Comparison and Analysis of the Speed Changes of the Top Three Men's 20km Men Walking in the 2018 World Championships

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Abstract. The walking race is the track and field event that has won the most Olympic and world championships in China. Race walking is a technology-led endurance event. Because the walking race is judged solely by the referee's eyes, the athlete's skills are very important. Once fouls are sent off, many years of hard training will disappear. This paper uses research methods such as literature data method, mathematical statistics method, and comparative analysis method. The purpose is to study and analyze the changes in the competition speed of the top three athletes of the men’s 20km race in the 2018 Asian Games in Jakarta. The gap between them is improved, thereby improving the overall level of our male 20km race walking athletes. The research shows that the speed of Chinese athlete Kaihua Wang in the first half is relatively fast and stable compared with the speed of the other two athletes. This is where Kaihua Wang's strengths lie, and also where he needs to continue to play in future training and competition. In the 20km race walking competition of Chinese athlete Kaihua Wang, the speed change in the second half was relatively large compared with the speed in the first half, and there was a sprint speed performance in the second half. However, compared to champion Japanese athlete Ikeda Xiangxi, the speed was not strong enough. In the 20km race walking competition of Chinese athlete Kaihua Wang, from the analysis of speed changes throughout the race, they are all slow-forward and fast-forward athletes. However, from the results of the entire competition, it was shown that the performance of the three athletes did not reach their personal best, all of which were affected by the environment and other factors.

Research Purpose

The race walking project is China's advantage in track and field events, and it is also an event that China can compete for in the Olympics and World Championships. The 2018 World Walking Team Championship is an important stage for Chinese walking to prepare for the 2020 Olympics cycle, improve performance, summarize experience, understand the situation of opponents and build confidence in the competition. In order to better prepare for the Tokyo 2020 Olympic Games, this paper aims to find out the shortcomings of Chinese athlete Kaihua Wang by studying the speed changes during the walking process of the top three athletes of the men’s 20km walking race in the 2018 World Walking Team Championship. Champion Koki Ikeda sprinted fast in the final stage and had good physical strength, which enabled Kaihua Wang to break through in future training and lay the foundation for preparing for the Tokyo Olympics.

Research Objects

Take the top three winners of the men's 20km walking race in the 2018 World Walking Team Championships, champion Japanese athlete Koki Ikeda, runner-up Chinese athlete Kaihua Wang, and third-place Italian athlete Massimo Stano as the research object, and the speed change of the three athletes as the research object.
Table 1. List of Athletes' Basic Information.

| Name            | Region | Date of Birth | Race Results | Individual Best |
|-----------------|--------|---------------|--------------|-----------------|
| Koki Ikeda      | Japan  | 1998-05-03    | 1:21:13      | 1:19:13         |
| Kaihua Wang     | China  | 1994-02-16    | 1:21:22      | 1:17:54         |
| Massimo Stano   | Italy  | 1992-02-27    | 1:21:33      | 1:20:51         |

Research Methods

Literature Method

According to the research purpose and core issues of this article, search "Chinese Journal Full-text Database" and "Chinese Master's Dissertation Database," and check the domestic and foreign research results on the race walking technology in the Library of Capital Institute of Physical Education. "Change" was searched, and 39 articles were consulted. Sort out the IAAF score statistics to provide a theoretical basis for this research.

Comparative Analysis

Through a comparative analysis of the performance of each of the top three athletes at each stage, the speed change of each athlete at each stage is analyzed, and corresponding conclusions are drawn.

Mathematical Statistics

According to the statistics of the International Track and Field Federation (IAAF) performance data, the top three speed changes during the men's 20km walking race in the 2018 World Walking Team Championships were calculated using Microsoft Excel 2010, and the averages were calculated to analyze the results Comparative analysis provides the basis.

Results and Analysis

The 2018 World Walking Team Championship (IAAF Walking World Cup) was held on May 5-6, 2018 in Taicang, Jiangsu. This competition is an important stage for China's walking race to prepare for the Tokyo 2020 Olympics. The circuit of this competition is a road circuit, and the distance of each lap is two kilometers. The speed of the walking race is very fast, and the technical and tactical performance as well as their own state and the level of their opponents are also closely related. In order to more accurately analyze the speed changes of the three athletes during the competition, the research in this paper will take 20km For the first half (first 5 laps) and the second half (last five laps), a speed change comparison analysis is performed.

