

International Journal of Sports, Exercise and Physical Education

ISSN Print: 2664-7281
ISSN Online: 2664-729X
Impact Factor: RJIF 8
IJSEPE 2025; 7(1): 12-22
www.sportsjournals.net
Received: 04-10-2024
Accepted: 09-11-2024

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Analysis of the performance and pacing strategies in the 800 m for junior female athletes in the Taiwan middle school athletic games (2022-2024)

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DOI: <https://doi.org/10.33545/26647281.2025.v7.i1a.151>

Abstract

This study aims to analyze the performance of junior female athletes in the 800-meter event during the Taiwan Middle School Athletic Games from 2022 to 2024, exploring the characteristics of their performance, pacing strategies, and the impact of these strategies on race results. The study utilizes official result reports and publicly available video footage as data sources, comparing the competition data over three years to reveal trends in pacing changes and the influence of energy distribution on performance outcomes. The results show that all athletes generally adopted a "fast-first, slow-second" pacing strategy. This strategy helped secure an early advantage but led to excessive fatigue and a slowdown in the second half of the race, ultimately affecting their results. Only one athlete maintained a more even pacing strategy and was able to sustain a consistent speed, ultimately achieving an outstanding performance. The study found that the slowdown in the second lap was the primary reason for poor results. Additionally, frequent competition schedules posed challenges to athletes' physical endurance and health, with overly tight schedules leading to excessive fatigue and an increased risk of injury. Therefore, the study recommends that future training should focus on athletes' energy management, the rational selection of pacing strategies, strengthening speed endurance, and adjusting competition schedules to avoid overloading, providing a basis for coaches to develop more scientifically grounded training plans.

Keywords: 800 m, pacing strategy, energy distribution, junior female athletes

Introduction

The 800-meter race, as a middle-distance event, requires athletes to complete a relatively long distance within a limited time, necessitating effective energy distribution and pace control throughout the entire race ^[1, 2]. The uniqueness of this event lies in the fact that athletes must not only possess the ability to accelerate quickly from the start but also maintain a consistent output throughout the race to ensure optimal performance ^[1-3]. Therefore, a rational pacing strategy becomes crucial in the 800-meter race, helping athletes effectively overcome physical fatigue and maintain a good competitive state ^[4, 5]. Achieving excellent results in the final requires not only speed and endurance but also the ability to adjust pacing flexibly based on the race conditions. Throughout the race, athletes' energy reserves and psychological state change, which directly affects their pacing choices, and different pacing strategies can significantly influence the final results ^[5, 6]. Pacing strategies are generally categorized into positive pacing strategies (fast start, slower finish), negative pacing strategies (slow start, faster finish), and even pacing strategies (consistent speed throughout). The selection of these strategies depends on various factors such as an athlete's physical condition, mental fortitude, and track conditions. Choosing the most suitable strategy based on personal traits is a core issue each athlete must address in the competition ^[3-6].

This paper aims to analyze the performance and pacing strategies in the 800-meter junior female events at the Taiwan Middle School Athletic Games (Taiwan-MSAG) from 2022 to 2024. By examining the preliminary, semifinal, and final results, this study explores the differences in athletes' performance at different stages, the variations in their pacing strategies, and how these strategies affect their final rankings. The goal of this research is to uncover the pacing characteristics of athletes during the race process, provide insights for

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optimizing their future performance, and offer valuable reference points for coaches in designing more scientifically based training strategies.

Literature review

This study aims to analyze the performance of junior female athletes in the 800-meter final at the Taiwan Middle School Athletic Games (Taiwan-MSAG) from 2022 to 2024, with a focus on their pacing strategies, energy distribution, and the impact of these factors on their final results. The research data includes the first and second lap times of each athlete in the final, as well as the changes in their total times across the preliminary, semifinal, and final rounds. Through this data, the study seeks to reveal the application of different pacing strategies and their relationship with performance outcomes, while also delving into the crucial role of pacing strategies and energy management in improving 800-meter race results.

Taiwan Middle School Athletic Games

The Taiwan Middle School Athletic Games is one of the most important annual track and field events in Taiwan, attracting top junior and senior high school athletes from across the country^[7]. It is held every April and is considered the highest stage for middle school athletes in Taiwan, offering significant competitive intensity and influence. The 800-meter race in the Taiwan-MSAG is often referred to as the "devil's 800" due to the immense physical and mental challenges it poses to athletes. Athletes must cover a relatively long distance in a short time, requiring both explosive power and endurance, while also needing to precisely control their pacing and effectively manage their energy throughout the race^[3-6]. The challenge is further compounded by the need to maintain a high pace in the first half of the race while avoiding excessive fatigue and then executing an effective sprint in the second half. This multi-layered demand places high expectations on the athletes' physical fitness, strategic planning, and psychological resilience^[6]. For junior female athletes, they are still in the process of learning technical skills and tactical strategies, and have not yet fully mastered optimal pacing strategies and energy management techniques. Therefore, studying the performance of this group can help better understand how they utilize their physical resources and make pacing decisions during competition. This can provide valuable insights for future training and race strategy. As the race progresses, athletes need to adjust their strategies according to their energy levels at different stages, and the performance variations in this process will shed light on the key role of pacing strategies in the 800-meter race.

800 m Pacing Strategies

In the 800-meter race, an athlete's pacing strategy is crucial to their overall performance and final result. Given the two-lap structure of the race, athletes must carefully distribute their energy and manage their speed. Below are three common pacing strategies^[1-6, 8-10]:

- **Positive Split Strategy:** In this strategy, the athlete starts the first lap at a faster pace in an attempt to gain an early lead, and then slows down in the second lap to complete the race. This strategy is suitable for athletes with strong explosive power, allowing them to create a gap with their opponents early on. However, if the first

lap is too fast, it may lead to exhaustion in the second lap, ultimately affecting the overall performance.

