Hindawi
Applied Bionics and Biomechanics
Volume 2023, Article ID 7368369, 8 pages
https://doi.org/10.1155/2023/7368369

Research Article

Characteristic of Elite Male 800-m Runner's Race Performance Based on Hybrid Computing Methods

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Received 29 November 2022; Revised 3 August 2023; Accepted 29 August 2023; Published 16 October 2023

Academic Editor: Andrea Cereatti

The purpose of the study was to analyze the characteristics of elite men's 800-m race performance, which help coaches to obtained the winning experience of 800-m race and prepare for athletes' training more efficiently. Hybrid computing methods were applied to analyze athletes' race performance. The study found that the competitive capability of elite athletes mainly include maximal speed running, speed endurance, and even pacing running. The maximal speed advance from 700–800 to 100–200-m sector, the velocity is also increase at the same time. The first peak speed (100–200 m) is higher than the second (500–600 m). Reduce the 0–400 m split times could be contributing to achieve personal best. 200–400 m is the even pacing phase which have the function of adjust physiological condition and preserve energy. The speed endurance was the most important factor to won the 800-m race. Place in permanent ranking and adopt the follow-running tactic can increase the odds to be medalist.

1. Introduction

The 800 m is the only race where athletes must run in lanes (before the first 100 m), after that begin to merge and run head to head form the start of the 100 m. 800-m competition features that creates unique tactical considerations such as "on the rail" but which increases the likelihood of getting "boxed in" [1]. Since 2008, men's 800 m have entered a new competition era [2]. All the final athletes got into 1 : 44.00 in the London 2012 Olympic Games (OG), David Rudisha also broke the record which created by Wilson Kipketer in 1997 [3]. The Rio 2016 OG saw current world record (WR) holder David Rudisha retain his 800 m Olympic title. Many athletes performances were within 1 : 43.00 in the London 2017 World Championship (WC), Doha 2019 WC, and Tokyo 2020 OG. The performance of world elite athletes is constantly improving [4]. The novel comprehensive analysis of pacing profiles, using high-resolution 100-m split times, adopted throughout major championships will better inform coaches about successful approaches to 800-m racing, and will indicate the importance of responding to (or instigating) pace changes throughout competition.

Prior studies indicated that Olympic and WC middle-distance finalists were racers, rather than pacers, in that, regardless of time, finalists with a strategy of winning, and might not have optimized energy conservation [5]. The necessity for athletes to finish high enough while conserving energy for the final, suggests that well-planned short and long-term competition strategies might be crucial [6]. There was a significant difference between the first and second laps, the average speed decreased steadily during the 200-m stages since 2016 [7]. Early study indicated that the proportion of anaerobic energy system and aerobic energy system was 60% and 40%, respectively, in the 800 m, two types of energy systems had a transition in the 200–400-m sector (40–55 s) [8]. Hanley B also indicated that well-trained 800-m athletes reached the maximal oxygen uptake in 45 ± 11 s, the maximal oxygen uptake decreased significantly in the last 38 ± 17 s and the blood lactate accumulated massively [9]. That indicated the 800-m race required high level of anaerobic endurance for athletes [10].

Some studies also demonstrated that achieving the first position when breaking for any lane and up to the first quarter of the race is not a good strategy, and the sudden accelerations

from the mark of the beginning of the free lane until the end of the first straight stretch are especially detrimental [11]. Previous studies have study the speed tactical behaviors and effort distribution in elite 800-m runners. However, there were few research about how elite athletes qualify for championship finals, which kind of competitive capacity contributed to 800-m athletes' performance in international competitions has not yet been analyzed. Therefore, the purpose of the study was to analyze the characteristics of elite 800-m athletes competitive capacity, which help coaches to obtain the winning experience and establishment of training plans more efficiently.

