

Race walking

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Introduction

Although race walking might seem to be a somewhat neglected athletics discipline, it is certainly the most controversial. This has to do with the judging of the strict rules by which it is governed. As in the running events, the fastest athlete is declared the winner of a race walking competition. Unlike runners, all athletes must move along the course without exceeding a certain critical velocity that would cause a flight phase in the stride and thus violate IAAF Rule 230.1, which requires that “no visible (to the human eye) loss of contact occurs”. Race walking, therefore, is to certain degree paradoxical: race walkers are required to be as fast as possible but not so fast that they start running.

The purpose of this paper is to provide an overview of the main aspects and discussion points around this discipline as a starting point for more detailed study. The points covered will be

- History
- Judging
- Technique and biomechanics
- Training
- Medical
- Psychology

History

The 18th and 19th century English tradition of “footmen”, who accompanied their masters’ coaches on long trips, inspired long-distance walking competitions, called pedestrian races, which were first held between 1775 and 1800 in England. Often, these took several days to complete. However, not all pedestrian races were so long. For example, Charles Westhall, a well-known pedestrian who in 1852 also became the first runner to break 4:30 for the mile on a track, was reported to have walked seven miles in 54 minutes at Newmarket Heath (MARLOW, 1990). A particularly famous pedestrian was Robert Barclay Allardice, a Scots nobleman born in 1779, who was widely known as Captain Barclay. As was common at the time, the many walking and running feats he undertook were nearly always on a bet. In 1809, he contracted to cover 1,000 miles by walking one mile per hour in 1,000 consecutive hours for a wager of 1,000 guineas. The event started on 1 June and ended on 12 July and attracted extensive press coverage. It is estimated that in completing the challenge Barclay received many times the original wager in side bets and that all the bets placed on the event totalled 100,000 pounds, the equivalent of 40 million pounds in today’s money (RADFORD, 2002).

In modern times, race walking is an Olympic discipline with distances of 20km for both men and women and 50km for men only. Race-walking events also appear in the IAAF World Championships in Athletics, the Commonwealth Games and the Pan American Games, among others. Race walking first appeared in Olympic Games in 1904 as a half-mile walk in the ‘all-rounder,’ the precursor

sor to the 10-event decathlon. In 1906, stand-alone 1,500m and 3,000m race-walking competitions (for men) were added, and – excluding 1928 – there has been at least one race-walking competition in every Olympics since.

Controversies linked to the judging of international competitions stretch back at least to the 1912 Olympic Games in Stockholm, when there were so many disqualifications from the 10,000m track race that only four competitors finished. At 1924 Paris Games, the issue again came to the fore as judging problems in the heats led to the resignation of the judges panel and a new panel had to be found for the final. In view of the large number of irregularities encountered, walking was eliminated altogether from the 1928 Games. British officials were mainly responsible for getting it back on the programme for the 1932 Games in Los Angeles. In the 1970s, controversy again returned as the 50km was dropped from the 1976 Montreal Games and the walks were almost lost from the Olympics. However, pressure from devotees of the sport won the day and the events remained (MARLOW, 1990).

Of great importance to race walkers, and a big step forward in obtaining international security for the events, was the introduction of the Lugano Trophy in 1961. This team competition, now called the IAAF World Race Walking Cup, is held every two years over the two Olympic distances, 20km and 50km. In 2004, a Junior division was added, consisting of men and women who are 19 or younger.

Women's race-walking contests were first recorded in Czechoslovakia in 1932. In 1975 an unofficial 5km women's race was added to the Lugano Trophy event and in 1979 the Eschborn Cup was established (MARLOW, 1990). A 10km road competition was included in the IAAF World Championships in Athletics for the first time in 1987 and it was added to the Olympic programme for the 1992 Games in Barcelona. The championship distance for women was extended to 20km from the 1999 World Championships.