- **Negative Split Strategy:** The athlete starts the first lap at a more conservative pace, conserving energy, and then accelerates in the second lap to sprint toward the finish. This strategy is ideal for athletes with stronger finishing abilities, as it allows them to overtake opponents in the latter half of the race. Research has shown that the negative split strategy helps athletes maximize their potential in the second half, but it requires careful control of the pace in the initial lap to ensure there is enough energy and mental stamina to support the final push.
- **Even Split Strategy:** The athlete maintains a steady pace throughout both laps, aiming for similar lap times. This strategy helps avoid significant fluctuations in energy levels, making the race more controllable. With proper training and a strong fitness foundation, the even split strategy can help athletes maintain a consistent rhythm, preventing excessive energy expenditure in the first lap that would lead to fatigue in the second lap.

Choosing the appropriate pacing strategy involves considering various factors, including the athlete's physical condition, mental state, and race conditions^[4-6, 11-18]:

- **Physical Condition:** Athletes with high explosive power may tend to adopt the positive split strategy, while those with stronger endurance might prefer the negative split strategy. However, the success of the negative split strategy depends on the athlete's energy reserves and mental resilience. Therefore, athletes should make decisions based on their individual situation and the competition environment.
- **Mental State:** The mental state also plays a crucial role in choosing a pacing strategy. Athletes who are highly nervous or lack self-confidence might lean toward the even split strategy to avoid excessive energy depletion. Conversely, athletes with strong mental fortitude may choose the negative split strategy, accelerating in the second lap to push their limits.
- **Race Conditions:** The environment and weather conditions can also affect an athlete's pacing strategy. For example, in hot or humid conditions, athletes may opt for the even split strategy to avoid early fatigue. Additionally, factors such as track conditions and the performance of competitors can influence pacing decisions to some extent.

Research methods

Data Collection

- Competition footage of the 2022-2024 Taiwan-MSAG junior female 800-meter finals were downloaded from YouTube^[19-21]. SHOTCUT video analysis software was then used to accurately extract lap time data for each athlete in the final.
- Official performance reports were obtained, which provided detailed results^[22], including data on athletes' performances at various stages of the race. This information was crucial for comparing and analyzing differences between the preliminary, semifinal, and final rounds. To enhance the readability of the data, all results were presented in total seconds, avoiding the complications of converting minutes and seconds. This

simplified data comparisons, provided a standardized format for calculating averages, differences, etc., and improved the efficiency and professionalism of statistical analysis and inter Taiwan comparisons.

- Three tables (Table 1-3) display the performances of the eight athletes in the 800-meter final of the Taiwan-MSAG junior female division from 2022 to 2024, including their times in each round (preliminary, semifinal, and final). This data will enable the analysis of differences in pacing strategies across different years and compare changes in results between the preliminary, semifinal, and final rounds.
- The following nine figures (Figures 1-9) present the

performance data of the eight athletes in the 800-meter finals of the Taiwan-MSAG junior female division from 2022 to 2024. These figures cover lap times in the finals, lap time differences, and total times across the preliminary, semifinal, and final rounds. By analyzing these visualizations, we can examine the changes in pacing strategies among athletes in the finals across different years. Additionally, we can explore the differences in performance between the preliminary, semifinal, and final rounds, thus revealing the impact of athletes' energy distribution and race strategies during the competition.

Table 1: 2024 Taiwan-MSAG Junior Female 800 m Results

Final Rank	Preliminary (Seconds)	Semi-Final (Seconds)	Final (Seconds)	Final		
				1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1 st	148.31	142.01	135.82	65.80	70.02	135.82
2 nd	144.39	141.74	136.21	65.60	70.61	136.21
3 rd	142.80	142.02	137.45	65.51	71.94	137.45
4 th	144.89	142.35	139.44	65.70	73.74	139.44
5 th	141.58	142.97	141.34	66.37	74.97	141.34
6 th	142.84	143.79	142.31	67.77	74.54	142.31
7 th	145.95	142.30	145.54	67.74	77.80	145.54
8 th	148.26	142.68	147.26	67.74	79.52	147.26
Average	144.88	142.48	140.67	66.53	74.14	140.67

Table 2: 2023 Taiwan-MSAG Junior Female 800 m Results

Final Rank	Preliminary (Seconds)	Semi-Final (Seconds)	Final (Seconds)	Final		
				1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1 st	146.76	136.75	133.63	66.23	67.40	133.63
2 nd	141.63	142.09	138.34	67.33	71.01	138.34
3 rd	140.88	144.14	141.07	68.26	72.81	141.07
4 th	145.84	144.51	141.30	68.23	73.07	141.30
5 th	145.43	146.28	144.79	68.60	76.19	144.79
6 th	145.22	146.07	144.92	68.54	76.38	144.92
7 th	146.49	145.45	146.55	68.60	77.95	146.55
8 th	143.95	145.02	151.47	68.57	82.90	151.47
Average	144.53	143.79	142.76	68.05	74.71	142.76

Table 3: 2022 Taiwan-MSAG Junior Female 800 m Results

Final Rank	Preliminary (Seconds)	Final (Seconds)	Final		
			1st Lap (Seconds)	2nd Lap (Seconds)	Total Time (Seconds)
1 st	142.45	134.61	64.17	70.44	134.61
2 nd	142.38	137.56	65.20	72.36	137.56
3 rd	144.77	141.32	65.17	76.15	141.32
4 th	144.53	144.04	66.13	77.91	144.04
5 th	147.71	145.51	66.20	79.31	145.51
6 th	147.82	147.11	66.17	80.94	147.11
7 th	149.95	152.81	67.17	85.64	152.81
8 th	145.36	154.79	67.20	87.59	154.79
Average	145.62	144.72	65.93	78.79	144.72