2. Materials and Methods

2.1. Subjects. The observations were the runners who have qualified for 800-m semifinals and finals. Official electronic finishing and 100-m split times of the 800 m in the Oregon 2022 WC, Tokyo 2020 OG, Doha 2019, and London 2017 WC were obtained from the open access website (https://www.worldathletics.org/result, https://olympics.com/result). The race result of Rio 2016 OG and London 2012 OG were obtained from the race video which downloaded via YouTube (the video was recorded and published by the official, the pixel and spatial were 1,920 × 1,080P/60 Hz), and analyzed using a frame-by-frame playback method via kinovea analysis software (Kinovea company, Britain, version 0.9.5). First, marked each 100-m sector finish line in the race video which has been marked by official. The 1,500-m start line was 0–100-m sector, 200-m start line was 100–200-m sector, 100-m start line was 200–300-m sector, and the 400-m finish line was 300–400-m sector. Second, record the time and ranking when athletes' torso first crossed the plane. The total complements of splits were not available because of disqualification, athletes dropping out, or faults in the timing system for 36 performances in the 800 m. Ultimately, the performances of 156 athletes were analyzed, which include 24-ranking first runners.

2.2. Design and Methodology. The study was designed as observational research in describing pacing profiles in elite standard modern 800-m events. First, the characteristics of the 800 m was analyzed as a whole. Factor analysis was applied to calculate the categories of each 100-m sector. Subsequently, the analysis of regression was applied to calculate the impact of different types of factors on the 800-m performance. Second, analyze the specific characteristics of 800 m based on the analyze, the different sector. The 400-m split times were used to calculate lap differentials for 800 m athletes. To analyze whether athletes ran a positive or negative split in the 800 m. Athletes' split times were further used to calculate the speed during each 100-m sector before the given split, and then analyzed the athletes' speed strategies. Analyzed athletes' ranking strategies based on changes in different sector ranking, and provide reference for analyzing the athletes' performance.

2.3. Statistical Analysis. The factor analysis was applied to analyze each 100-m split times. The KMO and Bartlett tests were used to analyze whether factor analysis is suitable, when KMO (Kaiser–Meyer–Olkin) > 0.6 and Bartlett's test P value ≤ 0.01 factor analysis is suitable. The maximal variance method was used to carry out orthogonal rotation, make the time factors could be named and explained. After the factor components were extracted, analysis of regression was applied to the quantitative relationship between various factors and competition results. The time differences between the first 400 m and the second 400 m were analyzed by independent t-test. Effect sizes (ES) for differences between 400-m split times was calculated used Cohen's d. The following threshold values used for ES statistics were ≥0.2 (small), >0.6 (moderate), >1.2 (large) and >2.0 (very large) [12].

Table 1: Bartlett and KMO test results.

Statistical test style		Results
KMO		0.636
Bartlett's	χ^2 Approximation	335.813
	Df	28
	sig.	<0.001

An ANOVA analysis of variance for repeated measures was applied to analyze the differences of each 100-m split times. The Mauchly test was applied to check the sphericity, if the test result of Mauchly's sphericity hypothesis were not accepted ($P < 0.05$), the correction of Greenhouse–Geisser was applied. The Tukey method was applied for multiple comparisons between each split times, repeated contrast tests conducted to identify changes between successive 100-m split times. Statistical significance was accepted as $P < 0.01$.

Data are presented as means and 90% confidence limits (CL) unless otherwise stated. The Pearson's correlation coefficient was applied to analyze the relationship between each 100-m split times and the final race time, and also applied to analyze the correlation between each 100-m sector and the final ranking. The partial correlation was applied to analyze the relationship between each 100-m split speed and 700–800-m speed. Descriptive statistics was applied to analyze the ranking of each 100-m sector.

3. Results

3.1. Factor Analysis of 100-m Split Times. As shown in Table 1, the KMO = 0.636 and Bartlett's test $P < 0.001$ which means that suitable for factor analysis.

As shown in Table 2, after comprehensive analysis of cumulative variance interpretation rate, the number of common factors extracted was determined to be four types. As shown in Table 2, all the 100-m sector could be divided into four types: 400–800, 200–400, 100–200, and 0–100 m.

