

# **A study to determine basic values of Aerobic, Anaerobic and running time performances of 800 meter rural collegiate athletes**

**Neeraj Kumar\*, Anand N. Badwe#**

\*PhD Scholar, Dept. of Orthopaedic Physiotherapy, Dr. A. P. J. Abdul Kalam College of Physiotherapy, Pravara Institute of Medical Sciences (Deemed to be University), Loni, Ahmednagar, Maharashtra

# Professor, Department of Physiology, Dr. Balasaheb Vikhe Patil Rural Medical College, Pravara Institute of Medical Sciences (Deemed to be University), Loni, Ahmednagar, Maharashtra

## **Corresponding Author:**

Neeraj Kumar

Dept. of Orthopaedic Physiotherapy, Dr. A. P. J. Abdul Kalam College of Physiotherapy, Pravara Institute of Medical Sciences (Deemed to be University),

Loni, Tal.- Rahata, Dist.- Ahmednagar, Maharashtra, India

Mobile No.- +91-9005411557

Email id: [physioner@gmail.com](mailto:physioner@gmail.com)

## **Abstract:**

**Background:** The 800 meter race is a form of middle-distance running and requires significant contributions from both the anaerobic and aerobic energy system. The purpose of the present study was to evaluate aerobic and anaerobic parameters and 800 meter running time of collegiate athletes of rural colleges. This maneuver will help to judge the ability of the participants and improve their performance in future.

**Methods:** 100 voluntary collegiate 800 meter athletes between age group of 18-25 years from different colleges from Rahata taluka of Ahmednagar district were randomly selected in this study. Initially all participants qualified PAR-Q and then anthropometric data and their 800 meter running time was recorded. Then all participants underwent three field tests i.e., F30 sprint test, RAST test for anaerobic power and Beep test for VO<sub>2</sub> max.

**Results:** The average age (in years), weight (in kg), height (in cm), BMI (kg/m<sup>2</sup>), 800 meter running time (in min.sec), F30 sprint test (in sec), Anaerobic power (in watt) and VO<sub>2</sub> max (in ml/kg/min) of all participants were 19.35 yrs (±1.37), 62.85 kg (±11.14), 171.43 cm (±6.28), 21.35 kg/m<sup>2</sup>(±3.48), 3.43sec (±0.23), 5.39 sec (±0.28), 331.49 watt (±120.90), and 35.54 ml/kg/min (±5.14) respectively.

**Conclusion:** From this study it is concluded that, the recorded values of 800 meter running time, F30 time, anaerobic power and VO<sub>2</sub> max are below normal standard values, indicating necessity to improve performance of participants with proper training.

**Keyword:** 800 meter athletes, middle distance athletes, aerobic capacity, anaerobic power, rural athletes

## **INTRODUCTION:**

The 800 meter race is a form of middle-distance running and requires significant contributions from both the anaerobic and aerobic energy system<sup>1</sup>. Middle distance running is completed at higher intensities than long distance running and lower intensities than sprint events, and appeared to be influenced by major contributions from a number of physiological variables<sup>2</sup>. Middle distance running performance is an area that has received limited attention in the scientific literature, perhaps due to the variety of factor that are related to performance over this range of distances. Performance in middle distance events is unique in that it is characterized by intermediate factors of biomechanics and physiology, with the challenge being to run at high velocities while still maintaining economical movement<sup>3</sup>. To perform 800 meter run, one has to have good endurance and strength. The strength and power are being instigating by fast twitch and endurance by slow twitch muscle fibers. There are two types of fibers found in muscle, one is slow twitch fibers and another is fast twitch fibers. The slow twitch fibers are meant for endurance activities such as long distance running, whereas the fast twitch muscle fibers are meant for power and strength such as sprint, weight lifting etc<sup>4</sup>.