Judging

The competitions of the English pedestrians in the late 16th and 17th centuries were conducted without standardised conditions. The walkers did not have to contend with rules, regulations and judges. This led to the distinction between walking and running being masked in a way that greatly obscured the athletic significance of pedestrian achievements and, in the end, significantly discredited them. As pedestrianism grew progressively less credible in the late 19th and early 20th centuries, it fell increasing out of public favour (MARLOW, 1990; OSTERHOUDT, 2000).

The first race walking codes came from an attempt to regularise rules for the popular 19th century long distance events, WESTHALL being perhaps the first to define in print how walking should be judged: "To be a good and fair walker, the attitude should be upright or nearly so, with the shoulders well back, and the arms when in motion held well up in a bent position, and at every stride swinging with the movement of the legs well across the chest, which should be well thrown out. The loins should be slack to give plenty of freedom to the hips, and the leg perfectly straight, thrown out from the hip boldly and directly in front of the body, and allowed to reach the ground with the heel being decidedly the first portion of the foot to meet it. The movement of the arms will keep the balance of the body and bring the other leg from the ground." (quoted in Heel and Toe Online, 2007)

But this was not definitive and, in those early days, judges had only the vague concept of 'fair heel and toe' to guide them. This term meant that before the toes of the back leg had been lifted, the heel of the foremost foot should be on the ground. When John Chambers won the first English amateur walking championship in 1866, the seven-mile track event was judged under this 'rule'. For its inaugural championships in 1880, the Amateur Athletics Association (AAA) in Eng-

land published its first Rules for Competition, consisting of 16 rules. Rules 14 and 15 were of particular interest to walkers: "In Walking Races, cautions and disqualifications to be left to the discretion of the judges." (Rule 14) "The decision of the Judges in each competition to be final." (Rule 15) Thus no effort was made to define what constituted correct walking and the judges were left to their own interpretations of what was 'fair heel and toe' (Heel and Toe Online, 2007).

Australasia was one of the first Athletics Congresses to adopt formal rules for the sport of walking. A. O. Barrett (the inaugural club secretary of the Melbourne Amateur Walking and Touring Club) and R. H. Croll (co-founder of East Melbourne Harriers and an early member of the Melbourne Amateur Walking and Touring Club) submitted the following propositions to the 1900 Australasian Convention of all the amateur associations in Auckland:

- That a racing walker must have contact with the ground with one foot during a stride, and with both feet at the end of a stride.
- That the heel of the front foot must touch the ground before the back foot leaves it.
- That as the heel of the front foot touches the ground the leg must not be bent, its knee must be locked.
- That the body and head must be kept upright.

These rules were adopted as the formal rules governing race walking in Australia and stayed in effect for many years. It took the wider race-walking world over 50 years to reach a comparable degree of sophistication in its own rules.

At the international level, it was not before the 1908 Olympics that the lack of agreement as to what constituted walking was brought into focus. The establishment of the IAAF in 1912 also saw the creation of an IAAF Walking Commission, but it was not until 1928 that the following definition of race walking was published: "Walking is progression by steps

so taken that unbroken contact with the ground is maintained." This new rule was to be employed for judging purposes in all international competitions.

However, as the simple IAAF rule did not discuss in any manner or form the need to land on the heel or give any real guidance to judges to help them decide what was legitimate and what was unacceptable, criticism continued, both on the grounds that the rule was 'insufficient' and that it was not clearly understood. From time to time, proposals were put forward for new definitions or for considerable amplification. Many of these made it to the agenda of the IAAF Congress but were either withdrawn or referred back for further analysis. At the 1949 Congress in Stockholm, an acceptable proposal was finally adopted, resulting in the 1928 definition being expanded to read: "Walking is progression by steps so taken that unbroken contact with the ground is maintained. At each step, the advancing foot of the walker must make contact with the ground before the rear foot leaves the ground." (Heel and Toe Online, 2007).