3.2. Analysis of Regression. According to the result of factor analysis, the 800-m race can be divided into 400–800, 200–400, 100–200, and 0–100 m. That can be taken as original data information, and the 800-m competitive model could be expressed as follows:

$$y = \varphi_0 + \varphi_1 x_1 + \varphi_2 x_2 + \ldots + \varphi_k x_k + \mu, \quad (1)$$

Table 2: Result of varimax rotation.

Sector (m)	Factor			
	1	2	3	4
0–100	0.045	−0.179	0.084	0.972
100–200	0.155	−0.037	0.905	0.097
200–300	−0.047	0.904	0.115	−0.150
300–400	0.094	0.920	−0.166	−0.076
400–500	0.678	0.548	−0.234	−0.051
500–600	0.938	0.120	−0.033	0.081
600–700	0.920	−0.053	0.273	0.086
700–800	0.737	−0.098	0.444	−0.097

Table 3: The regression equation goodness of fit.

R^2	Adjusted R^2	Variation of F	Sig.	Durbin–Watson
0.983	0.982	1079.054	<0.001	2.057

Table 4: Coefficient of regression.

	Nonstandard coefficient B	Standard coefficient Beta	t	Sig.
Constant	104.816		812.00	<0.001
400–800 m	2.115	0.839	55.576	<0.001
200–400 m	0.944	0.374	24.803	<0.001
100–200 m	0.927	0.368	24.360	<0.001
0–100 m	0.166	0.066	4.355	<0.001

Table 5: The differences of 400-m sector ($N = 156$).

0–400 (m)	400–800 (m)	Difference	t	p	Cohen's d
50.90 ± 1.75	53.04 ± 0.92	−2.12	−6.431	<0.001	1.53

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_3 \end{bmatrix}, X = \begin{bmatrix} 1\ \mathrm{x}_{11}\ \mathrm{x}_{12}\ \ldots\ \mathrm{x}_{1k} \\ 1\ \mathrm{x}_{21}\ \mathrm{x}_{22}\ \ldots\ \mathrm{x}_{2k} \\ \vdots\ \vdots\ \vdots\ \quad \vdots \\ 1\ \mathrm{x}_{n1}\ \mathrm{x}_{n2}\ \ldots\ \mathrm{x}_{nk} \end{bmatrix}, \varphi = \begin{bmatrix} \varphi_1 \\ \varphi_2 \\ \vdots \\ \varphi_k \end{bmatrix}, \mu = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix}, \tag{2}$$

$$\begin{cases} y_1 = \varphi_0 + \varphi_1 x_{11} + \ldots + \varphi_k x_{1k} + \mu_1 \\ y_2 = \varphi_0 + \varphi_1 x_{21} + \ldots + \varphi_k x_{2k} + \mu_2 \\ \qquad\qquad \vdots \\ y_n = \varphi_0 + \varphi_1 x_{n1} + \ldots + \varphi_k x_{nk} + \mu_n \end{cases}. \tag{3}$$

As shown in Table 3, R^2 and adjusted R^2 were approximated 1, the result of Durbin–Watson approximated 2. That all indicated that the goodness of fit for the equation were accept.

As shown in Table 4, the constant was 104.316, the coefficients between the four types of factors and the competition results were 0.839, 0.374, 0.368, and 0.066. Therefore, the equation about competitive capacity could be wrote as follows: $Y = 104.816 + 0.839X_1 + 0.374X_2 + 0.368X_3 + 0.066X_4$.

3.3. The Differences of 400-m Sector. As shown in Table 5, the 0–400-m split times was significantly less than 400–800-m split times, and the difference value was −2.12, the ES was large.

In order to further present the differences of the 400-m split time in detail, the study conducted statistics on each WC, OG, and the WR holder David Rudisha. For this reason, can we have a clear understanding of the relationship and trend between race results and the speed distribution of the two laps. In the following 800-m races, the minimum differences value was 0.86 s (2012), the maximal differences value was 3.43 s (David Rudisha). Not only does the 0–400-m split times was less than 400–800-m split times, but the range of speed required to medal has increased (Figure 1).

