



E-ISSN: 2707-7020
P-ISSN: 2707-7012
JSSN 2025; 6(1): 01-11
www.allsportsjournal.com
Received: 02-10-2024
Accepted: 07-11-2024

Han-Chen Huang
College of Tourism, Chung
Hua University, Hsinchu,
Taiwan

Lei Huang
An Si Junior High School,
New Taipei City, Taiwan

Analysis of 800 m results and pacing strategies for male athletes in the Japan junior high school championships (2021-2024)

Han-Chen Huang and Lei Huang

DOI: <https://doi.org/10.33545/27077012.2025.v6.i1a.296>

Abstract

This study analyzes the 800-meter race results of male athletes in the Japan Junior High School Championships from 2021 to 2024, focusing on performance in the preliminaries and finals, pacing trends, and key factors affecting results. The data were sourced from official results reports and video analysis, examining the impact of pacing strategies on competition outcomes. By comparing data over the four years, the study reveals athlete performance characteristics, strategy differences, and the effects of energy distribution on results. The findings show that negative split pacing was used in 2021 and 2022, while positive split pacing predominated in 2023 and 2024, with a general trend of slower second laps. Excessive energy expenditure in the preliminaries also affected the finals. The speed in the second lap was found to be highly correlated with final rankings, with athletes employing even or negative split strategies performing better. This study provides insights into pacing strategies for junior high school athletes and serves as a reference for coaches and athletes in tactical planning.

Keywords: 800 meters, pacing strategy, energy distribution

Introduction

The 800-meter race, a middle-distance event, requires athletes to complete a relatively long distance in a short amount of time, necessitating proper energy distribution and pacing control ^[1]. This event not only demands athletes to possess fast starts and acceleration abilities but also requires them to maintain stable performance throughout the race. Therefore, athletes must precisely adjust their energy distribution and pacing strategies to achieve the best results ^[2]. A well-planned pacing strategy is crucial in the 800-meter race, as it helps athletes effectively manage fatigue and maintain competitive performance ^[3]. To achieve optimal results in the finals, athletes must possess both speed and endurance and be able to adjust their pacing strategies flexibly according to race conditions. Throughout the race, an athlete's physical and psychological states continuously change, and these factors directly influence pacing decisions. Differences in pacing strategies can significantly affect final outcomes ^[4]. Pacing strategies such as positive splits, negative splits, and even pacing depend on various factors, including an athlete's physical reserves, mental toughness, and track conditions. Selecting the most suitable pacing strategy is a key challenge faced by athletes ^[5, 6]. This paper analyzes the preliminary and final results of the male 800-meter race in the Japan Junior High School Championships (Japan-JHSC) from 2021 to 2024, exploring the performance differences and how changes in pacing strategy impact the results. By comparing changes in performance between the preliminaries and finals, this study highlights pacing characteristics in races and offers recommendations for optimizing future performances. The findings will provide practical pacing strategy references for 800-meter athletes and scientific guidance for coaches' training.

Literature review: This study analyzes the pacing, energy distribution, and their impact on the final results based on the performance data of the top eight male athletes in the 800-meter finals at the Japan-JHSC from 2021 to 2024. The data include lap times (first and second laps) and total times from both the preliminaries and finals. By comparing the performance changes between the preliminaries and finals, the study reveals the use of different pacing strategies and their relationship to results, while also exploring the critical role of pacing strategies and energy management in high-level 800-meter races.

Corresponding Author:
Han-Chen Huang
College of Tourism, Chung
Hua University, Hsinchu,
Taiwan

Japan Junior High School Championships

The Japan Junior High School Championship is one of Japan's most important annual track and field events [7]. It attracts top junior athletes from across the country and covers a range of events, with a particular focus on middle and long-distance races, including the 800-meter, 1500-meter, and 3000-meter events. As an important platform for junior athletes, this championship not only offers a chance to showcase their abilities but also serves as a valuable opportunity to gain competition experience and improve technical skills. For the 800-meter event, athletes are required to have explosive power, endurance, speed, and strategy management skills, all while facing significant challenges in energy distribution and mental toughness. Since junior athletes have yet to fully master the best pacing strategies and energy regulation methods, studying their performance has important implications for future training and competition strategies. This study uses competition data to provide athletes with specific pacing strategy recommendations to help them better manage their energy and optimize their performance. Moreover, the study compares athletes' performances in the preliminaries and finals, exploring how they adjust their strategies under different race conditions and uncovering the potential impact of these adjustments on race results.

800-Meter Pacing Strategies

Pacing strategy is crucial in the 800-meter race, as different strategies can significantly affect overall performance and final results. The 800-meter race consists of two laps, requiring athletes to consider energy distribution, speed control, and strategy selection across several factors. Below are three common pacing strategies used in the 800-meter race [3-6, 8-10].

- **Positive Split:** Athletes run the first lap faster and then push themselves in the second lap, but at a slower pace. This strategy suits athletes with strong explosive power who can maintain a certain speed. The athlete consumes more energy in the first lap to create a lead and then attempts to maintain that lead in the second lap. However, if the first lap is too fast, it may lead to fatigue in the second lap, thus affecting overall performance.
- **Negative Split:** Athletes run the first lap at a relatively conservative pace and then accelerate in the second lap. This strategy is ideal for athletes with strong sprinting abilities, as it allows them to gradually build up energy in the latter half of the race and overtake competitors. A negative split strategy requires athletes to hold back in the early stages of the race and conserve enough energy and mental stamina for the final push.
- **Even Split:** Athletes maintain a consistent pace throughout both laps, with an average pacing time that remains the same. The advantage of this strategy is that it prevents energy fluctuations and helps maintain control of the race. With proper training and a solid energy foundation, an even split strategy enables athletes to maintain a steady pace and avoid expending too much energy in the first lap, which could lead to fatigue in the second lap.

Factors Influencing Pacing Strategy Selection

The choice of pacing strategy is influenced by several factors, primarily including the athlete's physical condition,

psychological state, and the competition environment [3-6, 11-18].

- **Physical Condition:** Athletes with higher explosive power and speed are more likely to choose a positive split strategy, using the early portion of the race to gain an advantage. On the other hand, athletes with better endurance typically prefer a negative split strategy, accelerating in the latter part of the race to overtake competitors. Research indicates that the negative split strategy often yields better results, but its success heavily depends on the athlete's physical reserves and psychological resilience. Therefore, athletes should choose a pacing strategy that aligns with their physical capabilities and the conditions of the competition.
- **Psychological State:** An athlete's psychological state plays a significant role in their pacing strategy choice. Athletes who are highly nervous or lack confidence may lean towards an even split strategy, aiming to avoid excessive energy expenditure and maintain a steady rhythm. In contrast, athletes with stronger psychological fortitude may choose a negative split strategy, challenging themselves to accelerate in the second half of the race and push their limits.
- **Competition Conditions:** The race environment and weather conditions can also impact an athlete's pacing strategy. For example, in hot and humid conditions, athletes may opt for an even split strategy to minimize the risk of early fatigue. Additionally, factors such as track conditions and the performance of competitors may also influence the athlete's pacing decision.

