Nantu Das
North-Eastern Hill University,
Shillong, Meghalaya, India

Sumanta Kumar Mandal
Visva-Bharati University,
Santiniketan, West Bengal,
India

Data analysis and qualitative assessment of 5000 meter male middle distance runners

Nantu Das and Sumanta Kumar Mandal

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Abstract
Sports and games has a great importance in education and also in maintaining health and fitness**.** To develop endurance, one may include middle distance run in their daily fitness activities**.** The 5000-meters middle distance running events are contested at all global athletics championships including India. The purpose of the paper is to analyze the pacing strategies of foreign elite male athlete and Indian male athlete in 5000-meter middle distance race. The study is to exhibit whether split 100 meter times of 5000-meter are varied in between foreign elite male athlete and Indian male athlete. Ten male leading foreign athletes are selected as foreign athletes from readily publically available data of the International Association of Athletic Federation (IAAF) World Athletics Championship 2017, World Athletics Championship 2019 and ten male Indian athletes are selected as Indian athletes from the Association of Indian Universities (AIU) All India Inter University Athletics Championship 2020. The research brings forth how the variations occurs among the Indian athletes of Male population and foreign athlete of Male population. The constant variation in their running pace, velocity of the foreign athletes is exhibited in accordance with their distance parameter including the distance coverages world championship from 100 meter to 5000 meter.

Keywords: Endurance health and fitness pacing strategies data analysis middle distance runner zonal velocity championship

1. Introduction
The 5000 mtr (Five-thousand meters') is the principal intermediate space event in athletics. Intermediate events are races lengthier than dashes and smaller than elongated run. A standard middle distance races are 800 meters, 1500 meter, 5000 meters. The results section commences with assessing the velocity variations, speed variations of male and female athletes. The research brings forth how the variations occurs among the Indian athletes of Male population and female population. The constant variation in their running pace, velocity of the Foreign athletes is exhibited in accordance with their distance parameter including the distance coverages in both Zonal tournaments and state level including national level competitions 100m, 200m, 300m, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900 and 5000 meters. The data analysis, exhibited how the variations in zonal velocities, running time with respective to nation preferences. Various tests are conducted to elucidate the objectives of the study. The tests include descriptive statistics, T-Ratio tests, F-ratio tests, One-Way Anova, percentile analysis, Post-hoc tests and Mann-Whitney U tests. The graphical representation is propounded for expounding the constant variation of the foreign athletes, in all the displacement and distance parameter of running competition. The comparative analysis is described in the section. For this analysis, SPSS package is utilized for testing the research hypothesis.

Striding tactics for high presentations in mid races fluctuate to some extent among several groups. The smaller mid races need a quicker jerk however lengthier distance needs cautious controller of the speed (Holt *et al*., 2014) [4]. The lengthier the distance, the more stamina is needed. The 5000-meters races are competed worldwide including India.

Corresponding Author:
Nantu Das
North-Eastern Hill University,
Shillong, Meghalaya, India

All the competitors require to succeed for the ultimate competitions via a sequence of competitions in a procedure to succeed for ultimate competition. The tactical position at middle distance in succeeding races is a solid factor of prerequisite (Renfree *et al*., 2014) [5]. An important constituent for fruitful races is the striding plan (Hettinga *et al*., 2017) [3]. Striding plan in 5000 meter races requires orderly supply of vitality during the run. Striding plan is rely on presentation achievement (Van Biesen *et al*., 2016) [8]. Usually middle distance race requires the speed factor associated with the long sprints and the aerobic capacity of a long distance run (Thompson, 2017) [7]. Competitors requires to understand the distance lasting till over and also tactics of other competitors (Casado *et al*., 2020) [1].

Remarkably, all global best from the fifteen hundred to the other long distance has been established in critical separations (Hanley *et al*., 2019) [2]. Critical separations define that running the semi of the competition somewhat lazier. The results section commences with assessing the velocity variations, speed variations of male and female athletes. The research brings forth how the variations occurs among the Indian athletes of Male population and foreign athlete of Male population. The constant variation in their running pace, velocity of the Foreign athletes is exhibited in accordance with their distance parameter including the distance coverages world championship from 100 meter to 5000 meter. The data analysis, exhibited how the variations in zonal velocities, running time with respective to gender preferences. Various tests are conducted to elucidate the objectives of the study. The graphical representation is propounded for expounding the constant variation of the foreign athletes, in all the displacement and distance parameter of running competition. The comparative analysis is described in the section. For this analysis, SPSS package is utilized for testing the research hypothesis.

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2. Data Acquisition
Around ten count of male leading foreign athletes were being chosen, to be the foreign athletes for this research. Data collection of those male runners participated in 5000 meters, in those past 2 Summer-Olympic-Games were obtained. The participants' data collection is also obtained for those when participated in World-championships competition as well.