3.4. The Differences of Each 100-m Split Speed. In order to present the continuous relationship between the speed of each sector, the results of analysis of variance were presented as a line chart. Which the result were average split time,

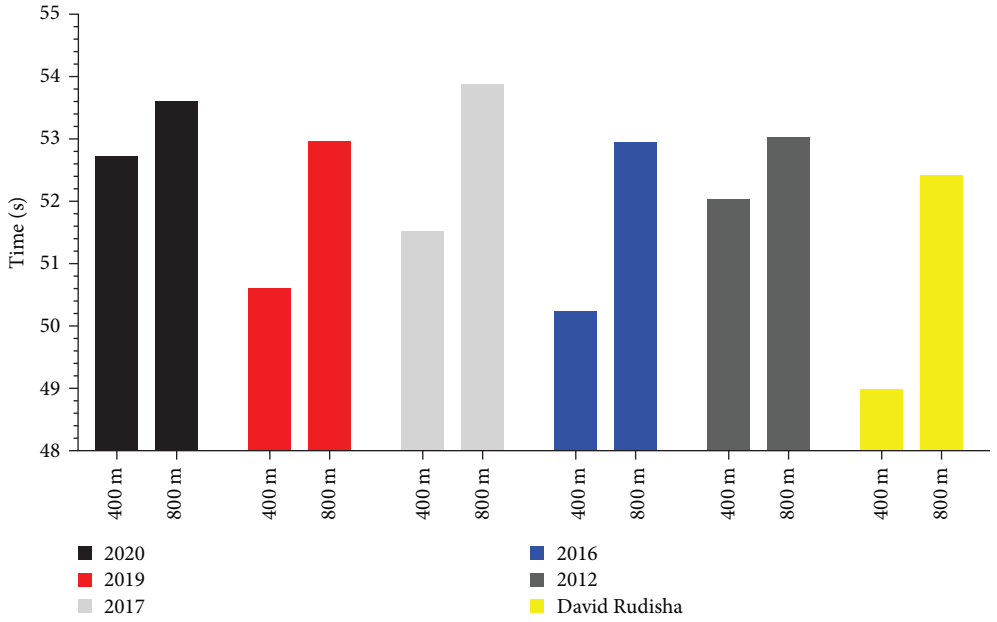

Figure 1: The split times of 0–400 and 400–800 m. Different colors represent different competitions.