Comparative Analysis of Top Three Athletes' First Half Speed

By comparing and analyzing the first half of the speed of the top three athletes, at the start of the first lap, Chinese athlete Kaihua Wang and Koki Ikeda had the same speed, both 8 minutes and 19 seconds, while Massimo Stano's starting speed was relatively slow and time it was 8 minutes and 22 seconds. As the game progressed, Koki Ikeda's speed from entering the second lap to the fourth lap was relatively faster, and the speed of the fourth lap reached the fastest speed in the first half. Although the three laps have an acceleration trend, the speed of the three laps is basically the same. When entering the fifth lap, its speed slightly decreased. At this time, the time to complete the fifth lap was 8 minutes and 14 seconds, which was an increase of 6 seconds compared to the time. Then through the analysis of the speed of the first five laps, Koki Ikeda's first half speed peak appeared on the fourth lap, which also indicates that Koki Ikeda carried out a small shifting process from the second to the fourth lap.

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Chinese athlete Kaihua Wang also accelerated during the second to fifth laps. The second, third, and fourth laps were 8 minutes, 8 seconds, and 8 minutes, 6 seconds, respectively. Its speed slightly ahead of Koki Ikeda, also during the fourth lap, a small acceleration peak appeared, the time was 8 minutes and 6 seconds. According to the comparative analysis of average speed, Kaihua Wang's average speed is the smallest, 8 minutes and 10 seconds, but it is only 1 second ahead of the other two athletes. Through these, we can analyze that the speed changes of the two athletes during the first half of walking are basically the same.

From the perspective of Massimo Stano's speed analysis, it showed that it entered the second lap with the fastest speed, with a time of 8 minutes and 6 seconds. The speed of the third and fourth laps is basically the same, but the deceleration is large on the fifth lap, and the time is 8 minutes and 14 seconds. Through speed comparison, this also shows that Kaihua Wang's fluctuations in the first half of the speed are relatively average.

| name         | 2KM   | 4KM   | 6KM   | 8KM   | 10K M  | average value |
|--------------|-------|-------|-------|-------|--------|---------------|
| Koki Ikeda   | 8:19  | 8:09  | 8:09  | 8:08  | 8:14   | 8:07          |
| Kaihua Wang  | 8:19  | 8:08  | 8:08  | 8:06  | 8:13   | 8:08          |
| Massimo Stano| 8:22  | 8:06  | 8:09  | 8:08  | 8:14   | 8:09          |

**Table 2. Statistics of the First Half of the Top Three Athletes' Speed Changes (Min).**

**Comparative Analysis of the Top Three Athletes' Second Half Speed**

Based on a comparative analysis of the top three athletes' second-half speed, Koki Ikeda kept the same speed on the sixth and seventh laps, 8 minutes, 1 second, and 8 minutes. During the eighth lap, the speed decreased and the deceleration was large, and the time reached 8 minutes and 12 seconds. There was a noticeable acceleration during the ninth and tenth laps. Especially in the final sprint phase, the maximum speed was reached, and the time was 7 minutes and 52 seconds. This result was the fastest of all three athletes at all speeds. It can be seen that Japanese athlete Koki Ikeda has the strongest sprint ability and speed keeping ability in the second half.

Kaihua Wang, on the sixth and seventh laps, had the same speed, both 8 minutes and 6 seconds. However, compared to Koki Ikeda and Massimo Stano, Kaihua Wang slightly slowed down during the eighth lap. Similarly, the speed slowed down significantly, reaching 10 seconds. During the last two laps, there was a noticeable acceleration. Especially in the last lap, the speed reached the peak of the whole speed, the time was 8 minutes and 1 second. And compared to Koki Ikeda's speed in the last tenth lap is obviously slightly slower. This also shows that Kaihua Wang's speed in the sprint phase needs to be strengthened.