Similarly, ten count of Male-leading Indian-athletes were chosen, to be the Indian athletes in data analysis. Data that pertains to Indian-athletes were been gathered from Inter-University Championship, through permission from the organising authority.

The zonal timings and retrospective lap-timings been available in IAAF website would be utilised for this data collection. The website utilised for data collection is www.iaaf.org. for both male athletes and women athletes, possessing IAAF permission. IAAF accorded its permission for using the data for research purpose and research investigation.

The running pace assessment of the sample count of athletes are considered in this analysis. Data regarding their running pace time is obtained from All India University-championship organization 2020 and IAAF World-Championship 2017. The name of the event is 5000 Meter-men. The event is conducted in the location Moodubidri, Mangalore, Karnataka, India.

The results were also tested with the hypotheses also. The statistical results are presented below with the respective interpretations. The statistical analysis is illustrated through various tests.

Random-sampling technique were been adopted for the study. The subjects would be chosen randomly from participants or athletes of past Summer Olympic-Gemes including Rio-de Jeneiro. The other data sources are retrieved from past 4 World-championship tournaments such as London, Beijing, Deegu and Moscow. This data is used for statistical-analysis, obtaining the permission of IAAF, in case of foreign athletes' data collection. The open-national participants, inter-state championships and inter-university participants were being selected randomly with respect to Indian athletes.

Random sampling technique is adopted. The subjects were selected randomly from the participants of previous two Summer Olympic Games i.e. Rio de Janeiro and London and previous four World Championships i.e. Daegu, Moscow, Beijing, and London is utilized for statistical analysis with the permission of IAAF for foreign athletes. Participants of open-national, and inter-university and inter-state championships will be randomly selected in case of Indian athletes.

3. Analysis and Results
Hundred meter divided spell data of 5000-mtr local male nationals and external best nationals signified in the Figure A. Said figure reveals that external best nationals are preserved an endless speed during the run of 5000-meter, whereas local

nationals are incapable to preserve the speed. With regard to zonal mean pace, Indian athletes are able to maintained constant pace with more timings without negative split. Whereas foreign athletes are able to maintained constant pace with less timings with negative splits represented in Figure-B Study also discloses that external best nationals are sound strategic on their plans and preserve a endless speed during the 5000 mtr run with more speed in second half. But local nationals are incapable to prearranged their striding plan in a correct way and there is an irregular competition speed. There is a complete tactical variance in competitions of intermediate athlete of local and external nationals.

The study similarly demonstrates an irregular running speed of intermediate local nationals, and the local nationals needs additional duration to finish the run.
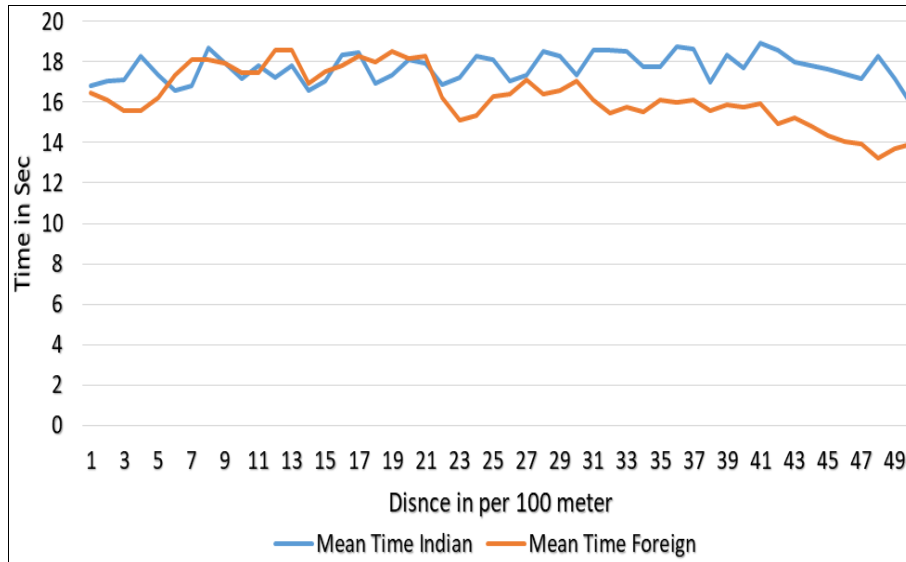