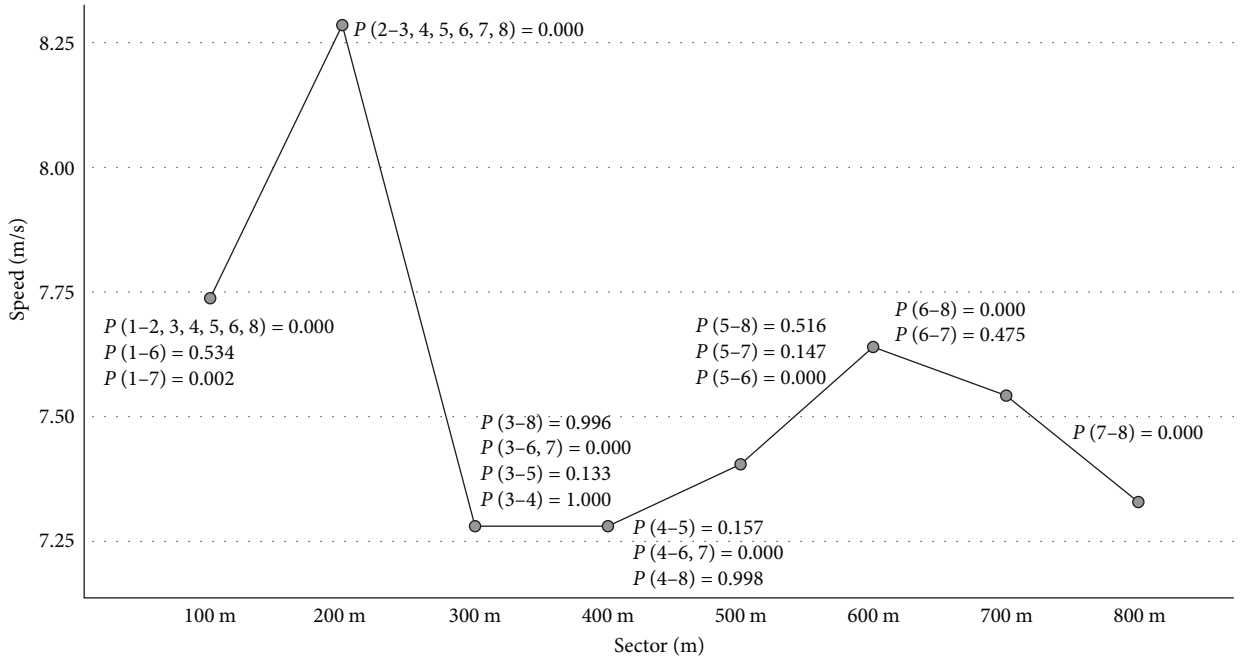

Figure 2: Differences between each sector speed. For example: $P(1–2)$ indicated as the P values of the 0–100 and 100–200-m sector speed.

rather than individual split time. As shown in Figure 2, the result indicated that there were significant differences between 100 and 200 m and the other split speed, the highest speed sector was occurred. There was no significant differences between 200–300 and 300–400-m split times, the lowest speed and even pace was occurred. The speed of 500–600 m was higher than 600–800 m, it meant the speed was decrease in the final split. The pacing profiles was similar to seahorse-shaped, which the speed of 100–200 and 500–600 m were higher than the others.

3.5. Correlation between 100-m Split Times and Final Race Time. As shown in Table 6, the split times of 200–300 m ($r = 0.638$, $P < 0.01$), 300–400 m ($r = 0.609$, $P < 0.01$), 400–500 m ($r = 0.414$, $P = 0.033$), and 700–800 m ($r = 0.479$, $P = 0.026$) were significantly correlated with the competition results, of which the highest speed was 200–300 and 300–400-m sector. The split times of 0–100 m ($r = 0.103$, $P = 0.499$), 100–200 m ($r = 0.218$, $P = 0.338$), 500–600 m ($r = 0.197$, $P = 0.194$), and 600–700 m ($r = 0.199$, $P = 0.218$) were not significantly correlated with the competition results.

Table 6: Correlation coefficient between 100-m split times and final race time ($N = 156$).

	0–100 (m)	100–200 (m)	200–300 (m)	300–400 (m)	400–500 (m)	500–600 (m)	600–700 (m)	700–800 (m)
r	0.103	0.218	0.638*	0.609*	0.414	0.197	0.199	0.479
p	0.499	0.338	<0.001	<0.01	0.033	0.194	0.218	0.026

Table 7: Partial correlation coefficient between 100-m split and 700–800-m split ($N = 156$).

	0–100 (m)	100–200 (m)	200–300 (m)	300–400 (m)	400–500 (m)	500–600 (m)	600–700 (m)
r	−0.449*	−0.409	0.098	−0.292	−0.547*	−0.051	0.229
p	0.004	0.010	0.552	0.071	<0.001	0.760	0.160

Table 8: Correlation between 100-m split ranking and final ranking ($N = 156$).

	0–100 (m)	100–200 (m)	200–300 (m)	300–400 (m)	400–500 (m)	500–600 (m)	600–700 (m)	700–800 (m)
r	0.122	0.187	0.228	0.257	0.290	0.430*	0.606*	1.000
p	0.147	0.029	0.017	0.022	0.015	<0.001	<0.001	/

Table 9: The proportion of medalists different sector ranking.