Research methodology

Data Collection

- This study downloaded the race videos of the 800m men's preliminaries and finals from the 2021 to 2024 Japan-JHSC from the YouTube platform [19-22]. The SHOTCUT video editing software was used for video analysis. Using this method, we were able to accurately extract each athlete's lap times and performance during the race, ensuring the precision and reliability of the data.
- This study also obtained official score reports, which include detailed information on the athletes' performances at different stages (preliminaries and finals) [23-26]. These score data help compare the differences between the preliminaries and the finals. To improve readability and clarity, the race results are presented in total seconds, eliminating the need for complex minute-second conversions. This makes the data comparison simpler and more straightforward. The standardized format facilitates the calculation of averages, differences, and other metrics, enhancing statistical analysis and international comparison, thus improving the efficiency and professionalism of data processing.
- The following four tables (Tables 1 to 4) present the performance data of the top eight athletes in the 800m men's finals at the Japan-JHSC from 2021 to 2024. These data include lap times for both the preliminaries and the finals, as well as the final results, which will help analyze the differences in pacing strategies across different years and the changes in performance between the preliminaries and finals.

- The following eight images (Figures 1 to 8) show the performance data of the top eight athletes in the 800m men's finals at the Japan-JHSC from 2021 to 2024, including lap times for both the preliminaries and

finals, as well as lap time differences. These data help analyze the changes in pacing strategies of athletes across different years and explore the differences between the preliminaries and finals results.

Table 1: Results of the 2024 51st Japan-JHSC Male 800M Final

Final Rank	Preliminary			Final		
	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1st	56.30	60.10	116.40	57.37	58.49	115.86
2nd	57.54	58.31	115.85	57.80	58.71	116.51
3rd	57.17	58.07	115.24	57.51	59.03	116.54
4th	56.64	59.79	116.43	57.21	60.60	117.81
5th	55.87	60.33	116.20	57.70	60.30	118.00
6th	56.66	59.67	116.33	58.00	60.24	118.24
7th	56.07	60.19	116.26	57.11	61.52	118.63
8th	57.00	59.22	116.22	58.24	65.32	123.56
Average	56.66	59.46	116.12	57.62	60.53	118.14

Table 2: Results of the 2023 50st Japan-JHSC Male 800M Final

Final Rank	Preliminary			Final		
	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1st	56.74	59.10	115.84	57.17	57.68	114.85
2nd	56.70	59.52	116.22	57.13	58.39	115.52
3rd	56.10	59.90	116.00	57.57	58.91	116.48
4th	56.83	60.25	117.08	57.47	60.09	117.56
5th	56.70	60.09	116.79	57.31	60.29	117.60
6th	56.23	60.82	117.05	57.60	60.36	117.96
7th	56.00	60.56	116.56	57.90	61.35	119.25
8th	56.80	59.89	116.69	57.31	62.16	119.47
Average	56.51	60.02	116.53	57.43	59.90	117.34

Table 3: Results of the 2022 49st Japan-JHSC Male 800M Final

Final Rank	Preliminary	Final		
	Total Time (Seconds)	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1st	115.98	59.70	55.50	115.20
2nd	117.45	59.80	56.75	116.55
3rd	117.07	59.97	57.13	117.10
4th	117.16	59.87	58.12	117.99
5th	117.48	60.20	57.99	118.19
6th	117.31	60.13	58.63	118.76
7th	118.04	60.33	59.14	119.47
8th	117.57	60.30	59.54	119.84
Average	117.26	60.04	57.85	117.89

Table 4: Results of the 2021 48st Japan-JHSC Male 800M Final

Final Rank	Preliminary			Final		
	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)	1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1st	59	59.40	118.40	59.74	57.38	117.12
2nd	61	57.54	118.54	60.24	57.32	117.56
3rd	58	59.31	117.31	59.60	58.05	117.65
4th	59	59.27	118.27	60.24	57.65	117.89
5th	61	56.82	117.82	60.00	57.97	117.97
6th	61	56.84	117.84	59.97	58.62	118.59
7th	58	59.71	117.71	59.54	59.16	118.70
8th	58	60.11	118.11	59.90	64.73	124.63
Average	59.38	58.63	118.00	59.90	58.86	118.76

