance runners.
4. In endurance test: The long-distance runners are better than their counterpart of sprinters.

### Recommendations

The following recommendations have been derived from this study.

1. To get a reliable result similar study may be taken up with a very large number of subjects.
2. In a similar study the subjects are not only the adjacent

level but all the regions such as, plain area, hilly area, coastal area and Table Land might be taken in to consideration. So that a clear idea of the regional, physical and environmental influence on physical fitness be obtained.

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