This definition focused concentration on the essential element of ground contact but issues remained and came to a head very quickly with controversies at the 1950 European Championship and the 1952 Olympic Games, ensuring that this version of the rule was short-lived. By the time the Melbourne Olympics came around in 1956, the rule had been split into two subsections and amplified to read:

1. Definition. Walking is progression by steps so taken that unbroken contact with the ground is maintained.

2. Judging. Judges of walking must be careful to observe that the advancing foot of the walker must make contact with the ground before the rear foot leaves the ground, and in particular, that during the period of each step in which a foot is on the ground, the leg shall be straightened (i.e. not bent at the knee) at least for one moment." (Heel and Toe Online, 2007).

This rule ensured that only the original 'heel and toe' version was acceptable as the one basic style of walking. This new rule served the walking community well and remained in force until, in October 1972, it was amended, with the addition of a further statement concerning when the leg must be straightened, namely in the vertical upright position. This amendment was necessary because of the ever increasing speed with which walkers raced and the increasing difficulties in deciding whether a competitor did in fact straighten his leg for the required instant. Now that instant was easier to judge – it had to be at a specific point in the stride: "Walking is progression by steps so taken that unbroken contact with the ground is maintained. At each step, the advancing foot of the walker must make contact with the ground before the rear foot leaves the ground. During the period of each step when a foot is on the ground, the leg must be straightened (i.e. not bent at the knee) at least for one moment, and in particular, the supporting leg must be straight in the vertical upright position." (Heel and Toe Online, 2007).

This version of the rule did not stand the test of time because it was still hard to interpret at high speed. If a competitor did not straighten on first contact with the ground and rolled through on an initially bent leg, there was still too much room for subjectivity in deciding whether he did indeed straighten for the required instant when in the vertical position. There were also increasingly frequent photographs that showed walkers without the necessary unbroken contact with the ground.

A new rule was promulgated in April 1996. It contained one obvious change – that of a continuously straight leg during the first half of the stride – and one subtle change – that of maintaining contact as viewed by the human eye: "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 shall be straightened (i.e.

not bent at the knee) from the moment of first contact with the ground until the vertical upright position." (Heel and Toe Online, 2007).

In international and other official races there are judges on the course to monitor adherence to the rule. Three judges submitting red cards for violations results in disqualification. A scoreboard is placed on the course so the competitors can see their violation status. When a third violation is received, the chief judge removes the competitor from the race by showing a red paddle. No judge may submit more than one card for each walker and the chief judge may not submit any cards; it is his or her job only to disqualify the offending walker. For monitoring reasons, races are held on a looped course or on a track so judges get to see competitors several times during a race. A judge may also caution a competitor that he or she is in danger of losing form by showing a paddle that indicates either losing contact or bent knees.

The IAAF and some national athletics federations conduct education and certification programmes for race walking judges.

According to OSTERHOUDT (2000), the modification requiring "lock-out" at contact with the walking surface as distinct from requiring it later in the stride (i. e., at mid-stride, the requisite case in the old rule) has been a very great mistake, because in his view the new rule dramatically increases the prospect of "lifting" for two related reasons:

1. The retarding effect under the new rule is significantly greater than under the old one because the horizontal distance between the centre of mass and the point of ground contact, at contact, is greater under the new rule than it was under the old one; because the angle of the leg to the supporting surface, at contact, is more acute under the new rule than under the old one; and because the position of the leg, at contact, is less inclined to ready horizontal movement toward the centre of mass under the new rule than under the old one.

2. The hips are not settled, but raised, by the “hard” lever required of the contact leg, at contact, by the new rule as distinct from the “soft” lever allowed by the old rule.

OSTERHOUDT also argues that it is not at all clear in what sense “locking out” at ground contact (as distinct from “locking-out” at mid-stride) creates a more characteristic and aesthetically pleasing walking stride, or resolves officiating problems associated with “lifting” – the alleged reasons for modifying the old rule in the first instance. He concludes from this that the new rule governing race walking has brought further misfortune and should be abolished.

