Chronological analysis of 20km race walking stages "Tokyo 2020" as an indicator for endurance training

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This study aims to identify the Chronological analysis of 20km race walk stages "Tokyo 2020" as an indicator for endurance training , the researchers used the descriptive method- Chronological analysis, the research sample consisted of athletes participating Tokyo 2020 in 20km race walking , the researcher used SPSS version 28 in processing data and in statistical analysis , the researcher reached prediction ratio of digital records depends on race stages also they reached the speed ratio approach in 20km and 50km race walking . The researcher has found that the players used multiple strategies during the race stages based on long-term endurance training, whether in 20 km and these methods and strategies helped the players to avoid early fatigues and finish the race well. The researcher recommends the use of long endurance training, high intensity interval training, and fartlek training for joggers during training units and increasing the volume of endurance training.

Key words : Chronological analysis , digital records , 20km,race walking, fatigue .

Introduction:

Race walking form part of the athletics program in the Olympic Games and all major athletics championships. Arcelli E (1996) , race walking is an abnormal form of gait with rules that dictate that no visible loss of contact should occur and that the knee should be straightened from first contact with the ground until the 'vertical upright position . (IAAF Competition rules (2021).

Race walking is a progression of steps so taken that the walker makes contact with the ground, so that no visible (to the human eye) loss of contact occurs. the advancing leg must be straightened (i.e. Not bent at the knee) from the moment of first contact with the ground until the vertical upright position.(IAAF , 230 ,2016)

Such constraints lead to a certain stability of the movement structure in race walking, especially of the first half of the support phase (Preatoni, La Torre & Rodano, 2006). However, even though the kinematics seems to be stable, the coordination of the body segments varies in a certain range, and changes occur under the influence of fatigue. All previous studies in race walking discussed this problem on the basis of single (Neumann, Gohlitz & Ernst, 2005; Hanley & Drake, 2007).

Athletes use more structured interval training workouts and high-intensity interval training (HIIT) to build speed and endurance. So, what exactly is HIIT training? It's a type of interval training in which you alternate short, very high-intensity intervals with longer, slower recovery intervals.

Interval training leads to many physiological changes including an increase in cardiovascular efficiency (the ability to deliver oxygen to the working muscles) as well as increased tolerance to the build-up of lactic acid. These changes result in improved performance, greater speed, and endurance. Hoyt T(2009).

Unlike interval training , Fartleks are more unstructured. Work-rest intervals can be based on how the body feels. With fartlek training, you can experiment with pace and endurance, and experience changes of pace.

Because of the implications of this rule, previous research in race walking has focused on the knee's movement during the stance phase rather than during swing. However, the swing phase might also be affected by the rules of race walking, thereby having an influence on key kinematic variables such as stride length and making it different from distance running technique. (Donà G. et al 2009) , HANLEY, B. et al (2011).

In race walking, the most important factor in competitive success is speed, although this is restricted by the two unique rules of race walking technique. At the most basic level, speed is determined by step, or stride length and stride frequency.

Pace strategy is the ability to regulate the speed of an athlete's movement, in order to reach the end of the race in a shorter time .Foster C. et al (2004) The tempo or pace strategy relates to racing: (a) up to 40 sec (sprint), (b)from 40 sec up to a few minutes (short distance), (c) medium and long distance and overtime, which last for hours .Thompson KG (2014)

Hypothesis :

The following research questions will be investigated in the present study:

1. IS analyzing the strategy of the race will help coaches and athletes?

2. Do competitor's race Walking groups differ in terms of pace strategy?

Purpose:

The purpose of this research was to study the timeless evolution of walking, as well as the Pacing Strategy Profiles of high-level men competitors in the 20 km of race walking. The methodology of analyzing the data of races, that have been conducted in the future, is applied in practice

Methods:

The Researcher used the descriptive method- with Chronological analysis of competitor's race Walking "Tokyo 2020" in Olympic games.