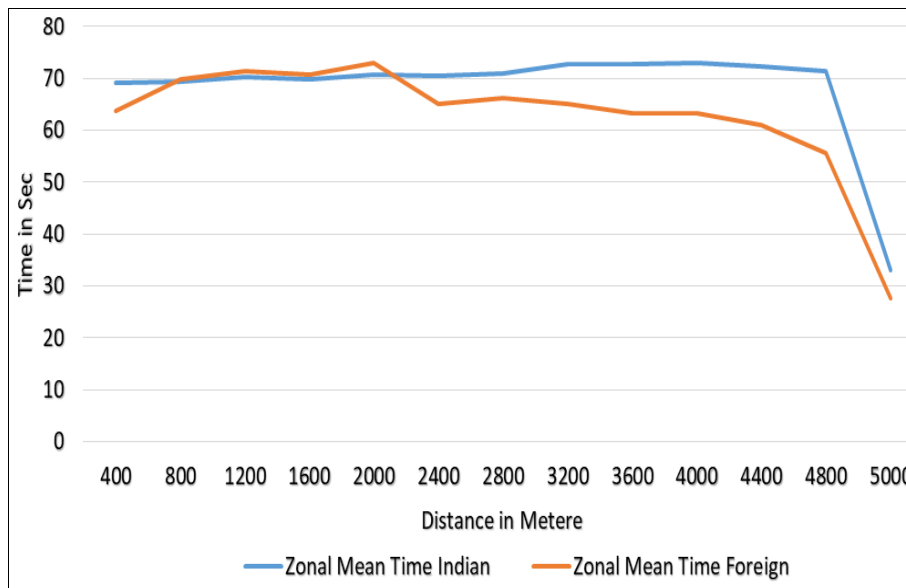**Fig 1:** Mean time foreign & Indian male athlete

Fig 2: Graphical representation of zonal pace

Independent Sample T- Test – 5000 Meters

Table 1: Group Statistics with Nationality as grouping variable

Group Statistics					
	Nativity of Athlete	N	Mean	Std. Deviation	Std. Error Mean
Running Time Male 5000 m	Indian	12	67.3958	10.88274	3.14158
	Foreigner	6	71.1117	1.50899	.61604

The above table 1 illustrates group statistics of the running time calculation of the male athletes. The mean values of the Indian male athletes are encountered in this section the standard deviation of the corresponding mean values of running time of male athletes of Indian nation and other foreign nation are computed, segregating to Indian players and foreign players. The Indian athletes acquired mean values of 67.39 of male population. Similarly, the mean values of foreign athletes were 71.71 for male population. It seems that male Indian athletes had higher zonal mean values for 5000 meters in comparison to foreign male athlete.

Table 2: Independent Samples Test – 5000 meters with Nationality as grouping variable

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	**Sig.**	**t**	**Df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Running Time Male 5000 m	Equal variances assumed	1.430	.024	-.820	16	.042	-3.71583	4.53142	-13.32201	5.89034
	Equal variances not assumed			-1.161	11.824	.026	-3.71583	3.20141	-10.70265	3.27098

The above table 2 describes the independent sample T ratio test in assessing the running time of athletes. The grouping variable, considered for T test is nationality of athlete, if he is an Indian or foreigner. The test enunciated how the running time of the athletes in 5000 meters are statistically or not statistically different with respect to nationality of athletes. The low significance value with $p < 0.05$, indicated that there exist statistical significant differences of running time of male athletes of Indian and foreign in 5000 meters, with respect to nationality. There are significant differences of the running time if they are Indian and variations if the athletes are foreigners. The statistical differences of mean values of running time among Indian athletes and foreign athletes, hence fulfilling the research hypothesis.

Table 3: Descriptive statistics – with respect to nationality

Group Statistics					
	Gender	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
RunningTimeIndian5000 m	Male	9	70.7800	1.28588	.42863
RunningTimeForeigner5000 m	Male	9	83.3733	3.12346	1.04115

The group statistics of running time of Indian and foreign athletes are enumerated in the above table 3. The mean values of running time calculation of 5000 m Indian and foreign athletes of male groups are depicted in the table. The standard deviation of the table is also represented.

4. Conclusion
The Indian athletes and foreign-athletes, exhibited differential average-zonal velocity and running time in each distance coverage. This illustrates that Indian athletes' higher variations in their running-time. But on the other side, the foreign athletes have, lesser mean-difference in comparison to average mean-values, depicted that constant variation in their running-timing throughout the distance coverage. Similarly, the Independent T sample test also evidence the research objectives and satisfies the research hypothesis. The independent T sample test in 5000 metres, implies that running time their zonal mean values of male athletes and female athletes, has statistical significant differences with respect to the nationality of the players. Their zonal mean running time values had different variations, in accordance tot the grouped variable Nationality of the athletes. The One-way anova test, also presented that there exists a significant relationship of the nationality of the athletes influencing the running time mean values in 5000 metres, hence accepting the alternative hypothesis and rejecting the null hypothesis. The running time variations of the athletes has dependency on the nationality of the player, if he or she is Indian or foreigner, then this running time completion varies based on these parameters. The outcomes of this analysis, explicated the testing of research hypothesis, proving the significance of the research.

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