With regard to the question of bent knees, KNICKER & LOCH (1990) conducted a very compelling investigation. In their kinematic time analysis, they found that not a single top-level race walker examined could avoid the loss of ground contact in some phase of the race. They also showed that none of the athletes monitored committed any infringement of the rule concerning knee extension in the support phase. Moreover, the kinematic analysis produced no case of bent knees in any phase. However, the judges in the same race identified bent knees in 48% of all cases. Based on these findings, the authors proposed that the rule demanding an extension of the knee in the vertical upright position be abolished, the arguments being that no case had been identified in which a walker’s knee was not extended and that there is no advantage to the athlete in failing to walk with an extended knee. Furthermore, it is clear that it is extremely difficult for judges to identify infringements of the current rule.

Technique and biomechanics

According to PAYNE & PAYNE (1981), race walking is not a natural skill in the sense that normal walking and running are, because these latter are the locomotor skills learnt from very early childhood. This means that a good coach must be available from the start so the walker can be sure to learn good tech-

nique and not have any inbuilt faults to eradicate. It also means that it takes several years to reach a really efficient level of technique.

As in running, the basic parameters are stride length and stride frequency. When ‘sprinting’, the walker will be limited by a stride frequency that will not respond much to training once the skill is learned and stabilised. This frequency will depend mainly on his/her inherited muscle quality. The main area for improvement in sprint walking will be in stride length, a factor that is of obsessive concern for every race walker. In longer races, as in long distance running, there will be a certain amount of compromise between the two parameters depending on the fatigue experienced by the athlete. As in most other athletic events, flexibility is an asset and hip mobility especially is an important factor in stride length. Stride length is also maximised if the feet move along a straight line. More emphasis is placed on the arm and shoulder action in race walking than in running, because of the need to counter-balance the exaggerated eccentric thrust of the legs and the movements of the hips. But in addition to counterbalancing the leg action, the arms also aid the forward drive with their swinging – the strong upward movement of both arms evokes extra forces from the ground through the driving leg.

The main styles of race walking are:

1. The clawing style: The leg action includes, in addition to the orthodox drive of the supporting leg once the centre of mass has passed in front of the foot, a ‘clawing’ action by this foot even while the centre of mass is still behind it. As this clawing action reduces the horizontal braking force during the times that the walker is accelerating it leads to a faster movement of the leg and, presumably, to an increase in overall speed.
2. Hyperextension of the knee: Some walkers have exceptional mobility of the knee joint and are able to exploit this by hyperextending it (extending the joint beyond the straight position of 180° to perhaps 185° or more) during the support phase. Since

the judges still regard this as being 'straight at the knee through the vertical position' the walker is able to keep his centre of mass from rising as much as if he had kept his upper and lower legs at 180°.

3. 'Orthodox' European style: The more usual style in Europe involves relatively little movement of the head and shoulders, with the athlete relying on good hip mobility and a strong arm action to absorb the eccentric thrust of the leg drive. The arms are usually maintained in vertical planes in the direction of the walk and the upper arm is pushed up to a horizontal position behind.
4. Mexican style: Instead of keeping the trunk and head in the rather rigid posture of the Europeans, the Mexicans are more flamboyant and tend to throw the head, shoulders and trunk around much more. The impression is of a supple, relaxed and carefree movement of the whole upper body, which absorbs the eccentric thrust of the legs without the hard driving of the arms practised by the Europeans. In the Mexican style, the feet move along a straight line rather than the two close parallel lines of the European style. This tends to reduce the wasted sideways component of force, which is more apparent when the feet move along parallel lines. The stride length is also slightly longer when walking along the single straight line.

SALVAGE et al. (2000) hold that the primary objective of race walking is to maintain a constant velocity of the body's centre of gravity without excessive vertical or side-to-side displacement. The visual impression of an elite race walker is of a steady forward motion without excessive bouncing or side-to-side sway.

The influence of walking velocity on rule adherence (keeping contact with the ground and the knee straightened) was investigated by NEUMANN (2005) and NEUMANN et al. (2006). The results of these studies show that, depending on the athlete's performance level,

incorrect walking begins with the occurrence of flight time and a bending of the knee between speeds of 2.75 to 4.0m/s. For identifying the maximum increase of the fault rate as far as knee straightening in the course of velocity is concerned, NEUMANN et al. (2006) introduced the term "coordinative threshold".