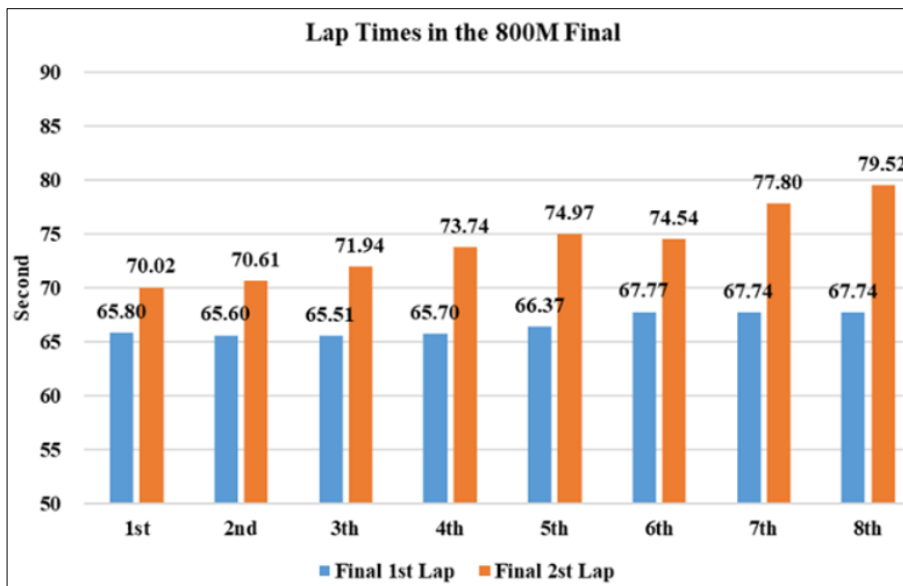


Fig 1: Lap Times in the 2024 Taiwan-MSAG Junior Female 800M Final

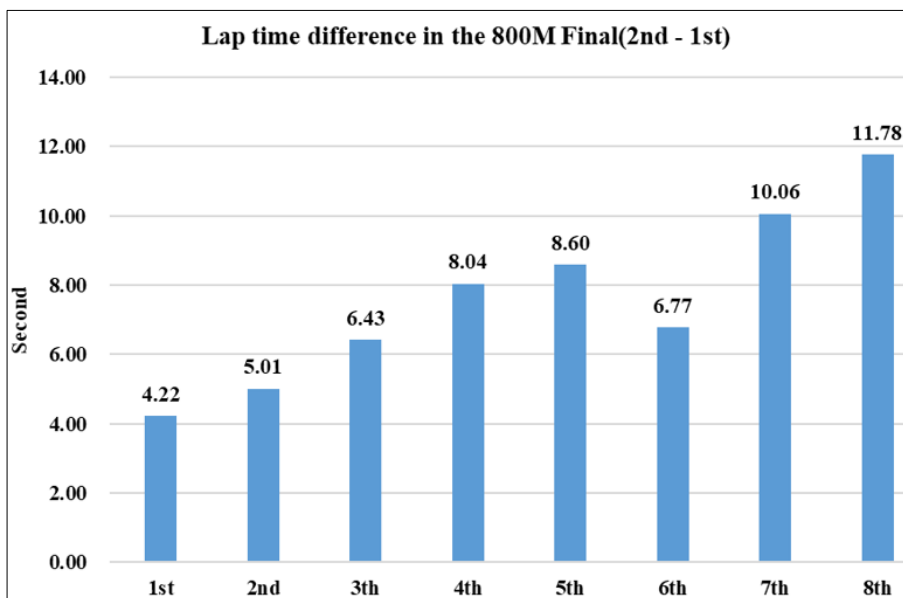


Fig 2: Lap Time Difference in the 2024 Taiwan-MSAG Junior Female 800M Final

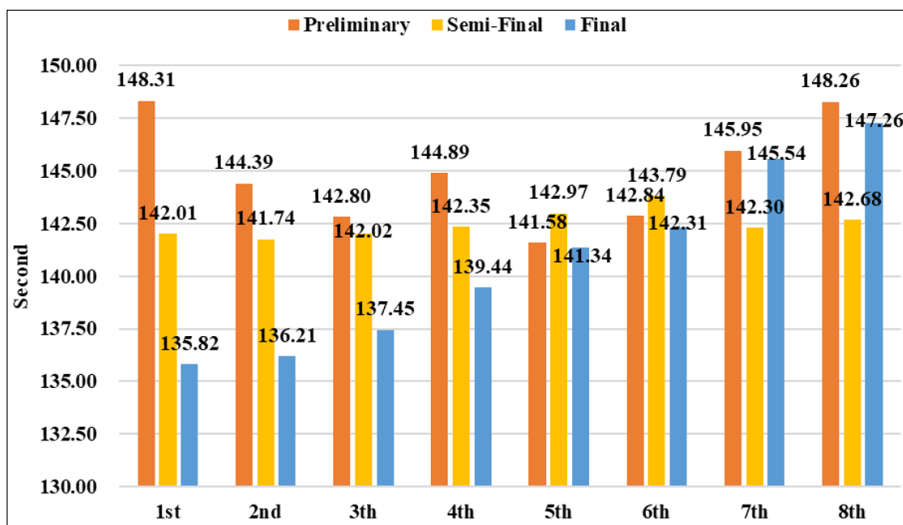


Fig 3: 2024 Taiwan-MSAG Junior Female 800m Finalists' Results in Each Round

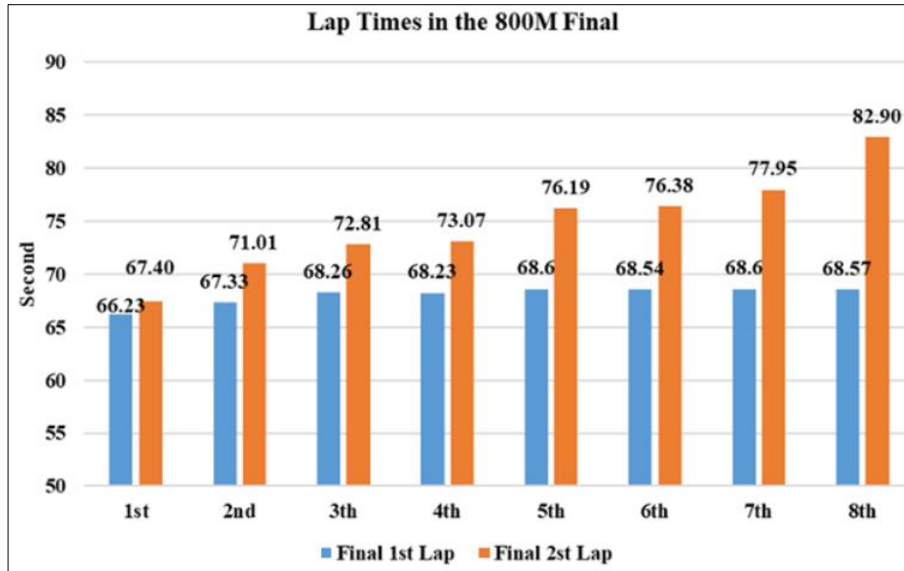


Fig 4: Lap Times in the 2023 Taiwan-MSAG Junior Female 800M Final

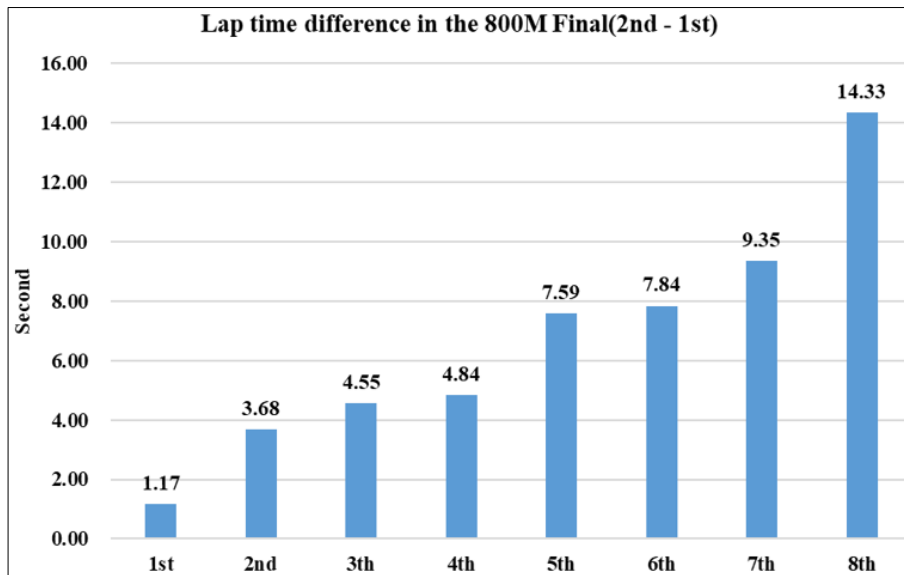


Fig 5: Lap Time Difference in the 2023 Taiwan-MSAG Junior Female 800M Final

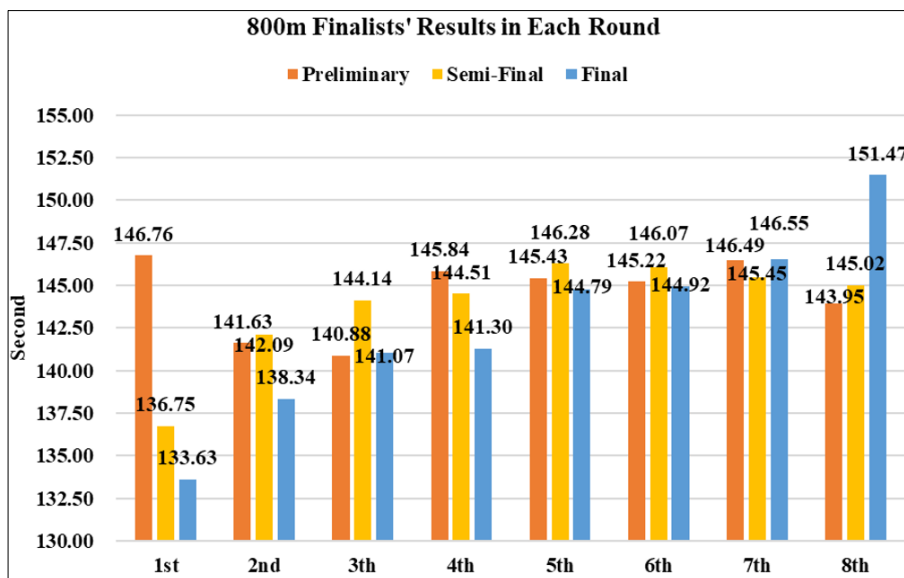


Fig 6: 2023 Taiwan-MSAG Junior Female 800m Finalists' Results in Each Round

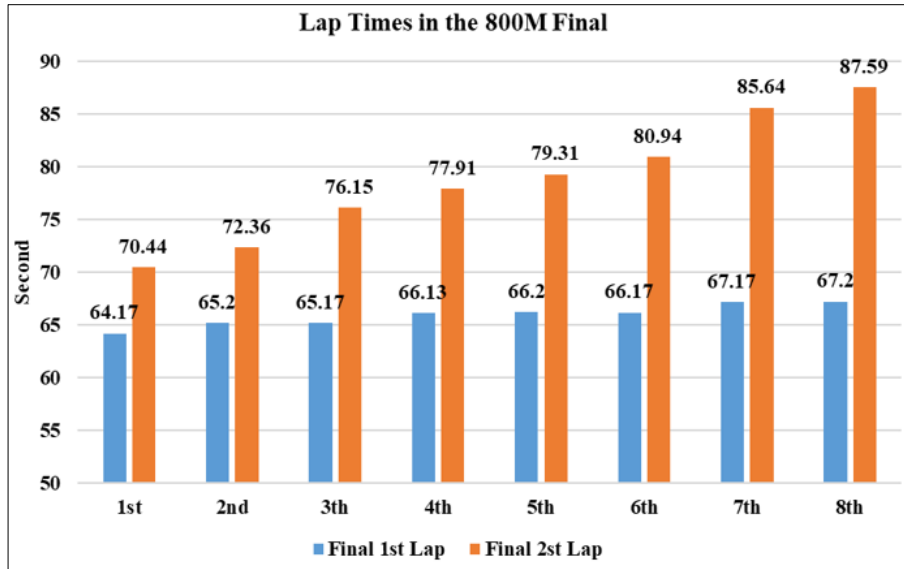


Fig 7: Lap Times in the 2022 Taiwan-MSAG Junior Female 800M Final

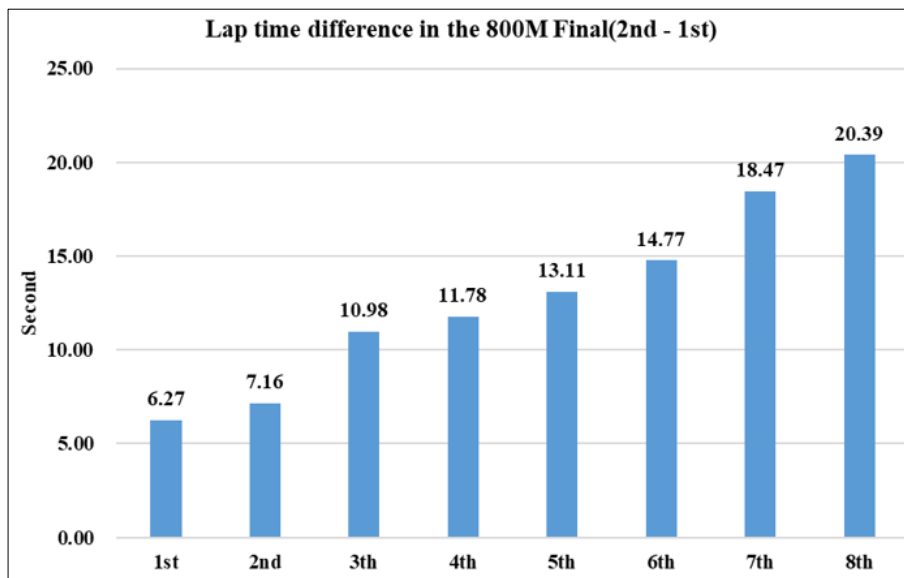


Fig 8: Lap Time Difference in the 2022 Taiwan-MSAG Junior Female 800M Final

