Training and Injury Profiles of International Race Walkers

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ABSTRACT

The high training volumes associated with elite race walking might result in better performances but they also increase the risk of injury. The purpose of this retrospective study was to survey training habits and injury prevalence amongst international race walkers. Self-administered questionnaires designed to record competitive performances, typical training practices, injury sites and occurrences were completed by 112 race walkers from 28 nations. On average, the men responding covered 125km of race walking across nine weekly training sessions, while the women covered 84km over seven sessions. Aside from these sessions, most athletes took part in running (80%) and resistance training (64%). The most commonly used training surfaces were roads (98%) and athletics tracks (68%). Injuries to the hamstrings, knees, feet and shins were the most frequently reported with more than half of cases requiring medical treatment and/or time off training. The author concludes with a discussion of the survey findings and recommendations on range of points that include the importance of speed training and shorter distance performances, the use of softer training surfaces, and suggestions for preventing injuries at various specific locations.

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Introduction

Unlike running, race walkers are not allowed to have any visible loss of contact with the ground. Furthermore, in race walking, the athlete's knee must be straightened from the moment of first contact with the ground until the 'vertical upright position'[1]. This abnormal movement of the knee, with the requirement for virtually constant contact, might be responsible for the particular injuries experienced by race walkers. Races are held over 10km (junior men and women), 20km (senior men and women) and 50km (senior men only), with race walking competitions being staged at the Olympic Games and other major athletics championships. Injuries sustained during high-standard competition are relatively rare although elite race walkers have been found to be at a much higher risk of illness (i.e. a non-musculoskeletal physical complaint) than other track and field athletes[2,3]. This might be due to strains on the cardiovascular and respiratory systems, and might account for the high number of athletes who drop out of 50km races[4].

Race walking is an endurance activity and most of the injuries sustained are overuse injuries caused by repetitive stresses on connective tissues[5]. Previous research on US-based race walkers found that the most commonly injured sites were the knee, foot and shin (although hamstring strains were the most commonly diagnosed injury)[6]. However, since the weekly distance covered by most participants was only 48km or less, this study was not reflective of the typical training or injury frequency of international race walkers. The greater training volumes of elite race walkers might result in better performances but there is also an increased risk of injury. Therefore, the aim of this retrospective study was to describe and analyse the training practices and injuries experienced by international race walkers.

Methods

A self-administered questionnaire, answered anonymously, was distributed to competitors via national team coaches at various international race walk events between 2012 and 2014. The same questionnaire was also made available via email through coaching networks. The questionnaire was made available in English, French, German, Russian and Spanish; translations were aided by native speakers. Questions were based on previous research on athletic injuries[6], covering personal details (e.g. height and weight), training practices and details of injuries suffered over the previous 12 months, five years and 10 years. Specific variables of interest were defined as shown in Table 1.

Participants were excluded if their personal best time for 10km was slower than 47:30 (men) or 55:30 (women). Ten kilometres was chosen in order to include junior athletes in the sample. In addition, although all athletes asked to complete the questionnaire obliged, some respondents were excluded as they did not fully answer all questions. As a result, the overall response rate was 72%.

Responses from the questionnaires were entered into a database with the results analysed using descriptive statistics. Associations between key variables were found using Pear-

Table 1: Specific variables of interest and definitions for questionnaire

VARIABLE	DEFINITION OF VARIABLE
Age	The age the athlete began training for race walking
Training years	The length of time over which the athlete had been participating in race walk training to date
Longest single walk per week	Distance covered by single longest race walk session per week
Race walk sessions per week	Total number of sessions per week
Time off training	The length of time during which the athlete could not train because of a reported injury
Medical treatment	Whether the athlete required specialist medical treatment for a reported injury

son's product moment correlation coefficient, while differences between men and women, and between 20km and 50km male competitors were found using independent t-tests or chi-square tests of association (for frequency data) as appropriate, with statistical significance accepted as $p < .05$.

Results

A total of 112 respondents from 28 nations completed the questionnaire (71 men and 41 women), with their details summarised in Table 2. There was no age difference between male and female respondents, although men were both taller and heavier ($p < .001$). All men had previously competed over 10km, while 61 had competed over 20km and 36 over 50km. Training quantities are summarised in Table 3. All women had competed over 10km while 28 had competed over 20km. The mean duration over which the athletes had taken part in race walking was 11 years (± 8) for men and nine years (± 7) for women. With regard to differences between men competing over the shorter and longer championship distances, those men who competed over 50km averaged 154km (± 38) a week with a longest single session of 37km (± 6). Both these distances were longer than those of men who raced only over 10km or 20km (total per week: 97 ± 28km; single longest session: 26 ± 7km) ($p < .001$). The total training distance covered by men was longer than that of women, as was the longest single session ($p < .001$).