Training

Training for race walking is generally very similar to running training (SALVAGE et al., 2000). HILLIARD (1986) points out that although race walking is essentially an aerobic activity, there are several integral components that contribute to the overall development of the athlete. These are: (1) technique, mobility and flexibility, (2) endurance, (3) speed and specific endurance, and (4) strength and strength endurance. Careful consideration must be given to the overall programme structure and content of each training unit relative to the athlete's needs, objectives and particular phase of the year. In essence, coaches must strive to provide a balanced programme that will ensure an athlete reaches a peak at a specific time of the year.

According to HILLIARD (1991), the inclusion of weight training and circuit training units in the overall programme of a walker is an essential component if the athlete is to realise his or her potential. Importantly, the benefits accruing from such work will greatly assist in technical development and greater confidence, particularly on tough undulating courses. He proposes that specific-strength and strength-endurance sessions (through hill sessions) should be incorporated on a regular basis (2-3 times per week).

SCHOLICH (1992) emphasises that strength training in race walking must be technique-orientated and based on the specificity of the motor-technical demands of the technique. It is started, supplemented and finished with stretching and mobility exercises. Strength training exercises for race walkers are usually divided into three categories: (1)

Specific-strength exercises with a movement structure that corresponds completely to walking; (2) specific-preparatory strength exercises with a movement structure similar to walking, or corresponding to single phases of walking; (3) general-strength exercises with a movement structure that does not correspond to, or have similarity with walking.

The aim of specific-strength exercises is to develop strength endurance in the muscle groups directly involved in the race walking movements, combined with the improvement of performance deciding functional systems. The development of strength endurance should essentially take place without increasing the cross-section of the muscles.

As far as the long-term training programme for race walkers is concerned, VALLANCE (2005) makes it absolutely clear that the development path of 50km walker is different to that of a 20km athlete. Under no circumstances should male race walkers be encouraged to attempt 50km events in the developmental stage of 18-23 years unless they are already proven and international competitors at 20km.

As far as race walking training with children and youths is concerned, HEDGE (2002) holds that the focus of should be on teaching the rules and on the learning and practicing of the correct technique, because these will decide whether the athlete remains in the competition or not. It is particularly important that novice race walkers are taught to land on the heel. The body should be carried almost vertically upright and only very marginally tilted forward. The arm action, which has more in common with sprinting than with distance running, should reflect the vigour of the legs. Shoulders should remain squarely across the track, but loose. Once the base technique is mastered at slow speed, an additional feature can be added – the swing of the hips to bring steps one in front of the other. All technique faults should be adequately addressed before practicing at faster speed, and that speed should be limited to what is sustainable without breaking the rules. This will vary for each

athlete and hence competitive training is to be discouraged for young race walkers. Relays of 100m or 200m are good for this. After a varying amount of practice, the action should no longer appear stiff and forced, rather the athlete flows smoothly along the track, driven by the hips. This is the time to increase race walking speed, building on a base of concurrent anaerobic work (e.g., repeated uphill sprints and cross-country runs), which should commence at the start of the season (HEDGE, 2002).

Three to four times a week is the most a young novice need train during his early days. As a guide, NIHILL (1975) suggests 1-2 sessions a week on the track and the remainder on the road with the maximum distance of five miles (8km) for the under 15 year olds and seven miles (12km) for the 15-17 year olds.

According to MOROZOV (1998), finding future race walking talent is very simple: All it needs is to ask children during a physical education period to walk and request them every 5-10 minutes to walk faster, faster and as fast as possible. Children who have potential for race walking usually walk fast, extend the knee joints, avoid a backward movement of the pelvis and do not drop their shoulders. The others present an entirely different picture. They drag their feet, keep their legs bent in the knee joint, bustle forward in an uncoordinated manner and drop their shoulders forward.

Medical

Most injuries that race walkers suffer are overuse injuries (DONAHOO, 1998). These injuries are caused by a muscle, tendon, ligament or bone being placed under repetitive stress. Many injuries result from problems associated with the pelvis and lower back.