The cardiorespiratory endurance is considered as the most important determinant of an individuals' fitness<sup>5</sup>. It is also known as maximal consumption of oxygen voluntarily (VO2 max)<sup>6</sup>. VO2 max is the ability of an individual to perform moderate to high intensity exercise for the prolonged period of time<sup>7</sup>. There are various methods to perform cardiorespiratory endurance (VO2 max) training such as running, cycling, jogging, swimming, brisk walking etc. In which, running, jogging and brisk walking on a computer connected calibrated treadmill is quite convenient and effective, as well as the VO2 max recording can be measured simultaneously<sup>8</sup>.

Since, 800 meter run requires both aerobic and anaerobic training<sup>1</sup>; therefore, it is important to evaluate aerobic and anaerobic parameters of such athletes. There are various aerobic and anaerobic field tests which can be performed to evaluate athletes in rural settings where availability of expensive equipments is a challenge. Furthermore, the regular evaluation of these aerobic and anaerobic parameters, which is very important, is a challenge due to non-availability of expensive equipments or professionals.

Therefore, the purpose of the present study was to evaluate aerobic and anaerobic parameters and 800 meter running time of collegiate athletes of rural colleges. This will help in identifying athletic ability of participants and improvement in their performance under proper training.

## **MATERIALS & METHODS:**

A total 100 healthy voluntary collegiate 800 meter athletes from different colleges of Rahata Talluka of Ahmednagar district aged between 18 to 25 years were randomly selected based on inclusion and exclusion criteria. The participants with any recent injury and any medical and/or psychological conditions which may affect their performances were excluded from this study. The minimum eligibility of participants was to qualify PAR-Q and they all submitted their written informed consent. The ethical committee approval has been taken

from Institutional Ethical Committee of Pravara Institute of Medical Sciences (Deemed to be University), Loni

The following variables were taken:

Name of variable	Statistical scale	Measurement method	Descriptive statistics
Age (years)	Ratio	Interview	Mean, SD
Gender (M/F/T)	Nominal	Observation/Interview	Proportion
Height (CM)	Ratio	Stadiometer	Mean, SD
Weight (KG)	Ratio	Weighing machine	Mean, SD
800 meter running time (sec)	Ratio	Stop watch	Mean, SD
F30 time (sec)	Ratio	Stop watch	Mean, SD
Anaerobic power (Watt)	Ratio	RAST test	Mean, SD
VO2 Max (ml/kg/min)	Ratio	Beep test	Mean, SD

**Table 1: List of variables measured**

### **Measures:**

**800 meter running time:** After a warm-up of self-selected velocity and 5 minutes of rest, participants were asked to perform 800 meter run in a minimal time possible

**F30 sprint test<sup>9</sup>:** This test assessed the sprinting ability over a short distance, which is of particular importance for many sports and has been associated with the performance of different activities. F30 has been performed on a straight track marked with cones and lines at 30 and 60 m after the starting point. The participants waited for the signal at the starting point and then ran at maximum speed. Participants performed two trials separated by 5 minutes and the best time has been used in the analysis.

**Anaerobic power (RAST- Running Based Anaerobic Sprint test)<sup>10</sup>:** Initially, body mass of each participant measured with the same clothes to be used in the RAST Test. Two lines taped to the floor marked a sprinting trace of 35 meters and cones placed at the end of each of the line. Participants instructed to complete six 35-meter sprints at maximum pace and to be sure to cross each line. Participants verbally encouraged to run as fast as possible during each run to ensure a maximal effort. Between each run, participants are allowed to rest for 10 seconds before turning around, in order to allow them to prepare for the subsequent sprint. Each 10-second interval between the sprints has also been timed manually. For the first sprint, the instruction was “ready, 3, 2, 1, go”. For the other five sprints, a countdown from 6 to 1 and the start signal “go” proved to be sufficient. Power, expressed in watts (W), and be calculated by the formula  $\text{power} = (\text{Body Mass} \times \text{Distance}^2) / \text{Time}$ . Peak power (PP) is defined as the highest calculated power and minimum power (MNP) as the lowest, while mean power (MP) is defined as the average power over the six sprints.