Table 2: Mean (± SD) respondent ages, heights, masses and personal best times at 10km, 20km and 50km

	Age (yrs)	Height (m)	Mass (kg)	10km	20km	50km
Men	26.9± 8.8	1.80± 0.06	68.3± 6.9	42:13± 2:17	1:26:45± 5:14	4:00:37± 12:26
Women	24.3± 6.7	1.65± 0.07	54.3± 5.2	49:06± 3:56	1:37:35± 8:05	–

Table 3: Mean (± SD) training quantities of male and female race walkers

	Age began training (yrs)	Total distance per week (km)	Longest single walk per week (km)	Race walk sessions per week
Men	15±4	125±44	32±9	9±2
Women	15±5	84±35	21±6	7±3

Since men were faster than women over 10km and 20km ($p < .001$), they were separated for the purposes of reporting correlations. Men's 10km personal best times were correlated with their best times over 20km ($r = .90$, $p < .001$) and 50km ($r = .64$, $p < .001$), while women's 10km times were correlated with their 20km times ($r = .94$, $p < .001$). Amongst men, faster 10km and 20km performances were associated with greater volumes of training per week (10km: $r = –.55$, $p < .001$; 20km: $r = –.46$, $p < .001$) and greater single session distances (10km: $r = –.56$, $p < .001$; 20km: $r = –.39$, $p = .003$). However, better 50km times were associated only with the length of the longest single session ($r = –.39$, $p = .022$) and not with total distance walked per week. Amongst women, there were even stronger associations between personal best times and greater volumes of training per week (10km: $r = –.77$, $p < .001$; 20km: $r = –.70$, $p < .001$) and greater single session distances (10km: $r = –.71$, $p < .001$; 20km: $r = –.51$, $p = .006$).

In terms of additional training, 80% of respondents ran regularly, 64% did resistance training, 43% swam, 30% cycled, 6% cross-country skied, with 13% and 5% taking yoga and Pilates, respectively. Only three participants did not partake in other activities. The most common training surfaces for training were normal roads (98%), followed by athletics tracks (68%), treadmills (20%) and grass (11%). No differences were observed in any of these values between men and women.

With regard to frequency of injury (overall or per body site) no difference was observed between genders (Figure 1). In total, 42 (59%) of the men and 27 (66%) of women suffered at least one injury during the previous 12 months. To further highlight the regularity of injury to each site, Figure 2 shows the frequency of injuries recalled in the previous five and 10 yrs, as well as the previous 12 months. Hamstring injuries required time off training in 59% of cases and medical treatment (e.g. physiotherapy) in 68% of cases. For other injured sites time off training was required in 59% for knee, 71% for foot, and 72% for shin injuries, with medical treatment required for 57% for knee, 50% for foot, and 67% for shin injuries. The amount of training lost due to these injuries ranged from two days to eight months, with just over half (52%) causing losses of 21 days or less.

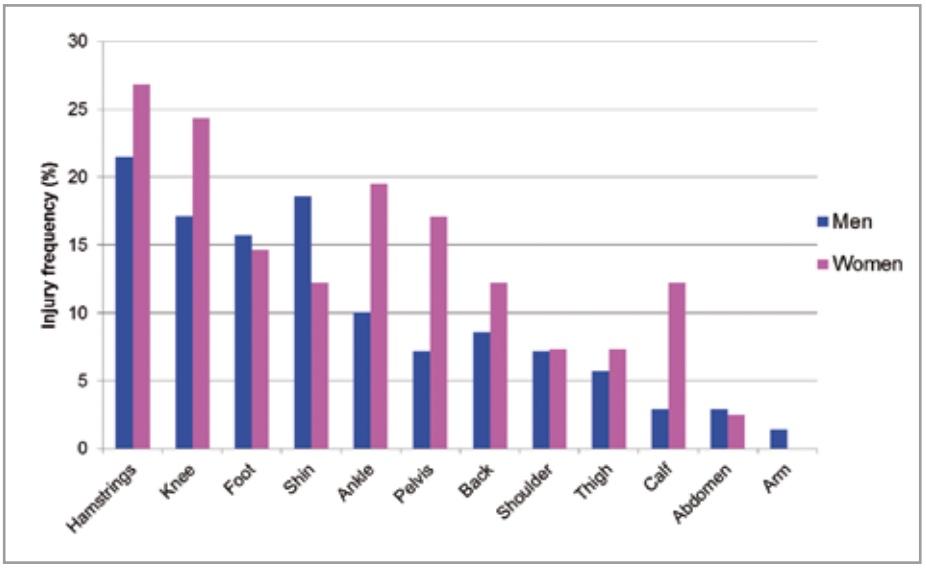

Figure 1: Frequency (%) of reported injuries by gender during the previous 12 months