From the comparative analysis of the speed of Massimo Stano in the second half, it can be seen that the speeds on the sixth and seventh laps relative to Koki Ikeda are basically the same, the speed remains good, both are 8 minutes and 1 second, and faster than Kaihua Wang speed. This was also the peak speed of Massimo Stano in the second half. However, Massimo Stano experienced a very significant slowdown compared to the first two athletes during the ninth lap, even though Massimo Stano accelerated significantly in the last lap, which is faster than the ninth lap time. It took 11 seconds, but it also gradually lags behind the top two athletes in the final acceleration process. This also shows that Massimo Stano strengthened endurance training during the later training and acceleration training during the sprint. And Kaihua Wang also needs to improve the ability to strengthen the final sprint speed while maintaining physical strength.

| name         | 12KM  | 14KM  | 16KM  | 18KM  | 20KM  | average value |
|--------------|-------|-------|-------|-------|-------|---------------|
| Koki Ikeda   | 8:01  | 8:00  | 8:12  | 8:09  | 7:52  | 8:02          |
| Kaihua Wang  | 8:06  | 8:06  | 8:12  | 8:09  | 8:01  | 8:06          |
| Massimo Stano| 8:01  | 8:01  | 8:11  | 8:16  | 8:05  | 8:06          |
### Comparative Analysis of the Top Three Athletes' Full Speed

Table 4. Statistics of the Top Three Athletes' Full Speed Changes (Min).

| name            | 2KM  | 4KM  | 6KM  | 8KM  | 10KM | 12KM | 14KM | 16KM | 18KM | 20KM | average value |
|-----------------|------|------|------|------|------|------|------|------|------|------|---------------|
| Koki Ikeda      | 8:19 | 8:09 | 8:09 | 8:08 | 8:14 | 8:01 | 8:12 | 8:09 | 7:52 | 8:07 |               |
| Kaihua Wang     | 8:19 | 8:08 | 8:08 | 8:06 | 8:13 | 8:06 | 8:06 | 8:09 | 8:01 | 8:08 |               |
| Massimo Stano   | 8:22 | 8:06 | 8:09 | 8:14 | 8:01 | 8:01 | 8:11 | 8:16 | 8:05 | 8:09 |               |

After comparing the data of the first half and the second half of the results, it was found that the sum of the results of Koki Ikeda and Massimo Stano was the same, that is, 40 minutes and 59 seconds after ten laps. The sum of Kaihua Wang's first half results was 49 minutes and 48 seconds. Compared with the other two athletes, the speed was faster, 11 seconds faster. It can be seen that Kaihua Wang, our Chinese athlete Kaihua Wang, performed well in the first half of this 20km race walking race and achieved good results, which is also its advantage.

In the second half, the speed of the three athletes all improved. In fact, Koki Ikeda sprinted. In the next half of the time, 40 minutes and 14 seconds were far ahead. Out, Japanese athlete Koki Ikeda speeded up in the second half. The second half of Kaihua Wang and Massimo Stano both took 40 minutes and 34 seconds, which was a big difference of 20 seconds compared with Koki Ikeda. Through the speed difference between the front and back half, it can be found that Kaihua Wang has the smallest speed difference, which shows that Kaihua Wang is relatively stable in the whole court; while the other two athletes have a large speed difference, especially Koki Ikeda. The speed increase is greater in the half, especially when sprinting. This shows that Kaihua Wang has shortcomings in the second half of the speed, and it is also a place that needs to be further improved in future training.

### Conclusions and Recommendations

#### Conclusions

The speed of Chinese athlete Kaihua Wang in the first half is relatively fast and relatively stable compared with the speed of the other two athletes. This is where Kaihua Wang's strengths lie, and also where he needs to continue to play in future training and competition. In the 20km race walking competition of Chinese athlete Kaihua Wang, the speed change in the second half was relatively large compared with the speed in the first half, and there was a sprint speed performance in the second half. However, compared with champion Japanese athlete Koki Ikeda, the speed was not strong enough.

Chinese athlete Kaihua Wang, in this 20km race walking competition, from the analysis of speed changes throughout the race, are all slow-forward and fast-forward athletes. However, from the results of the entire competition, it was shown that the performance of the three athletes did not reach their personal best, all of which were affected by the environment and other factors.
Recommendations

Kaihua Wang's speed needs to be further improved during the second half of the competition. In the future training, it is necessary to strengthen the training, especially the speed training in the sprint phase. In the training process, Kaihua Wang needs to strengthen endurance training and reasonable allocation of physical strength. Maintain a relatively reasonable average speed in the front and rear half and increase the speed in the second half.

Athletes are greatly affected by the environment and other factors during the competition, and then they need to strengthen the adaptability of different competition environments in order to achieve a higher level of competition in each future competition.

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