	0–100 (m)	100–200 (m)	200–300 (m)	300–400 (m)	400–500 (m)	500–600 (m)	600–700 (m)	700–800 (m)
R-1	21.90%	22.30%	24.50%	25.90%	28%	30.56%	42.76%	100%
R-2	5.30%	3.90%	2.70%	1.30%	2.20%	5.64%	12.95%	0%
R-3	40.78%	45.55%	42.62%	41.51%	40.99%	48.81%	37.23%	0%
R-4	8.56%	9.75%	11.68%	10.78%	13.31%	8.49%	5.15%	0%
R-5	2.96%	1.61%	0%	2.01%	0%	6.50%	1.91%	0%
R-6	17.18%	14.10%	13.39%	14.02%	12.80%	0%	0%	0%
R-7	3.32%	2.79%	5.11%	4.48%	3.50%	0%	0%	0%
R-8	0%	0%	0%	0%	0%	0%	0%	0%

Note: R is the abbreviation for ranking.

3.6. Partial Correlation between Each 100-m Split Speed and Final 100-m Split Speed. As shown in Table 7, 0–100 m ($r = -0.449$, $P = 0.004$), 100–200 m ($r = -0.409$, $P = 0.010$), 300–400 m ($r = -0.292$, $P = 0.071$), 400–500 m ($r = -0.547$, $P < 0.001$), and 500–600 m ($r = -0.051$, $P = 0.760$) split speed were negatively correlated with 700–800 m. The 200–300 m ($r = 0.098$, $P = 0.552$) and 600–700 m ($r = 0.229$, $P = 0.160$) split speeds were positive correlated with the 700–800 m.

3.7. Correlation between 100-m Split Ranking and Final Ranking. As shown in Table 8, the correlation coefficient between 0 and 100-m split ranking and final ranking was the lowest, there was no significant differences ($r = 0.122$, $P = 0.147$). The correlation coefficient between 600 and 700 m split ranking and final ranking was the highest, there was significant correlation ($r = 0.606$, $P < 0.01$). As the end of the competition approaches, the correlation coefficient between each split ranking and the final ranking of athletes gradually increased.

3.8. Changes of Each 100-m Split Ranking. In order to discriminate the changing patterns of athlete rankings, 24 ranking first runners were selected for further analysis. As shown in Table 9, according to the longitudinal analyze of the 100-m split ranking data, the ranking of the medalist in the sector was mainly ranked in the first, third, fourth, and sixth. The proportion of the third ranking was the highest. According to the horizontal analyze of each 100-m split ranking data, the ranking changed slightly at 0–100, 100–200, 200–300, 300–400, and 400–500 m but changed greatly at 500–800 m, the proportion of athletes first and second ranking increased gradually from the 500 to 600 m, the proportion of sixth and seventh decreased gradually. Medalist moved forward significantly in the 600–700-m sector and ranked first in the last 100-m sector.

4. Discussion

4.1. Race Performance Characteristics of Speed Endurance. Previously in a 2012 publication, it was reported that the level of speed endurance was an important element for athletes to win the 800-m race, the blood lactate began to accumulate in large quantities which athletes experience physical fatigue after completed first 400-m sector [13]. The study found that elite 800-m athletes still maintained the same speed as they start sector when they run to 500–600 m and the final 100 m split speed does not decreased significantly (Figure 2). It indicated that the elite athletes are better able to draw upon their speed and have the technical abilities to limit deceleration. They could keep high speed at the end

of the competition after pace surged and could experience less physiological disturbance [14]. This observation is in line with the previous related findings, which indicated that they had higher reserve ratio and high-speed running capability [15]. In a word, increase the speed endurance can be contribute to cope with the relationship between keep high-speed running and preserve energy.