The certified distance of the race divided into 10 sections of 2km each was recorded by official Result in world Athletics website . the individual pace strategies were found that describe the athletes' tactics in this race

Sample :

The participants who completed the 20 km walking race, numbering 52 participants in the XXXII Olympic Games, and were divided into 4 groups (the 1st three winners – 2nd group less than 5% - 3rd group from 5% to 10% - 4th group is greater than 10% of the average difference Timeline for the top three winners). Olympic Stadium, Tokyo (JPN) , 30 JUL–08 AUG 2021 .

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Results :

Table 1. The individual time per 2km of the winners in the 20km men's race walking in The XXXII Olympic Games , Tokyo 2020 .

POS	2km	4km	6km	8km	10km	12km	14km	16 km	18km	20 km	Time
1	8:31	8:25	8:08	8:03	7:58	8:01	8:14	8:38	7:52	7:35	1:21:05
2	8:31	8:27	8:07	8:02	7:58	8:02	8:14	8:39	7:53	7:43	1:21:14
3	8:29	8:29	8:06	8:03	7:58	8:01	8:14	8:38	7:52	7:58	1:21:28

Table 2. The Position of the winners in the 20km men's race walking per 2km in The XXXII Olympic Games , Tokyo 2020 .

Player	2km	4km	6km	8km	10km	12km	14km	16 km	18km	20 km
1	13	6	4	4	3	3	2	1	1	1
2	20	24	5	5	4	6	6	5	3	2
3	1	22	3	3	2	4	1	3	2	3
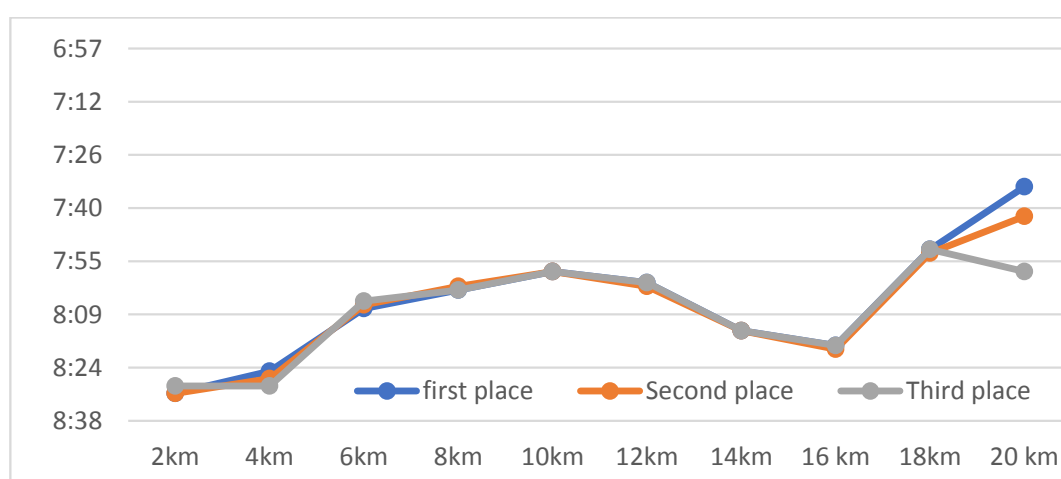
Fig. (1) Figure 1. The individual time per 2km of the winners in the 20km men's race walking

- XXXII Olympic Games , Tokyo 2020.

Table 3. Average split time and average Finish time of each group of participants the XXXII Olympic Games , Tokyo 2020.