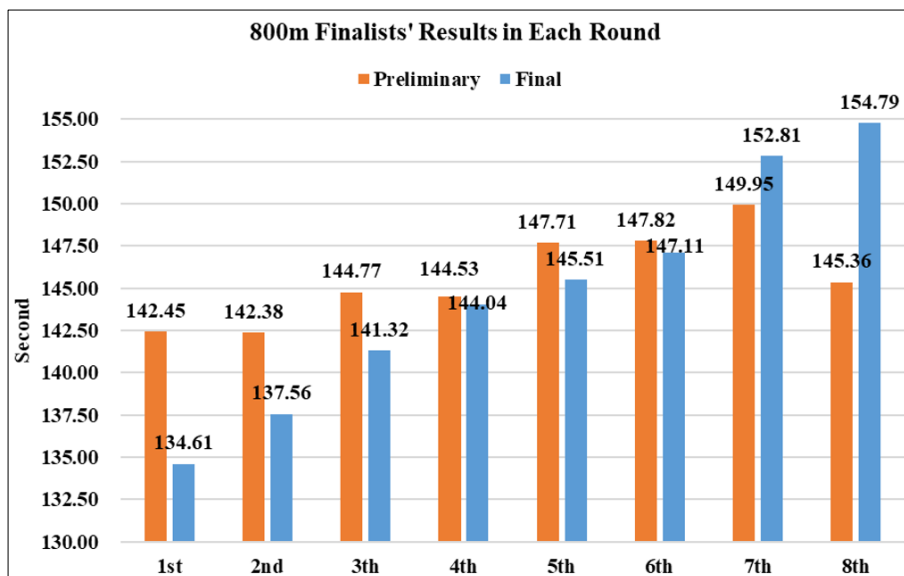


Fig 9: 2022 Taiwan-MSAG Junior Female 800m Finalists' Results in Each Round

Data Analysis

- **Calculation of Performance Averages:** The average performance times for each athlete in the preliminary, semifinal, and final rounds for each year will be calculated. This aims to assess the overall performance trends and provide baseline data for subsequent analyses. This process helps reveal performance changes across different years and provides a quantitative foundation for further strategy comparisons.
- **Extreme Value Analysis:** The fastest and slowest lap times for each year will be identified and analyzed in-depth to understand their impact on final results. Analyzing extreme values helps identify outliers in performance, allowing us to examine their pacing choices, energy distribution, and strategies, providing a clearer understanding of how these outliers might affect the final results.
- **Comparison of Lap Time Differences between the First and Second Laps in the Final:** The pacing of the first and second laps in the finals will be compared to evaluate the athletes' race strategies. By comparing lap times, we will determine whether athletes adopted 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 pacing across both laps). This will allow us to explore how strategies were implemented and how they align with athletes' energy levels, examining the impact of different strategies on the final results.
- **Statistical Analysis of the Relationship between Pacing Strategies and Final Results:** Statistical

methods will be employed to explore the relationship between pacing strategies and final results, identifying the role of various factors in performance differences. Through this analysis, we can quantify the impact of different pacing strategies on final results and determine which strategies are most effective in improving performance.