The study found that athletes were accustomed to increasing the speed of first 400 m in pursuit of excellent results (Figure 1), which required athletes to demonstrate a high level of speed endurance in the second 400 m. It indicated that the characteristics of the elite 800 m performance have changed. Athletes were used to improve the performance of the first 400-m race in the competition, so as to maximize their potential competitive capacity and got more excellent achievement [16]. From the perspective of energy system contribution in 800 m event, athletes did not not obtain advantages by acceleration in the final phase, but by controlling the degree of speed decrease in the sprint phase as much as possible, so as to ensure good competitive capacity in the final 100-m sector [17]. In conclusion, the speed endurance was the most important factor to won the 800-m race in the present compete situation.

4.2. Race Performance Characteristics of Even Pacing Running. The main goal of 800-m race was to control the energy cost and avoid speed decrease in the sprint phase [18]. Therefore, it required athletes to adopt appropriate competitive tactics. The study found that the athletes adopted even pacing tactics in 200–400 m which the 200–300 and 300–400 m split speed were similar (Figure 2). Relevant study also confirmed that the athletes will not change speed largely between 200–300 and 300–400-m sector [19]. The study found that 200–300-m split speed and 300–400-m speed were significantly correlated with the final result, it meant that kept a suitable speed in two adjacent sector was an important factor to achieve excellent results (Table 8), and the greatest resistance to slowing down was determinant for the outcome of the race.

Even pacing has a lower energy cost than running with acceleration and deceleration spurts throughout, and the sudden accelerations from the mark of the beginning of the free lane until the end of the first straight stretch are especially detrimental [20]. In addition, the current study also found that 200–400-m split speed was relatively low (Figure 2). Athlete adopted this tactic could reduce the adverse impact of rapid acceleration in 100–200-m sector and avoid the body fatigue caused by the accumulation of blood lactic. At the same time, it was conducive to adjust the state of physical function and preserve energy for the sprint phase [21]. In sum, the world class athletes were good at adopting even pacing running tactic in 200–400-m sector.

4.3. Race Performance Characteristics of Maximal Speed Running. The 100–200-m sector was the start of head, to head competition and athletes will compete for the helpful position at maximal speed [22]. Only when athletes show faster speed in this sector they could occupy a better position and avoid getting "boxed in." Sandford et al. [1] found that the maximal speed appeared in the 700–800-m sector before 2009 in 800 m. However, the study found that elite 800-m athletes achieved the maximal speed in 100–200 m. It was indicated that when elite 800-m athletes striving for excellent competition results, they were used to increase 100–200-m split speed, then reduced the 0–400-m split times (Figure 1). At the same time, the special competitive capability had been trained with the change of men's race characteristics. The elite 800-m athletes could still keep maximal speed running after completed the acceleration of 100–200-m sector (Figure 1).

A notable characteristic of the recently adopted positive pacing approach is the faster speed demand between 100–200-m, with another 600-m to run (Figure 1). BENCE KELEMEN reveals that maximal speed has increased 0.5 ± 0.2 m/s where prior to 2009 800 m, of which David Rudisha's demonstrates the maximal speed was as high as 8.92 m/s when he broke WR in London 2012 OG [23]. Athletes with excellent maximal speed capability could better deal with the stress situation in the competition, which could maintain the stability of physical function after rapid acceleration [17]. Literature about middle distance running has proved that with the improvement of the elite 800-m performance, the maximal speed shown in the competition was also constantly increased [24]. In conclusion, the maximal speed was an important factor for 800-m athletes to obtain personal best.

4.4. Race Performance Characteristics of Pacing Pattern. It is important for 800-m athletes and coaches to understand the tactics of successful race performance, especially for pacing tactic adopted by 800-m athletes. The study indicated that elite 800-m athletes shown the characteristics of "double peak speed" pacing pattern in the race (Figure 1). The first peak speed occurred in 100–200-m sector, the second peak speed occurred in 500–600-m sector, there was one steady speed plateau between 100–200 and 500–600 m. Previous studies indicated that the pacing profile was largely *U*-shaped although the slower "tail" meant it had a seahorse-shaped appearance, a profile that appears unique to championship 800-m racing [14]. Previous studies and our study were improved that the pacing patterns within 800 m event were so similar, elite 800-m runners are racers, not pacers, they would not aspire for even-paced races but for achieved personal best.