**VO2 max(Beep test)<sup>11</sup>:** This test involved continuous running between two lines 20m apart in time to recorded beeps. The test subjects stood behind one of the lines facing the second line, and began running when instructed by the tape. The speed at the start was quite slow.

The subject continued running between the two lines, turning when signaled by the recorded beeps. After one minute, a sound beep indicated an increase in speed, and the beeps were closer together. This was continued for each minute (level). If the line was not reached in time for each beep, the subject must rerun to the line turn and try to complete the task within 2 more 'beeps'. Also, if the line is reached before the beep sounds, the subject must wait until the beep sounds. The test was stopped if the subject failed to reach the line (within 2 meters) for two consecutive ends. The athletes score was considered as the level and number of shuttles (20m) reached before they were unable to keep up with the recording. This score was converted to a VO<sub>2</sub>max equivalent score using mobile app.

## STATISTICAL ANALYSIS:

Descriptive statistics were done using SPSS v.16.00. Mean and standard deviation were used to prepare summary statistics.

## RESULTS:

A total of 100 rural collegiate 800 meter athletes participated in this study. The average age (in years), weight (in kg), height (in cm) and BMI (kg/m<sup>2</sup>) of all participants were 19.35 ( $\pm 1.37$ ), 62.85 ( $\pm 11.14$ ), 171.43 ( $\pm 6.28$ ) and 21.35 ( $\pm 3.48$ ) respectively.

The aerobic, anaerobic and 800 meter running performances of all participants are shown in table 2.

S. No.	Variables	Average	SD
	800 meter running time (min.sec)	3.43	$\pm 0.23$
	F 30 time (sec)	5.39	$\pm 0.28$
	Anaerobic power (watt)	331.49	$\pm 120.90$
	Fatigue Index (watt/sec)	6.72	$\pm 8.28$
	VO <sub>2</sub> max (ml/kg/min)	35.54	$\pm 5.14$

**Table 2: Showing aerobic, anaerobic and 800 meter performances of all participants**

## DISCUSSION:

A total 100 rural collegiate 800 meter athletes randomly participated in this study. Their average age was 19.35 years. The average time for completing 800 meter run of all athletes was 3 min 43 sec., which is well below than the national and international time<sup>12,13</sup>. They need to improve their running time in order to qualify, compete and win the national or international 800 meter running competition.

The F30 sprint time of all athletes was assessed and the average time was 5.39 seconds, which is also well below the standard time<sup>9</sup>. F 30 test assess the sprinting ability over a short distance which is important for 800 meter running performance. In order to improve athletes' F 30 performance, a well planned strength training of lower limb is required<sup>14</sup> and it can be achieved with a proper guidance of physiotherapist or trainer.

Furthermore, anaerobic power of all athletes was measured using RAST (Running Based Anaerobic Sprint test). The average anaerobic power was 331.49 watt, which is also well below national and international standards<sup>10</sup>. This performance can also been required to improve with the help of well guided strength training program<sup>14</sup>, as to thereby improve 800

meter running performance. Similarly, fatigue index was measured using the same RAST test and its average was 6.72 watt/sec.

The VO<sub>2</sub> max (Cardio-respiratory endurance) of all athletes was measured by using Beep test. The average VO<sub>2</sub> max of all athletes was 35.54 ml/kg/min, which is below the standard national and international values<sup>11</sup>. As we know that VO<sub>2</sub> max is an important determinant of cardio-respiratory fitness, it is very much required in 800 meter running performance<sup>5,6,7</sup>. It can be improved by regular aerobic exercises<sup>8</sup>.

Since, 800 meter run is a type of middle distance running and requires both aerobic and anaerobic energy system and these parameters were found below than standard in the rural 800 meter collegiate athletes in the present study. There are many national and international athletes who indulge in drug abuse substances in order to perform better in their sports competition<sup>15</sup> and the rural collegiate athletes may inclined towards using these illegal method to outperform. Therefore, in a nutshell, it is highly recommended to have a proper aerobic and anaerobic training for rural collegiate athletes to make them ready for higher level participation in 800 meter run.