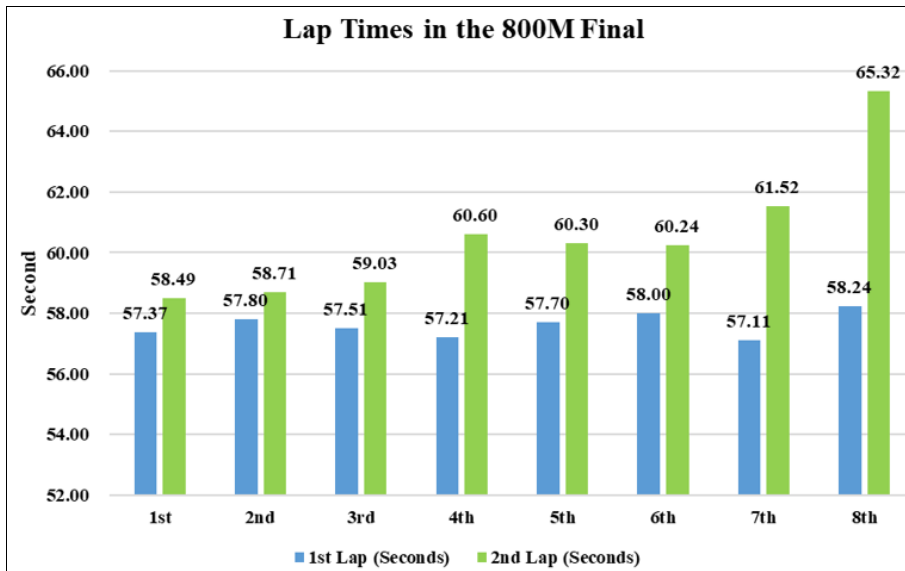


Fig 1: Lap Times in the 2024 Japan-JHSC Male 800M Final

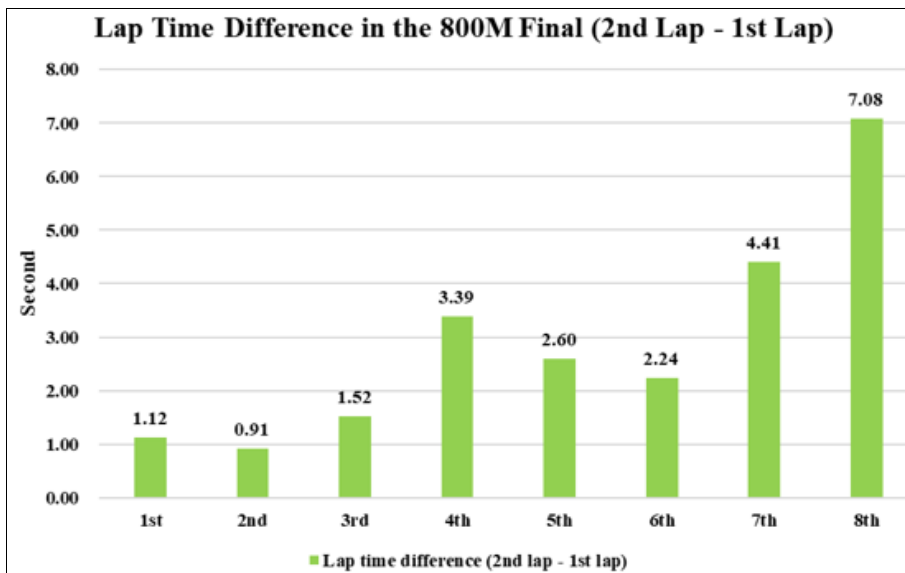


Fig 2: Lap Time Difference in the 2024 Japan-JHSC Male 800M Final

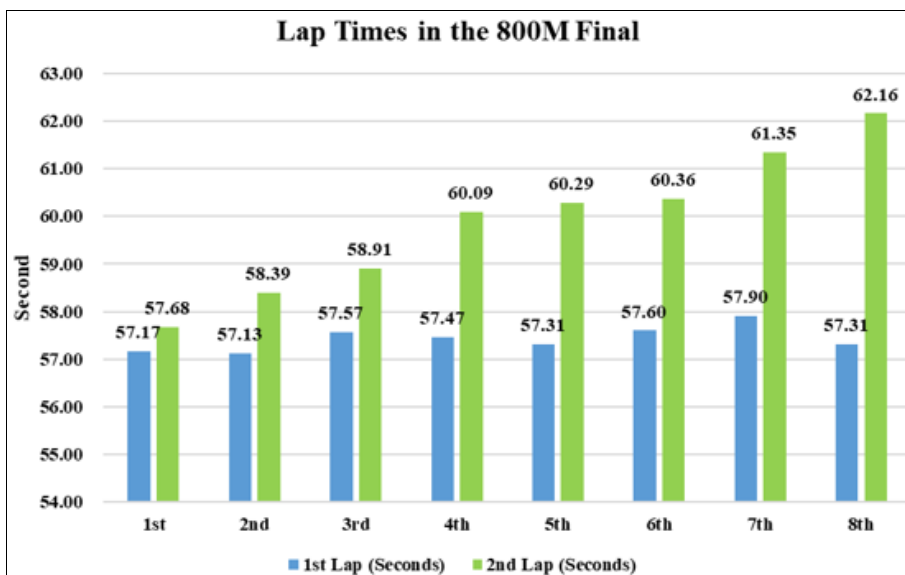


Fig 3: Lap Times in the 2023 Japan-JHSC Male 800M Final

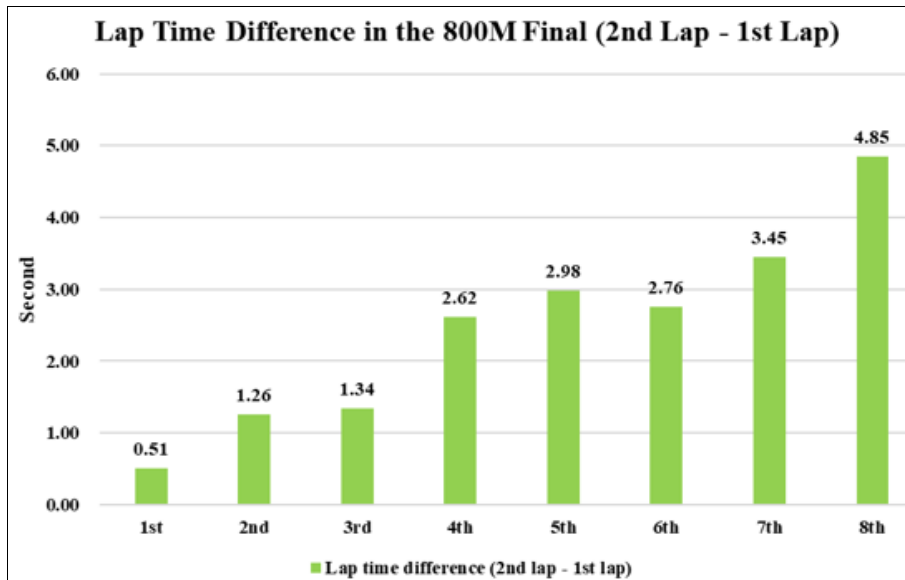


Fig 4: Lap Time Difference in the 2023 Japan-JHSC Male 800M Final

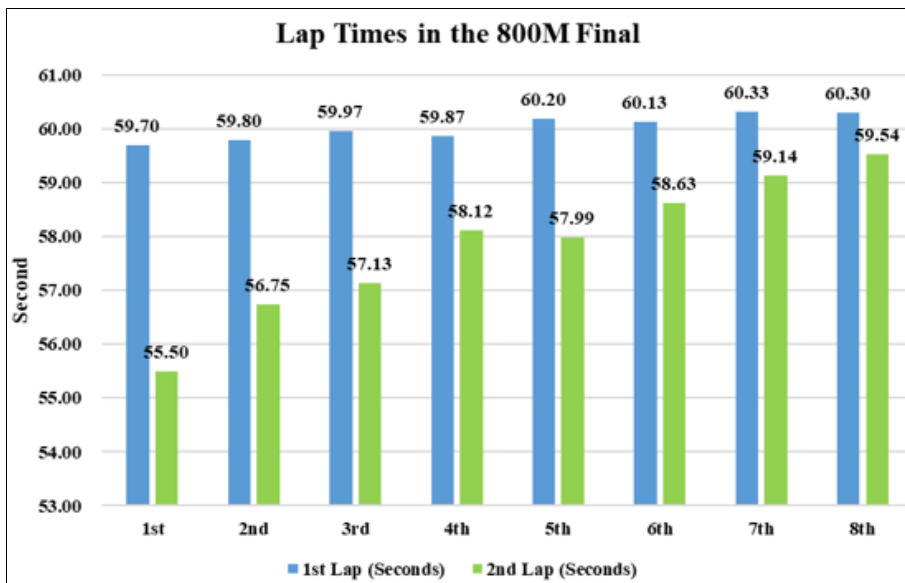


Fig 5: Lap Times in the 2022 Japan-JHSC Male 800M Final

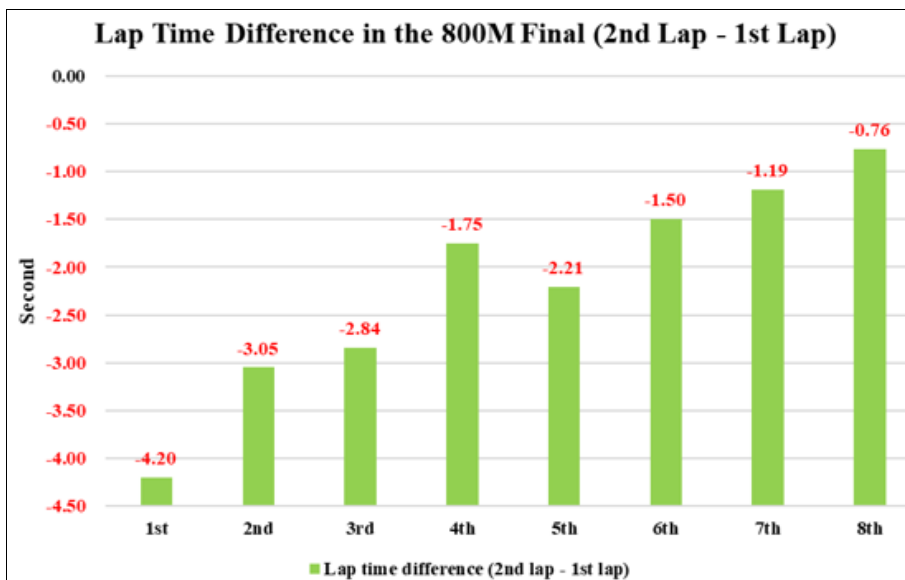


Fig 6: Lap Time Difference in the 2022 Japan-JHSC Male 800M Final

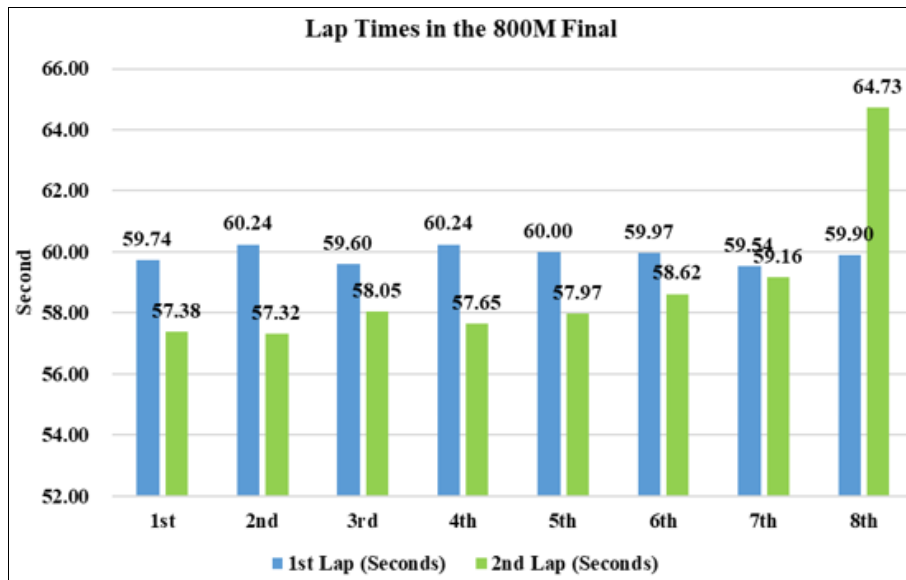


Fig 7: Lap Times in the 2021 Japan-JHSC Male 800M Final

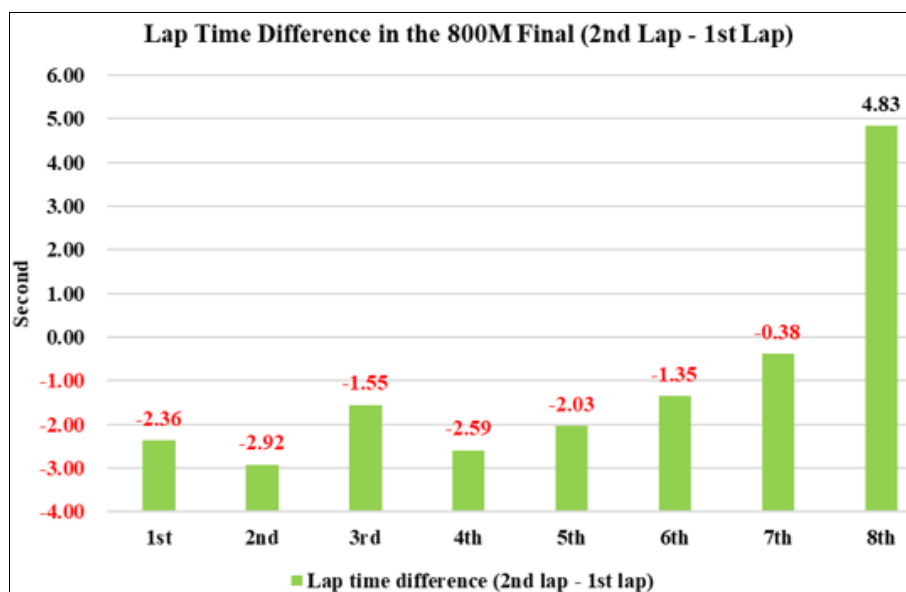


Fig 8: Lap Time Difference in the 2021 Japan-JHSC Male 800M Final

Data Analysis

- **Calculate the average performance of athletes in the preliminaries and finals each year:** By calculating the average performance for each stage across the years, we can assess the overall trend in performance and provide baseline data for subsequent analysis.
- **Analyze extreme values:** Identify the fastest and slowest lap times and explore how these extreme values impact the final results. Extreme value analysis helps identify athletes with unusual performances and analyze how their pacing choices, energy distribution, and strategies affected their final results.
- **Compare the pacing differences between the first and second laps to assess the strategy:** By comparing lap times, we can determine whether athletes used a positive split strategy (faster first lap, slower second lap), a negative split strategy (slower first lap, faster second lap), or an even split strategy (consistent pace in both laps). Based on the implementation of these strategies, we will explore their effects on performance and conduct a deeper analysis correlating with athletes'

physical condition and psychological adjustments.