Although generally good for people with knee problems, race walking can also lead to medial knee pain due to over-pronation and excessive internal rotation of the tibia. Other problems can be anterior shin splints caused

by the foot striking the ground in front of the knee rather than beneath it as in running, strains to the hip joints from the rolling hip motion and hamstring injuries due to hyperextension of the knee at midstance and at heel contact (KUMMANT, 1981).

Degenerative changes in the hip and knee joints could not be found in 14 male, competitive walkers, aged between 50 and 70; none of them showed any sign of osteoarthritis in hip or knee joints in spite of heavy training loads during long careers and in spite of malalignment in several of the subjects (EKSTRAND et al. 1990). That race walking is a relatively injury-free sport is also confirmed by a study conducted by FRANCIS et al. (1998). The results of the study of over 400 walkers in the San Diego/Long Beach, CA, area show that most injuries involve the lower extremity, but the "average" race walker suffers only one serious injury every 5.7 years. Race walkers who train six or seven times per week are most likely to be injured; those who train three or fewer times per week are least likely to be injured. The percentage of injured participants increases progressively with weekly training mileage. In general, however, the rate of injuries in race walkers is low.

Psychology

Race walking is a special case within the endurance sports because during the competition the athlete must not only deal with states of fatigue and exhaustion but must also concentrate on keeping to the rules by using a certain walking technique. Thus, the athlete is in the permanent conflict of wanting to win on the one hand, but on the other hand not being allowed to exceed a certain critical velocity, which is about 4.50m/sec (KIRCH-GÄSSNER & MEISSNER, 1996).

The fact that race walkers are required to adhere to stringent technical rules while undergoing prolonged and continuous physiological stress mandates not only rigorous biomechanical and physiological preparation, but also the psychological make-up or skills

that allow an athlete to deal with this dual load during training and competition. No matter how sound the athlete's technique or how good the conditioning, without a certain mental toughness, that athlete will never attain a truly optimal performance. In race walking, mental toughness can be equated with consistency in performance, and consists of a combination of attributes:

- Discipline, diligence and focus are most evident in a successful athlete's willingness to train. Discipline also includes being able to sustain good technique and turnover, even when feeling very fatigued.
- Tenacity is of critical importance when those key decision points come up during a race to either accelerate or back off. Often, it is only by conscious decision and force of will that an athlete can persevere and work through difficult spells in a race.
- Poise and emotional self-control are important prerequisites for success in race walking. Athletes must learn how to gain control of themselves and their emotions before they can control their performance.

Race walkers must have the desire, determination and inner drive to want to be the best. This involves a high degree of self-confidence, concentration, and commitment, being mentally tough and competitive enough to stay focused on their own goals and race plans, and if necessary, to raise their own level of discomfort high enough to break away from the pack or competitor. As most walkers want to develop more confidence, better consistency, improved concentration, composure and mental toughness throughout a race, time should be spent at training camps going over things the athletes can do to set their minds up for success and feel like they are in control over what they want to occur. "Scripts of excellence" and mental plans of how they would like their competition to unfold should be developed. The race walker should think about the way he or she wants to feel, focus and function both prior to and during various phases of the competition. Similarly, race walkers should engage in mental training

sessions, learning how to “switch channels” when things get tough. The duration of race walking events is unique in that there is a great deal of time for the mind to wander from the positive aspects of their effort. Consequently, learning how to channel the high energy of competition into peak performance is one of the attributes that separate the elite from the average.

Many race walkers also enjoy using individualised audio-visual race preparation tapes to help them set their minds up for success. The visualisation should be as vivid

as possible. Often, task-specific cues are incorporated (i. e. “drop the arms, quick turnover,” “keep the head up, focus on the person in front of you,” “turnover, turnover, turnover”) as positive reminders to help them keep focused. With their favourite music in the background, they can visualise themselves executing their race plan to perfection (YUKELSON & FENTON, 1992).

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