Previous study indicated that the athletes usually adopt either the ranking tactic or the personal best tactic according to the competition goal, which makes the athletes show different pacing pattern in the 800-m race [25]. The athletes who not only pursue the competition ranking but also strive to create personal best usually adopt the positive pacing tactic. The other types of athletes who only want to occupy ranking often adopt negative pacing tactic [26]. The study found that the athletes' first 400-m time was significantly less than that of the second 400 m (Figure 2). The maximal speed of athletes occurred in the 100–200-m sector, not in the 700–800-m sector. Gareth N. Sandford also found that a change in tactical behavior has occurred in M800 championship racing, whereby since 2011, medalists have largely

run faster first laps. That all shown that the athletes adopt a positive and aggressive pacing tactic in 800-m race.

4.5. Ranking Characteristics of Medalist. There was an trend of the ranking change forward from 600 to 700 m sector, but less ranking change before 600 m (Table 9). Previous studies indicated that when the athletes occupy the front positions at 500–700 m could they surpass the opponents or expand their advantages in the final sprint phase. They were used to look for opportunities strive for excellent race results in the final phase and seldom change ranking frequently at the first half of the race [20].

According to López-del Amo et al. [11], the split ranking tactics adopted by the medalist could be divided into three types: lead running type, follow-running type, and sprint surpassing type. The lead running type signify athletes ranked the first from start to finish. The follow-running type signifies athletes ranked the third before 600 m and improve ranking from the last 200 m. The sprint surpassing type signify athletes gradually surpasses the opponent in the last 300 m, and win the race with a powerful sprint in the last 100 m [26]. In the study, 800-m medalist often adopt the follow-running tactic (Table 9). On the one hand, this kind of tactic could avoid the risk got boxed in. On the other hand, it was contribute to complete the race tactics and achieve the race goals. However, if an athlete adopted the lead running tactic, they will face the problem of overcoming the air resistance and increasing the oxygen consumption by 7.5% [27]. In conclusion, 800-m athletes who adopted the follow-running tactic can be a sensible tactic to stay out of trouble, dictate the pace, run on the rail, and be at the front where the odds of winning improve.

5. Conclusions

The competitive capability of elite 800-m athletes mainly include maximal speed running, speed endurance, and even pacing running. The speed pattern has the characteristics of "double peak speed," which the first peak speed is higher than the second. The maximal speed advance from 700–800 m sector to 100–200 m sector, the velocity is also increasing at the same time. Successful athletes have potentially technical abilities to reduce the 0–400 m split times, in that they are better able to draw upon their and speed, that could be contribute to create personal best. 200–400 m sector is the even pacing phase which have the function of adjust physiological condition and preserve energy. The speed endurance was the most important factor to won the 800-m race. Place in permanent ranking and adopt the follow-running tactic can increase the odds to be medalist.

Due to the long distance involved in the 800-m race, it is difficult to conduct testing of athletes' performance and physiological functions during the competition. The research only analyzed the competitive performance of athletes, lacking the support of physiological and biochemical test. In the future, it is necessary to further analyze the internal mechanisms of athletes' competitive performance characteristics from a physiological perspective. The OG official have not always been able to access more shorter electronic split times (shorter than 100 m); with the limitation that these broadcasts typically restrict coverage to the leaders and identifying when each split is reached can be difficult because of the obscured athletes.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Chao Chen contributed to the conception of the study and wrote the manuscript. Jie Ma contributed to the data collection and conception of the study. Jinzhuang Song contributed to analysis and manuscript preparation. Shengbao He performed the data analyses. Mengchao Tan helped to perform the analysis with constructive discussions.

Acknowledgments

This study was supported by the Tangshan Normal University Education and Teaching Reform Project (Theory and Practice of The Deep Hybrid of Information Technology in Track and Field Teaching) (2022JG02) and the Tangshan Normal University Science Research Fund Project (2023C06).

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