- **Use statistical analysis to explore the correlation between pacing strategies and final results:** We will determine the role of each factor in the performance differences, helping to clarify the influence of pacing strategies on final outcomes.

Results and Discussion

Overall Performance and Trend Analysis

Comparison of Preliminary and Final Performance

By comparing the preliminary and final results from 2021 to 2024 (Table 5), significant differences in performance were observed between the two stages. In 2024, athletes' final results were generally slower than their preliminary performances. Specifically, the average final time in 2024 was 118.14 seconds, which was 2.02 seconds slower than the preliminary time of 116.12 seconds. This trend was evident among most athletes, especially the 8th-place finisher, whose final performance dropped by 7.34 seconds (refer to Table 1), indicating a potential issue with physical collapse or injury. The situation in 2023 was relatively

stable, with only the 1st and 2nd-place finishers showing improved final times, while the other athletes experienced a decline, leading to an average final time 0.81 seconds slower than the preliminary performance. In 2022 and 2021, most athletes were unable to maintain their best preliminary performances in the finals, with final times slower than the preliminaries by 0.63 seconds and 0.76 seconds, respectively.

Table 5: Average Times of Japan-JHSC Male 800M (2021-2024)

Year	Preliminary Average Time	Final Average Time	Gap (Final - Preliminary)
2021	118.00	118.76	+0.76
2022	117.26	117.89	+0.63
2023	116.53	117.34	+0.81
2024	116.12	118.14	+2.02

Observation of the Fastest and Slowest Performances

Based on the data from 2021 to 2024 (Table 6), we observed

Table 6: Results Distribution of Preliminary and Final (2021-2024)

Year	Preliminary Fastest Time	Preliminary Slowest Time	Gap (Slowest - Fastest)	Final Fastest Time	Final Slowest Time	Gap (Slowest - Fastest)
2021	117.31	118.54	1.23	117.12	124.63	7.51
2022	115.98	118.04	2.06	115.20	119.84	4.64
2023	115.84	117.08	1.24	114.85	119.47	4.62
2024	115.24	116.43	1.19	115.86	123.56	7.70

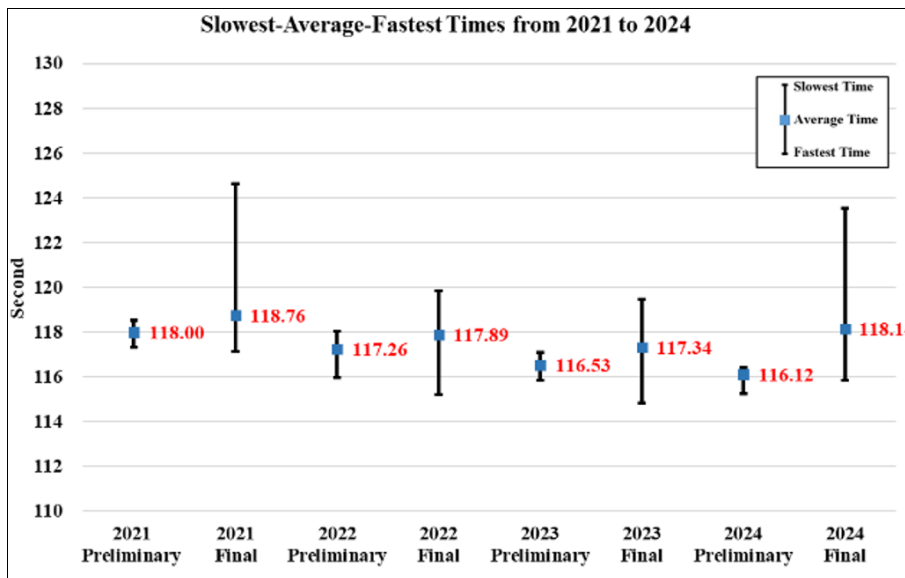


Fig 9: Comparison of Slowest, Average, and Fastest Times from 2021 to 2024

Analysis of the First and Second Lap Speed Differences

By analyzing the first and second lap performances in the preliminaries and finals from 2021 to 2024 (Table 7), we observed a significant slowdown in the second lap in 2023 and 2024 (Figure 10), while 2021 and 2022 exhibited a noticeable acceleration in the second lap. This indicates that the athletes in 2023 and 2024 adopted a "fast first lap, slow second lap" pacing strategy, whereas athletes in 2021 and 2022 followed a "slow first lap, fast second lap" strategy, showing two distinct pacing styles. In 2023 and 2024, whether in the preliminaries or finals, athletes generally ran slower in the second lap than in the first lap, reflecting the "fast first lap, slow second lap" pacing model. In the 2024 final, the top three athletes, despite running slower in the second lap, maintained relatively even pacing without

significant changes in the performance gap between the preliminary and final rounds (Figure 9). Taking 2024 as an example, the fastest preliminary time was 115.24 seconds, and the slowest time was 116.43 seconds, while the fastest final time was 115.86 seconds, and the slowest time was 123.56 seconds. Compared to the preliminaries, the performance gap in the finals generally increased, particularly in 2021 and 2024, where the differences were 7.51 seconds and 7.70 seconds, respectively. This suggests that the final performances were more unstable, with a noticeable drop in speed during the later stages of the race. In particular, the gap in the 2024 final was the largest, reaching 7.70 seconds. This could be related to increased physical exertion, higher pressure, and adjustments in race strategy during the finals. Overall, the increasing performance gap in the finals over the years reflects the intensifying competition and fluctuations in athletes' performances.

extreme speed drops. In contrast, other athletes showed significant drops in their second lap speeds, indicating possible fatigue or endurance issues (refer to Table 1). In 2023, the pacing pattern reflected a "positive split" strategy, with the second lap being 3.50 seconds slower than the first lap in the preliminaries and 2.47 seconds slower in the finals, suggesting that the athletes were unable to maintain their speed in the second half of the race. On the other hand, 2022 showed a "negative split" pacing strategy, where athletes were more conservative in the first lap and accelerated in the second lap, a strategy that benefited those with strong sprinting ability in the final lap. Similarly, 2021 also exhibited a "negative split" trend, with most athletes accelerating in the second lap to finish the race.