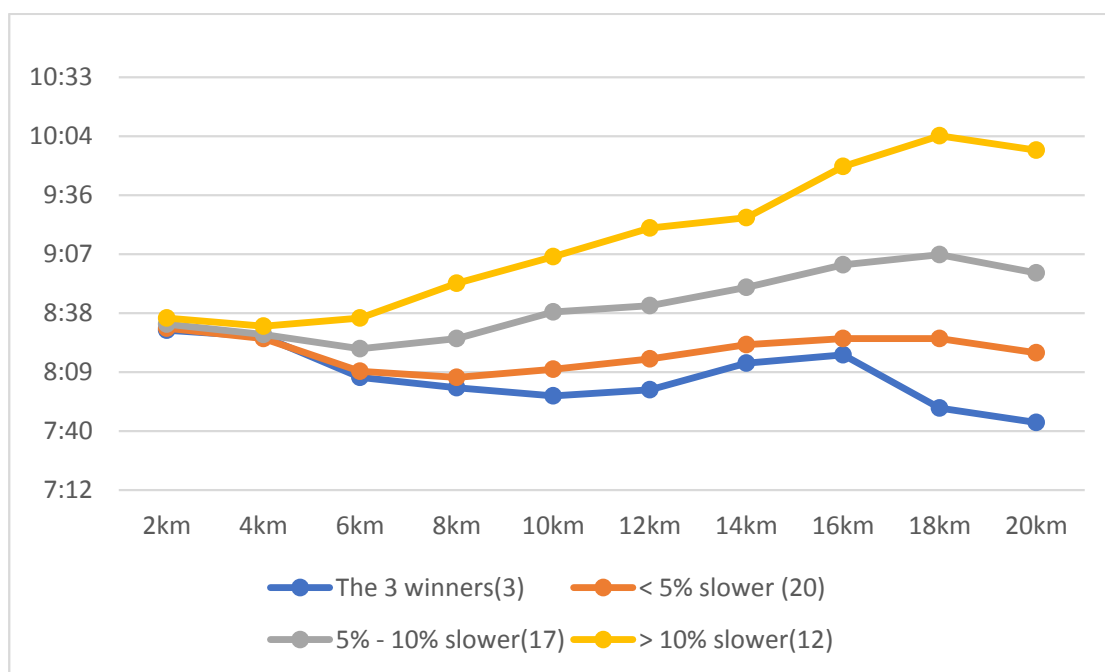| Groups	2km	4km	6km	8km	10km	12km	14km	16km	18km	20km	A.F.Time
The 3 winners(3)	8:30	8:27	8:07	8:02	7:58	8:01	8:14	8:18	7:52	7:45	1:21:16
< 5% slower (20)	8:31	8:26	8:10	8:07	8:11	8:16	8:23	8:26	8:26	8:19	1:23:19
5% - 10% slower(17)	8:33	8:28	8:21	8:26	8:39	8:42	8:51	9:02	9:07	8:58	1:27:22
> 10% slower(12)	8:36	8:32	8:36	8:53	9:06	9:20	9:25	9:50	10:05	9:58	1:32:00

Figure 2. The Average split time and average Finish time of each group of participants per 2km in the 20km men's race walking - XXXII Olympic Games , Tokyo 2020.

Discussion :

The following results expand the theoretical knowledge of men's pace strategy in 20km of race walking. So that the methodology of analyzing the data of race that have been or will be conducted in the future is applicable. Table 1,2 and Figure 1 show the individual's time per 2km of the winners in the predetermined intermediate sections of the 20km of the race, in relation to their Positions . The winner of the golden medal and the 1st place has started in the 13th position then took the 1st place at 16 km and kept the 1st place till the finish line ,while the 2nd place has started in 20th position then went fast to the 5th position at 6km and kept it till 16km then went to 3rd position at 18km then reached the finish line in the 2nd position. while the 3rd position has started in the 1st position then went to 22nd position at 4km then went faster to the 3rd position and kept it till finish line ,which means that the winners have a strategy form the start till the finish line based on their own approximate time for each race stage, which started with time average in the early stages of the race then decreasing the time stage till the finish line .This indicates that endurance training with long term and interval training have helped the athletes to keep their own strategy which is highly shown with the winner at 1st position as time gap(54 sec.) between the first stage(8.31) and last stage(7.35).

As shown in table (3) and figure 2 the researcher has divided the competitors into 4 groups {The winners(3), %5 >slower(20) , 5% - %10slower(17) , > 10% slower(12)} in order to identify the differences between tactics plans for all competitors .

The 1st group includes the 1st three winners as they have the same strategy during the race stages , this is shown in the table and those with the 1st three positions by an average final time (1:21:16) within deviation (-11sec. +2 sec.+13sec.)

The 2nd group includes the competitors(20 athletes) who have finished the race in time up to 5% slower than the time average of the 1st group in a time gap(2.03min.).