Results and Discussion

Overall Performance and Trend Analysis

Comparison of Performance Across the Preliminary, Semifinal, and Final Rounds

By comparing the performance of athletes in the preliminary, semifinal, and final rounds from 2022 to 2024 (Table 4), we observed significant differences in their results across the various rounds. Over the three years, athletes generally performed better in the final round compared to the earlier rounds, indicating clear strategic adjustments. Specifically, in 2022, the final performance of athletes was 144.72 seconds, 0.90 seconds faster than their preliminary round performance of 145.62 seconds. In 2023, the final performance was 142.76 seconds, 1.03 seconds faster than the semifinal and 1.77 seconds faster than the preliminary round. In 2024, athletes posted a final round time of 140.67 seconds, 1.81 seconds faster than the semifinal and 4.21 seconds faster than the preliminary round. These data suggest that athletes typically controlled their pacing in the preliminary and semifinal rounds, maintaining a certain level of performance to ensure they could peak during the final round. This strategy reflects the athletes' ability to maximize their energy in the critical final, ultimately achieving their best results.

Table 4: Average Times of Taiwan-MSAG Junior Female 800 m (2022-2024)

Year	Preliminary Average Time	Semi-Final Average Time	Final Average Time	Gap (Final-Semi-Final)	Gap (Final-Preliminary)
2022	145.62	N/A	144.72	N/A	-0.90
2023	144.53	143.79	142.76	-1.03	-1.77
2024	144.88	142.48	140.67	-1.81	-4.21

Observation of Fastest and Slowest Performances

According to the data from 2022 to 2024 (Table 5), we observed significant changes in the performance gaps between the preliminary, semifinal, and final rounds (Figure 10). Over the three years, the fastest times gradually improved across the rounds (with the fastest times in the preliminary, semifinal, and final being 140.88 seconds, 136.75 seconds, and 133.63 seconds, respectively), but the performance gap between athletes also widened. For example, in 2023, the fastest times in the preliminary,

semifinal, and final were 140.88 seconds, 136.75 seconds, and 133.63 seconds, with the performance ranges being 5.88 seconds, 9.53 seconds, and 17.84 seconds, respectively. Over the three years, the performance gaps in the final round were 20.18 seconds, 17.84 seconds, and 11.44 seconds, showing that as the competition progressed, athletes experienced increased physical fatigue, and the competitive pressure also grew. These gaps reflect the intense competition of the event and the fluctuations in athletes' performances during the final round.

Table 5: Results Distribution of Preliminary, Semi-final, and Final (2022-2024)

Year	Preliminary Fastest Time	Preliminary Slowest Time	Gap (Slowest - Fastest)	Semi-Final Fastest Time	Semi-Final Slowest Time	Gap (Slowest - Fastest)	Final Fastest Time	Final Slowest Time	Gap (Slowest - Fastest)
2022	142.38	149.95	7.57	N/A	N/A	N/A	134.61	154.79	20.18
2023	140.88	146.76	5.88	136.75	146.28	9.53	133.63	151.47	17.84
2024	141.58	148.31	6.73	141.74	143.79	2.05	135.82	147.26	11.44

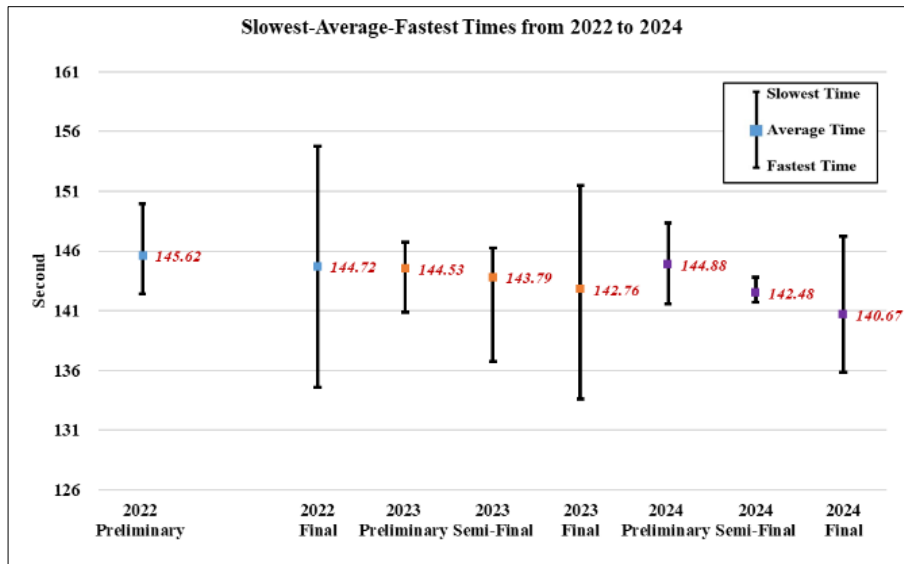


Fig 10: Comparison of Slowest, Average, and Fastest Times from 2022 to 2024

Analysis of the Speed Difference Between the 1st and 2nd Laps in the Finals

By analyzing the first and second lap times from the 2022 to 2024 finals (Table 6), we observed a significant trend of slowdowns in the second lap over the three years (Figure 11). Most athletes adopted a "fast start, slow finish" pacing strategy, as indicated by the generally slower second lap times. The only exception across the three years was the pacing of the first-place finisher in 2023, whose lap times

were relatively even (Figure 5), showing no significant decrease in speed. Although the second lap was slightly slower than the first (66.23 seconds for the first lap and 67.40 seconds for the second lap), the 1.17-second difference reflects a more stable pacing strategy. In contrast, other athletes exhibited more pronounced declines in speed during the second lap, suggesting potential stamina or endurance issues that ultimately impacted their performance (Tables 1-3).