Table 7: Lap Average Times of Preliminary and Final (2021-2024 Japan-JHSC Male 800M)

Year	Preliminary 1 st Lap Average Time	Preliminary 2 nd Lap Average Time	Gap(2nd-1st)	Final 1st Lap Average Time	Final 2nd Lap Average Time	Gap(2nd-1st)
2021	59.38	58.63	-0.75	59.90	58.86	-1.04
2022	N/A	N/A	N/A	60.04	57.85	-2.19
2023	56.51	60.02	+3.50	57.43	59.90	+2.47
2024	56.66	59.46	+2.80	57.62	60.53	+2.91

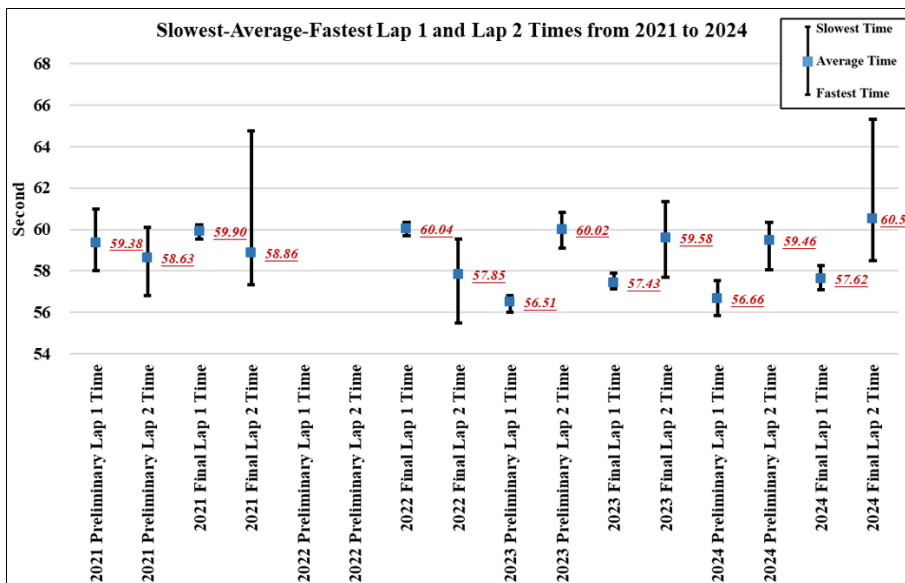


Fig 10: Comparison of Slowest, Average, and Fastest Lap Times from 2021 to 2024

Relationship Between Rankings and Pacing

Table 8 displays the R² values (coefficient of determination) for the first lap time, second lap time, and the difference between the two laps in relation to ranking across races from 2021 to 2024. The R² value, as an indicator of the goodness-of-fit in regression models, reflects the strength of the relationship between independent and dependent variables. The value ranges from 0 to 1, with values closer to 1 indicating a higher degree of fit and stronger variable relationships. Based on the data in the table, the second lap time shows a strong explanatory power for ranking, with R²

values ranging from 0.5558 to 0.9689, indicating a medium to very strong relationship. The difference between the first and second lap times also demonstrates strong explanatory power, with R² values ranging from 0.5586 to 0.9259, representing a medium to very strong relationship. In contrast, the relationship between the first lap time and ranking is weaker, with R² values ranging from 0.0276 to 0.8902, showing significant variation in explanatory power from very weak to relatively strong, and therefore cannot serve as the main reference.

Table 8: R² Values for Ranking vs. 1st Lap Time, 2nd Lap Time, and Lap Time Difference (2nd-1st)

Year	Rankings vs. 1st Lap Time R ²	R ² Classification	Rankings vs. 2nd Lap Time R ²	R ² Classification	Rankings vs. Lap Time Difference(2nd-1st) R ²	R ² Classification
2021	0.0276	Very Weak Relationship	0.5558	Moderate Relationship	0.5586	Moderate Relationship
2022	0.8902	Very Strong Relationship	0.9493	Very Strong Relationship	0.9109	Very Strong Relationship
2023	0.2949	Weak Relationship	0.9689	Very Strong Relationship	0.9259	Very Strong Relationship
2024	0.1177	Very Weak Relationship	0.7486	Strong Relationship	0.7395	Strong Relationship

R² Classification Explanation:

Very Weak Relationship (0.00 - 0.19): Very low goodness of fit, with little variance explained by the model.

Weak Relationship (0.20 - 0.39): The model explains some of the variance, but there is still a significant amount unexplained.

Moderate Relationship (0.40 - 0.59): The model has a good fit, but there is room for improvement.

Strong Relationship (0.60 - 0.79): The model explains the variation in the dependent variable well.

Very Strong Relationship (0.80 - 1.00): The model explains the variation in the dependent variable very well, with very high goodness of fit.

Analysis of Special Athlete Performances

The performance of special athletes in 2024 stands out, particularly the 8th place finisher, whose time difference between the preliminary and final races was 7.34 seconds. This significant time gap suggests that the athlete

experienced a collapse in physical stamina or an injury, resulting in a noticeable slowdown in the second lap, which severely impacted their final result. In 2023, the 7th and 8th place finishers also showed significant fluctuations in their performances, mainly due to fatigue in the second lap, with

time losses of 2.69 seconds and 2.78 seconds, respectively. In contrast, 2022 and 2021 saw fewer extreme variations, with most athletes maintaining consistent pacing in the final, except for the 8th place finisher. In 2022, the first-place finisher's performance was notable, with a first lap of 59.70 seconds and a second lap of 55.50 seconds, leading to a total time of 115.20 seconds. This negative split strategy (a 4.20-second difference) demonstrated a conservative approach in the first lap, preserving energy and avoiding excessive fatigue, followed by a gradual acceleration in the second lap, allowing for a strong finish. This strategy effectively avoided premature exhaustion, ensuring the athlete maintained energy for the final push. In 2023, the first-place finisher had a first lap time of 57.17 seconds and a second lap time of 57.68 seconds, with only a 0.51-second difference between the two laps, maintaining a stable pace throughout the race. This strategy helped the athlete avoid starting too fast or suffering from fatigue in the later stages, allowing for a balanced energy distribution. Most other athletes in 2023 adopted a positive split strategy, where the first lap was faster than the second.

Race Strategy and Pacing Model Analysis

General Trends in Pace Patterns

In the 2023 and 2024 races, athletes generally exhibited a "fast in the beginning, slow at the end" pacing strategy (positive split pacing). However, in the 2021 and 2022 races, athletes mostly adopted a "slow in the beginning, fast at the end" pacing strategy (negative split pacing). In 2021 and 2022, athletes maintained a slower pace in the first lap to conserve energy, then increased their speed in the second lap, often sprinting. In contrast, in 2023 and 2024, most athletes adopted the "fast in the beginning, slow at the end" strategy, with some even maintaining speeds in the second lap close to the first lap, indicating a difference in pacing strategies. In 2024, the top athletes showed less slowdown in the second lap, demonstrating strong endurance and the ability to avoid significant performance drop-off.