The 3rd group includes the competitors (17 athletes) who have finished the race in time between 5%-10% slower than the time average of the 1st group in a time gap(6.06min.).

The 4th group includes the competitors(12 athletes) who have finished the race in time more than 10% slower than the time average of the 1st group in a time gap(10.44min.).

Through the different time gap between the four groups it is highly shown that 4th group lack the experience of speed endurance which have been shown clearly in the degeneration of stage speed at 12km ,14km,16km,20km, as this degeneration happened quickly starting at the 8km in a time gap (51 sec.) from the 1st group, and increased in the time gap till (2.13 min.) at 18km, 20km , but they have a good strategy that can be applied with delaying fatigue and improve endurance using Interval training which is based on the principle of adaptation.

In the long-distance competitions, the nature of the distance requires the athletes to train more endurance while maintaining the mean speed during the performance, also it requires that athletes must distribute their effort during the various stages of the race and maintain speed without prejudice to the legal rules of the race walking competition, it also requires the efficiency of the respiratory system, and the muscular system, and also using the High-intensity interval training (HIIT) is a great way to bump up your cardio and strength workouts by adding intensity, variety, and a calorie-burning boost.

Conclusion :

The researcher concludes the followings:

- The athletes having tactics led them to achieve top position.

- There is a difference in the average speed between different stages through the race.

-There is lack of endurance within the athletes which led to the inability to go along with top groups.

Recommendation :

- Building the athlete's own strategy during endurance training for development of performance for 20 km.

- Including endurance training in an exercise routine

-Focus on strength training exercises for 20 km walking

- Training with modest times to participate in the 20 km race walking.

Reference :

Aschenbrenner P, Erdmann WS, Giovanis V, Lipinska P (2006) Investigations on technique and tactics of race walking during Olympic Games Athens 2004 - first announcement. Schwameder H, et al. (Eds.), University of Salzburg 1: 517.

Donà G, Preatoni E, Cobelli C, Rodano R, Harrison AJ. (2009) Application of functional principal component analysis in race walking: an emerging methodology. Sports Biomech 8(4): 284-301, 2009.

Foster C, Hettinga F, Lampen J, Dodge C, Bobbert M, et al. (2004) Effect of competitive distance on energy expenditure during simulated competition. International Journal of Sports Medicine 25(3): 198-204.

Hanley, B. & Drake, A. (2007): The effects of fatigue on race walking technique. In H.-J. Menzel & M.H. Chagas (Eds.), Proceedings of the International Society on Biomechanics in Sports Ouro Preto/Brazil (pp.256-259).

Hanley, B.; Bissas, A. & Drake, A. (2011). Kinematic characteristics of elite men's and women's 20 km race walking and their variation during the race. Sports Biomechanics, 10 (2): 110-124.

Hoyt T. Skeletal muscle benefits of endurance training: Mitochondrial adaptations. *AMAA J*. 2009;22(3).

International Association of Athletics Federation (2016). IAAF Competition rules 2016-2017. Retrieved from http://www.iaaf.org/about-iaaf/documents/rules-regulations#rules

International Association of Athletics Federations. Competition Rules 2012-13. Monaco: IAAF; 2011.

Neumann, H.F., Gohlitz, D. & Ernst, O. (2005). Wettkampfanalyse zur Erhöhung der Zielgerichtetheit des Kraft- und Techniktrainings im sportlichen Gehen. Zeitschrift für Angewandte Trainingswissenschaft, 12 (2), 7-20.

Thompson KG (2014) Pacing: Individual strategies for optimal performance. Human Kinetics.

Preatoni, E., La Torre, A. & Rodano, R. (2006). A biomechanics comparison between racewalking and normal walking stance phase. In H. Schwameder, G. Strutzenberger, V. Fastenbauer, S. Lindinger & E. Müller (Eds.), Proceedings of the XXIV International Symposium on Biomechanics in Sports (pp. 143-146).

Worldathlatics (2021) : results , The XXXII Olympic Games , Olympic Stadium, Tokyo (JPN) , 30 JUL–08 AUG 2021 , http://www.iaaf.org .