Since all the athletes were intended to improve their performances therefore it is imperative to provide them a suitable training opportunity and proper coaching to meet their expectations. There is a lack of such opportunity in rural setup, and government and non-government organization need to think about it. There are some private organizations like Pravara Institute of Medical Sciences (Deemed to be university), Loni, in this region which have such facility up to some extent which can be utilized by these rural colleges and can send their athletes for training and performance improvement. The basic amenities, like running track is also found missing in many rural colleges which is also available in Pravara Institute of Medical Sciences (Deemed to be University), and can be utilized by other nearby colleges for their athletes. The colleges are also have to support their athletes with running gears like shoes, jersey etc, to those who are having financial needs.

‘India lives in village’, therefore, proper sports lab and facility is required in village to encourage rural youths to participants in more sporting activities and play for country someday, and win medals in international events. There can be a thrust area for researchers also to do some basic as well as advance study in rural athletes.

## **CONCLUSION:**

The 800 meter running time, F30 time, anaerobic power and VO<sub>2</sub> max of all athletes were found below the standard level and need to be improved with proper training at their respective places. The sports training facility and well-equipped sports labs are there in major cities and centers but it is also required to develop such center in rural areas. The government and Non-government organization are required to think about this thrust area and encourage rural population to indulge in more and more sporting activities.

**REFERENCES:**

1. Blumkaitis JC, Sandefur CL, Fahs CA, & Rossow LM. Anaerobic and aerobic contributions to 800 m and 8 km season bests. *Journal of Trainology*. 2016, 5: 28-42.
2. Brandon LJ. Physiological factors associated with middle distance running performance. *Sports Med*. 1995, 19 (4): 268-277.
3. Thompson MA. Physiological and biomechanical mechanisms of distance specific human running performance. *Integrative and Comparative biology*. 2017, 57(2): 293-300.
4. Katch VL, McArdle WD, & Katch FL. Essentials of exercise physiology. 3<sup>rd</sup> ed. *Lippincott Williams & Wilkins*. 2011
5. Kumar N, Archana, & Singh P. To determine the association of cardiorespiratory fitness with anthropometric characteristics in collegiate athletes. *Serb J of Spo Sci*. 2015, 9(1), 27-30.
6. Kumar N, Srivastava D, Tiwari NN, & Dwivedi S. Effective time for consumption of preexercise energy drink to enhance cardiorespiratory fitness. *Saudi J of Spo Med*. 2017, 17: 79-81.
7. Kumar N, & Laroiya N. Association of VO<sub>2</sub> max, agility and BMI among collegiate athletes. *Annals of Spo med & res*. 2017, 4(5), 1121.
8. Thompson WR, Gordon NF, & Pescatello LS. ACSM's guidelines for exercise testing and prescription. *Lippincott Williams & Wilkins*. 2009, 54.
9. Mackenzie, B. (1999) *Flying 30 metre Test* [WWW] Available from: <https://www.brianmac.co.uk/flying30.htm> [Accessed 7/3/2022]
10. Mackenzie, B. (1998) *RAST* [WWW] Available from: <https://www.brianmac.co.uk/rast.htm> [Accessed 7/3/2022]
11. Mackenzie, B. (2001) *VO<sub>2</sub> max* [WWW] Available from: <https://www.brianmac.co.uk/VO2max.htm> [Accessed 7/3/2022]
12. <https://indianathletics.in/wp-content/uploads/2022/02/National-Records-updated-as-on-1-Feb-2022.pdf>
13. <https://www.worldathletics.org/world-rankings/800m/men?regionType=world&page=1&rankDate=2022-03-01&limitByCountry=0>
14. Haugen T, Seiler S, Sandbakk O, and Tonnessen E (2019). The training and development of elite sprint performance: an integration of scientific and best practice literature. *Sports Medicine*. 2019, 5:44
15. Kumar N, Paul M, & Sandhu JS. Why players engage in drug abuse substances? A survey study. *Doping Journal*. 2011, 8, 1. Available at: <http://dopingjournal.org/content/8/1/>

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