Differences Between Preliminary and Final Race Strategies

Looking at the performance differences between the preliminary and final races, most athletes exerted maximum effort in the preliminary race and struggled to maintain their best performance in the final. Data from 2021 to 2024 shows that, except for a few athletes who performed better in the final, most athletes had slightly lower final race results. Notably, in 2024, the first-place athlete was 0.54 seconds faster in the final than in the preliminary, which may have been due to more refined energy and pacing management. Other athletes, on the other hand, struggled to maintain their performance in the final due to excessive energy consumption in the preliminary round.

Impact of Pacing Strategies on Results

Pacing strategies significantly influenced athletes' final rankings. Especially in 2021 and 2022, athletes generally adopted negative split strategies (slower first half, faster second half), which helped preserve enough energy to sprint in the second lap. In 2024 and 2023, although most athletes opted for a positive split strategy (faster first half, slower second half), maintaining speed in the second lap still significantly impacted final performance. For instance, the 8th place athlete in 2024 experienced a 7.34-second decline

in the final due to a collapse in performance in the second lap.

Adaptability and Psychological Strategy

In addition to physical management, an athlete's psychological adjustment plays an important role in pacing strategy. In high-intensity races, the psychological state often directly influences pacing decisions. Many athletes, especially in the final, experience heightened nervousness or anxiety, which can lead to overly aggressive strategies and disregard for energy expenditure. In key races like the finals, athletes' psychological pressure and desire to win may prevent them from adjusting their strategies according to their actual physical condition. In the 2023 and 2024 finals, many athletes showed significant fluctuations in speed during the first two laps, indicating an imbalance between psychological pressure and energy expenditure. Therefore, in addition to physical training, psychological adjustments and strategic planning should be essential components of athletes' preparation for the final race.

Suggestions for Improving Pacing Strategies

To improve performance in the final, optimizing pacing strategies is crucial. Athletes should focus on proper energy allocation by avoiding overly aggressive starts, especially in the first lap, and aim to control their pace to prevent excessive energy expenditure. Ensuring that enough energy is conserved for the later stages of the race is essential. Psychological regulation and physical coordination also play key roles. Athletes should strengthen their psychological training to avoid adopting irrational sprinting strategies under high pressure. Strategies should be adjusted according to the athlete's physical condition during the race, maintaining calm and avoiding overly aggressive tactics. Additionally, data analysis and feedback mechanisms can be valuable tools. Athletes can use data analysis to monitor pacing variations and adjust their strategies based on actual performance. Pre-race simulation training, which mimics the pacing patterns of a final race, can help athletes identify their optimal pacing rhythm. Lastly, endurance training and recovery are important factors. Strengthening endurance training improves energy reserves, helping athletes maintain stable performance throughout the race. Post-race recovery is equally crucial to prevent fatigue from affecting performance in the latter stages.

Analysis of Factors Affecting Performance

Impact of Preliminary Round

Due to the competition structure and the pressure to advance, athletes push themselves to secure a spot in the top eight during the preliminary round, leading to significant energy expenditure. This strategy makes it difficult for athletes to fully recover after the preliminary round, affecting their performance in the final. From 2021 to 2024, the overall performance in the preliminary rounds remained stable, with athletes performing well, but physical fitness declined in the finals. The average times for the preliminary rounds in 2021 and 2022 were 118.00 seconds and 117.26 seconds, respectively, while in 2023 and 2024, they were 116.53 seconds and 116.12 seconds, respectively. The high-intensity performance in the preliminary rounds gradually depleted the athletes' energy, affecting subsequent competitions. In 2024, some athletes showed a significant gap between their preliminary and final results (116.12

seconds in the preliminary round, 118.14 seconds in the final), revealing differences in their preparation and adaptability. Additionally, extreme values in the preliminary round are also important. In 2024, the slowest time in the final was 123.56 seconds, while the slowest time in the preliminary round was 116.43 seconds, indicating the impact of energy distribution and competition strategy on final performance.

Impact of Final Round

Performance in the final round is typically influenced by physical fitness, as athletes are unable to maintain their best speed from the preliminary round in the second lap. Most athletes' performance declines in the final. In 2024, the average time in the final was 118.14 seconds, 2.02 seconds slower than the preliminary round, showing that energy depletion after the first lap led to a decrease in speed. The athlete in 8th place experienced a collapse in physical strength, with their time increasing by 7.34 seconds, highlighting the importance of energy management. In 2023, athletes generally exhibited a "fast at first, slow at second" pacing strategy in the final, with the second lap being slower. Athletes finishing in lower positions showed signs of energy collapse or speed reduction. The times of athletes finishing in 7th and 8th places decreased by 2.69 seconds and 2.78 seconds, respectively, compared to the preliminary round. The impact of physical fitness on performance was significant. Athletes in higher positions were able to maintain a stable pace in the second lap, while those in lower positions experienced a notable slowdown due to insufficient energy. This demonstrates that pacing strategy and energy management are crucial. In 2021 and 2022, athletes generally adopted a negative split strategy (slower in the first half, accelerating in the second half), which helped preserve energy for a sprint in the second lap, especially benefiting those with strong sprinting abilities.

Strategic Recommendations

In the preliminary round, athletes should focus on strengthening their endurance training to minimize excessive energy consumption, while also emphasizing recovery to ensure optimal performance in the final. Physical fitness monitoring is crucial to ensure that energy levels are suitable for the preliminary round, which will improve performance and help preserve fitness for the final. Athletes should carefully plan their competition strategies to avoid exhausting themselves too early in the preliminary round, adjusting their pacing based on the competition dynamics to ensure sufficient energy for the final. In the final round, energy management in the second lap becomes crucial. Athletes must prioritize energy distribution and sprinting strategies to prevent excessive energy expenditure in the first lap. Interval training can be particularly helpful in improving sprinting ability during the second lap. Additionally, enhancing psychological resilience and endurance training is essential for athletes to remain calm during energy depletion and maintain efficient performance in the second lap. Finally, athletes should adjust their pacing strategies based on the competition situation and their physical condition, avoiding starting too fast to prevent a drop in speed during the second lap.