Table 6: Lap Times of 2022-2024 Taiwan-MSAG Junior Female 800 m Final

Time	2022 Final Lap 1 Time	2022 Final Lap 2 Time	2023 Final Lap 1 Time	2023 Final Lap 2 Time	2024 Final Lap 1 Time	2024 Final Lap 2 Time
Average	65.93	78.79	68.05	74.71	66.53	74.14
Slowest-Average	1.27	8.80	0.56	8.19	1.24	5.38
Average-Fastest	1.76	8.35	1.81	7.31	1.02	4.12

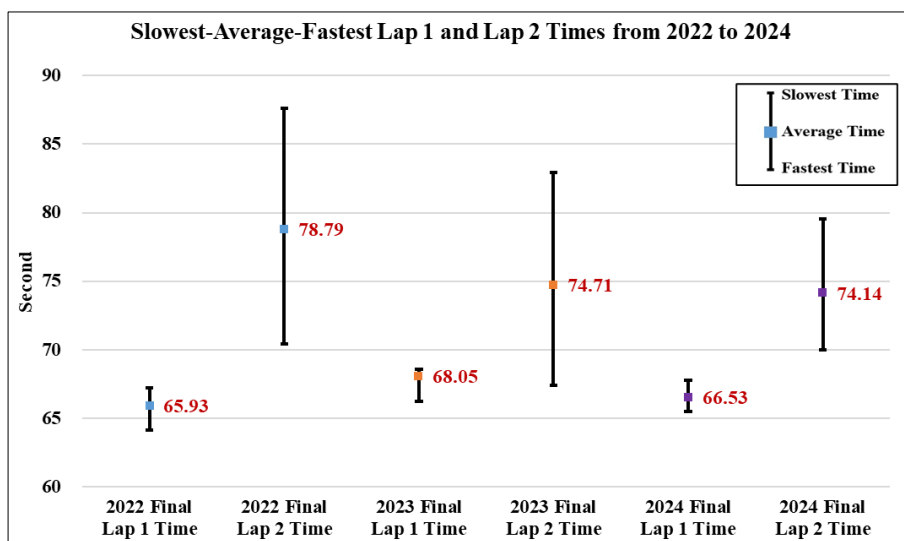


Fig 11: Comparison of Slowest, Average, and Fastest Lap Times from 2022 to 2024

Relationship Between Rankings and Pacing

Table 7 presents the R² values (coefficient of determination) for the relationship between ranking and first-lap time, ranking and second-lap time, as well as the time difference between the two laps (second lap minus first lap time) from 2022 to 2024. The R² value is a measure of the fit of a

regression model, which reflects the strength of the relationship between the independent and dependent variables. The R² value ranges from 0 to 1, with a higher value indicating a stronger relationship between the variables. From the data in the table, we observe that the second lap time has an extremely strong explanatory power

for the ranking, with R^2 values ranging from 0.9410 to 0.9812, indicating a very strong relationship. Similarly, the time difference between the first and second laps also shows a very strong explanatory power for ranking, with R^2 values between 0.8430 and 0.9749, demonstrating a significant

correlation and serving as a stable reference indicator. In contrast, the relationship between first lap time and ranking is weaker, with R^2 values ranging from 0.6792 to 0.9219, indicating a moderate to strong correlation, still reflecting a good explanatory capacity.

Table 7: R^2 Values for Ranking vs. 1st Lap Time, 2nd Lap Time, and Lap Time Difference (2nd-1st)

Year	Rankings vs. First Lap Time R^2	R^2 Classification	Rankings vs. Second Lap Time R^2	R^2 Classification	Rankings vs. Lap Time Difference(2nd-1st) R^2	R^2 Classification
2022	0.9209	Very Strong Relationship	0.9812	Very Strong Relationship	0.9749	Very Strong Relationship
2023	0.6792	Strong Relationship	0.9410	Very Strong Relationship	0.9160	Very Strong Relationship
2024	0.7866	Strong Relationship	0.9530	Very Strong Relationship	0.8430	Very Strong Relationship
<p>R^2 Classification Explanation:</p> <p>Very Weak Relationship (0.00 - 0.19): Very low goodness of fit, with little variance explained by the model.</p> <p>Weak Relationship (0.20 - 0.39): The model explains some of the variance, but there is still a significant amount unexplained.</p> <p>Moderate Relationship (0.40 - 0.59): The model has a good fit, but there is room for improvement.</p> <p>Strong Relationship (0.60 - 0.79): The model explains the variation in the dependent variable well.</p> <p>Very Strong Relationship (0.80 - 1.00): The model explains the variation in the dependent variable very well, with very high goodness of fit.</p>						

Analysis of Exceptional Athlete Performance

The first-place finisher in the 2023 Taiwan-MSAG junior female 800 m final recorded a total time of 133.63 seconds, with split times of 66.23 seconds for the first lap and 67.40 seconds for the second lap, resulting in a time difference of just 1.17 seconds between the two laps. This indicates that the athlete maintained a remarkably consistent pace throughout the race. Such steady pacing effectively avoided common issues associated with a positive split strategy, such as starting too fast, as well as the potential fatigue collapse linked to a negative split strategy in the later stages of the race. This pacing strategy allowed the athlete to manage energy effectively, maintaining optimal performance throughout the event. In contrast, other athletes showed more variability in their pacing. For example, in the 2024 race, the first-place finisher had the smallest time difference between the two laps (4.22 seconds), while the eighth-place finisher experienced a much larger discrepancy of 11.78 seconds. This highlights that the pacing strategies of these athletes were less consistent, leading to greater fluctuations in their performance, unlike the first-place finisher in 2023 who was able to maintain a stable distribution of effort throughout the race.