Conclusion

This study provides an in-depth analysis of the performance

and pacing strategies in the 800-meter race for elite male junior athletes at the Japan-JHSC from 2021 to 2024. It examines the evolution of pacing strategies and their impact on race outcomes. The findings reveal that athletes' pacing strategy choices varied over the years. In 2021 and 2022, most athletes predominantly adopted a negative split strategy, while in 2023 and 2024, a positive split strategy was more common. Regardless of the chosen strategy, performance in the second lap was closely tied to the final result. Athletes who effectively employed a negative split strategy (slower first lap, faster second lap) or maintained an even pacing distribution typically achieved better overall results. The study also highlights that excessive energy expenditure during the preliminary rounds negatively impacted performance in the final, emphasizing the importance of proper energy management in multi-round competitions. Based on these findings, athletes are advised to focus on managing energy consumption during the preliminary rounds to ensure peak performance in the final. Furthermore, enhancing endurance training is recommended to improve energy stability during the latter stages of the race. Additionally, pacing strategies should be tailored to each athlete's physical characteristics and psychological resilience, enabling them to select the most effective race rhythm and, ultimately, enhance their competitive performance.

References

1. Hsu SY. Analysis of training effects of pacing in 800-meter segment running. *J Phys Educ.* 1995;20:203-211. <https://doi.org/10.6222/pej.0020.199512.4018>
2. Tsai YM, Chen CJ, Chen MK. Four weeks of 800-meter interval running training teaching programs for different teaching abilities of running training results. *Nat Chung Hsing Univ J Sports.* 2016;15:61-69. <https://www.airitilibrary.com/Article/Detail?DocID=a0000559-201601-201602230010-201602230010-61-69>
3. Amo J, Planas-Anzano A, Zakynthinaki M, Ospina-Betancurt J. Effort distribution analysis for the 800 m race: IAAF World Athletics Championships, London 2017 and Birmingham 2018. *Biol Hum Kinet.* 2021;13(1):103-110. <https://doi.org/10.2478/bhk-2021-0013>
4. Filipas L, Nerli Ballati E, Bonato M, La Torre A, Piacentini MF. Elite male and Male 800-m runners' display of different pacing strategies during season-best performances. *Int J Sports Physiol Perform.* 2018;13(10):1344-1348. <https://doi.org/10.1123/ijspp.2018-0137>
5. Sandford GN, Pearson S, Allen SV, Malcata RM, Kilding AE, Ross A, Laursen PB. Tactical behaviors in men's 800-m Olympic and World-Championship medalists: A changing of the guard. *Int J Sports Physiol Perform.* 2018;13(2):246-249. <https://doi.org/10.1123/ijspp.2016-0780>
6. Chen C, Ma J, Song J, He S, Tan M. Characteristics of elite male 800-m runner's race performance based on hybrid computing methods. *Appl Bionics Biomech.* 2023;2023:1-8. <https://doi.org/10.1155/2023/7368369>
7. Japan Association of Athletics Federations. The 48th Japan Junior High School Championships. Japan Association of Athletics Federations; c2024 Dec. Available from: <https://www.jaaf.or.jp/competition/>
8. Rave JM. The relationship between tactical positioning

- and the race outcome in 800-m running at the 2016 Olympic Games and 2017 IAAF World Championship. *J Hum Kinet.* 2020;71:299-305.
<https://doi.org/10.2478/hukin-2019-0090>
9. Duffield R, Dawson B, Goodman C. Energy system contribution to 400-metre and 800-metre track running. *J Sports Sci.* 2005;23:299-307.
 10. Kelemen B, Benczenleitner O, Tóth L. Are 800-m runners getting faster? Global competition performance trends between 1999 and 2021. *J Phys Educ Sport.* 2022;22(9):2231-2237.
 11. Kelemen B, Csányi T, Revesz L, Benczenleitner O, Toth L. Comparison of winning and record tactics in elite-level male middle-distance running. *J Phys Educ Sport.* 2023;469-475.
<https://doi.org/10.7752/jpes.2023.02058>
 12. Casado A, González-Mohino F, Gonzalez Rave JM, Boullosa D. Pacing profiles of middle-distance running world records in men and women. *Int J Environ Res Public Health.* 2021;18:12589.
<https://doi.org/10.3390/ijerph182312589>
 13. Zhang YZ. Pacing teaching method for the 1500 meter race. *Q Chin Phys Educ.* 1991;5(2):70-75.
 14. Chen WY. Pacing strategy during the 1500 meter race. *Sports Res Rev.* 2010;111:25-32.
 15. Tsai YR, Dai SJ, Ling ZF. Pacing analysis of the 1500 meter race in the 29th National University Games. *Q Chin Phys Educ.* 1999;12(5):28-33.
 16. Hanley B, Stellingwerff T, Hettinga FJ. Successful pacing profiles of Olympic and IAAF World Championship middle-distance runners across qualifying rounds and finals. *Int J Sports Physiol Perform.* 2019;14:894-901.
 17. Tucker R, Lambert MI, Noakes TD. An analysis of pacing strategies during men's world-record performances in track athletics. *Int J Sports Physiol Perform.* 2006;1:233-245.
 18. de Koning JJ, Foster C, Lucia A, Bobbert MF, Hettinga FJ, Porcari JP. Using modeling to understand how athletes in different disciplines solve the same problem: Swimming versus running versus speed skating. *Int J Sports Physiol Perform.* 2011;6:276-280.
 19. Japan Junior High School Championships Track and Field LIVE Channel. The 51st Junior High School Championships; c2024 Dec. Available from:
<https://www.youtube.com/@LIVETFRemaker/videos>
 20. Japan Junior High School Championships Track and Field LIVE Channel. The 50th Junior High School Championships; c2024 Dec. Available from:
<https://www.youtube.com/@LIVETFRemaker/videos>
 21. Athletics Family. The 49th Junior High School Championships. Dec 2024. Available from:
<https://www.youtube.com/@runfamily>
 22. Nagasaki Sasebo Athletics Channel. The 48th Junior High School Championships. Dec 2024. Available from: <https://www.youtube.com/@kct88at2011>
 23. Japan Association of Athletics Federations. Results of the 51st Junior High School Championships. Japan Association of Athletics Federations. Dec 2024. Available from:
<https://www.jaaf.or.jp/competition/detail/1851/>
 24. Japan Association of Athletics Federations. Results of the 50th Junior High School Championships. Japan Association of Athletics Federations. Dec 2024.
- Available from:
<https://www.jaaf.or.jp/competition/detail/1751/>
25. Japan Association of Athletics Federations. Results of the 49th Junior High School Championships. Japan Association of Athletics Federations. Dec 2024. Available from:
<https://www.jaaf.or.jp/competition/detail/1639/>
 26. Japan Association of Athletics Federations. Results of the 48th Junior High School Championships. Japan Association of Athletics Federations. Dec 2024. Available from:
<https://www.jaaf.or.jp/competition/detail/1559/>