Competition Strategy and Pacing Mode Analysis

General Trend of Pacing Mode

Over the past three years, athletes generally conserved energy during the preliminary rounds and semifinals, aiming to give their best performance in the finals. As a result, the rankings typically followed a pattern of preliminary round < semifinal < final, a trend consistently observed each year. In the finals, the pacing pattern most commonly exhibited the characteristic of a "fast first lap, slow second lap," where athletes started aggressively in the first lap but experienced a decrease in speed in the second lap. For example, in 2023, the first-place finisher had a time difference of just 1.17 seconds between the two laps, the only athlete with a gap smaller than 2 seconds. In contrast, other athletes showed a notable decline in speed in the second lap, with the smallest time difference between laps being 3.68 seconds (for the second-place finisher in 2023) and the largest being 22.10 seconds (for the eighth-place finisher in 2023). This shows a significant fluctuation in pace between the two laps.

Impact of Pacing Strategy on Performance

Across the three years of competition, almost all athletes adopted a positive split strategy, starting faster in the first half and slowing down in the second half. However, many athletes were unable to maintain the same pace in the second lap, leading to suboptimal final results. Athletes in the lower rankings, especially those in the second lap, often experienced a more pronounced drop in speed. For instance, in 2024, the eighth-place finisher had a time difference of 11.78 seconds between laps, while the eighth-place finisher in 2023 had a time gap of 22.10 seconds, and in 2022, it was 20.39 seconds. These athletes faced physical collapse in the second lap, leading to a dramatic decline in their final results.

Analysis of Factors Influencing Performance

The competition consists of three rounds-preliminary, semifinal, and final-requiring athletes to complete all races within three consecutive days. However, in 2022, due to the COVID-19 pandemic, only two rounds were held. Athletes typically conserve energy during the preliminary and semifinal rounds to perform their best in the final, but the demanding schedule and frequent competitions result in significant physical exertion. Athletes often compete in multiple events, sometimes as many as five, including two individual events and three relay events such as the 4×100 m, 4×400 m, and 4×400 m mixed relay. The cumulative fatigue from multiple events, coupled with the tight competition schedule, can greatly affect performance in the 800-meter final. Physical fatigue is a key factor influencing final performance, as athletes often cannot maintain the same pace in the second lap as in the first, leading to the common "fast first lap, slow second lap" pacing pattern. Over the past three years, athletes generally slowed down in the second lap compared to the first. Those in lower rankings, particularly in the second lap, often experience physical collapse or a significant reduction in speed. For instance, the 7th and 8th place finishers showed a noticeable performance decline compared to the preliminary rounds (refer to Tables 1-3), emphasizing the importance of energy management in final performance. Most athletes adopt the "fast first lap, slow second lap" strategy in the final, but this often results in insufficient energy for the second lap,

affecting the final outcome. Athletes who manage to maintain a consistent pace in the second lap tend to achieve better results.

Strategy Recommendations

- **Competition Strategy Planning:** Athletes should carefully plan their strategies in the preliminary and semifinal rounds to avoid early exhaustion. They should adjust their pacing based on the competition situation and ensure they conserve enough energy to perform at their best in the final.
- **Second Lap Energy Management:** The key to success in the final is managing energy in the second lap. Athletes should allocate their energy wisely, adjusting their sprint strategy for the second lap as the race progresses, avoiding excessive energy consumption in the first lap that could lead to collapse in the second. Incorporating interval training to improve sprint capacity in the second lap will help address issues related to physical fatigue.
- **Psychological Resilience and Endurance Training:** Facing the physical challenges of the final, athletes must possess strong psychological resilience. Through endurance training and psychological coaching, athletes can maintain composure as their energy decreases and still perform efficiently in the second lap.
- **Pacing Strategy Optimization:** Athletes should adjust their pacing strategy based on their energy levels and the competition situation. In addition to the traditional "fast first lap, slow second lap" strategy, they may also consider the "slow first lap, fast second lap" or an even-paced strategy. Proper energy conservation and a strong final lap sprint can maximize competitive advantage in the final.

Conclusion

This study analyzed the overall performance and pacing strategies of Taiwan-MSAG junior female 800-meter race participants from 2022 to 2024, revealing trends and key factors across the preliminary, semifinal, and final rounds. The results show that most athletes adopted the "fast first lap, slow second lap" pacing strategy. They typically performed aggressively in the first lap of the final but experienced a noticeable slowdown in the second lap, leading to excessive energy depletion, which ultimately affected their results. The winner of the 2023 final maintained a stable pace, with a time difference of only 1.17 seconds between the first and second laps, highlighting the importance of consistent pacing for achieving outstanding performance. In contrast, other athletes suffered from significant physical fatigue, especially in the second lap, which led to a decline in rankings. Furthermore, the frequent competition rounds presented a significant challenge to the athletes' physical endurance. Athletes often conserved energy in the preliminary and semifinal rounds to ensure peak performance in the final. However, due to physical fatigue, their speed in the second lap was generally slower, particularly among athletes in the lower rankings, who showed clear signs of physical collapse. The tight competition schedule had a major impact on physical recovery, and excessive participation in multiple events could pose a health risk to the athletes. Based on these findings, this study recommends that 800-meter runners should focus on managing their physical endurance and

pacing strategy in the second lap to avoid excessive energy depletion, adjusting their strategies according to the race situation. Additionally, enhancing endurance training and psychological resilience is crucial for athletes to maintain stable performance in the competitive final. Coaches should carefully plan training and race schedules to prevent over-participation in events, ensuring the athletes' physical well-being and health. Overall, this study provides practical advice on pacing strategy, physical management, and event scheduling, offering valuable guidance for coaches in training and pre-race strategy formulation.

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