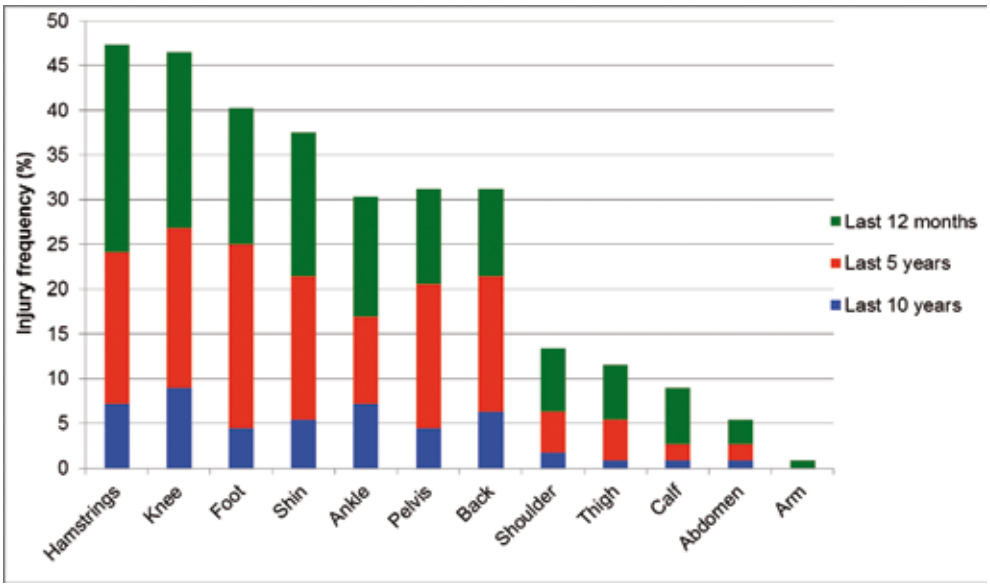

Figure 2: Frequency (%) of reported injuries across all athletes in the previous 12 months, 5 years and 10 years

Discussion

Race walking is an endurance event (albeit with specific technical elements) and this is reflected in the considerable training volumes reported by these international athletes, who were generally quite experienced and had started training in their teenage years. The longer distances covered by men in training per week compared with women was partly due to the greater training volumes carried out by 50km competitors. Practically all athletes surveyed took part in other types of training, such as running or swimming, further reflecting the physical demands of training for this particular event and possibly accounting for the high incidence of non-musculoskeletal illnesses[2,3]. Even though it is a much shorter distance, it was notable that performances over 10km were associated with better personal best times over 20km and even over 50km. This was particularly interesting given that 50km performance was not associated with total distance walked per week, and there might be a limit to the benefits accrued from increasing training distances (especially if it results in a restricted focus on speed). However, the length of the single longest session did seem important and appears a key component of 50km training, and better athletes did train over longer distances than slower competitors. It is nonetheless a good idea for athletes (particularly juniors) to focus on achieving fast and technically-sound performances over the shorter distances before moving up to 20km or 50km.

In general, injuries to the most affected sites required medical treatment or time off training, with nearly half disrupting training for more than three weeks. Fewer injuries were reported for the upper limb than for the lower limb, unsurprising given that race walkers experience multiple, repetitive foot impacts. In addition, the technique used results in a substantial jarring motion[7] that might affect the knee and hip joints. Previous research on retired race walkers (aged between 50 and 70 years) showed that although osteoarthritis was not present in

the hip or knee, malalignments were very common, particularly in the foot[8]. While there were few abdominal injuries, the pelvis and back were both frequently injured, possibly due to a combination of the impact forces experienced and the exaggerated movements of the pelvic and shoulder girdles[9,10].

It might be possible for race walkers to reduce impact forces by training on softer surfaces such as grass. However, given major championship race walk events are held on roads, it was not surprising that most athletes used this surface in training. It was interesting though that approximately two-thirds of respondents also used more compliant athletics tracks and this might help reduce the risk of some injuries (although care must be taken to vary the direction taken around the track when completing long distances to avoid overstressing one leg or the other).

Location alone was not fully accountable for frequency of injury. For example, opposing pairs of muscle groups differed in this regard; the calf muscles of the lower leg were injured much less frequently than the shin muscles and the hamstrings much more frequently than the anterior thigh muscles. Similar to previous research[6], hamstring injuries were, in fact, the most frequently reported by this group of athletes. These injuries might be caused by their eccentric contraction during late swing[11], similar to that reported for other track and field athletes[12]. Additionally, because the knee must be fully extended by initial contact, this abnormal feature of race walking gait might be partly responsible for the strain on the hamstrings. Young athletes with a history of hamstring injuries should therefore be particularly cautious when considering race walking as an event, and coaches should note that strength training of these muscles is a particularly important component of race walk training that even world-class athletes should not neglect.

Shin muscle pain has been previously reported in race walkers[6,13] and might be due to either the eccentric contraction experienced at heel strike or to high activation levels throughout the swing phase[11]. Indeed, high magnitudes of stress in the shin muscles have been found during the swing phase in fast (normal) walking speeds, and in normal circumstances a transition to slow running would take place to reduce this stress[14]. The added burden on the ankle to ensure ground clearance in race walking[11] might therefore stress the shin muscles even more and cause the high incidence of pain found. Improved training for the lower leg muscles (e.g. through gradual progressions of walking distances and speed) is therefore necessary to reduce the risk of injury to these key muscles. In particular, a gradual build-up of training volume and pace should be undertaken by those new to the event or when returning to training after a rest period.

Men and women have very similar race walking movement patterns[11] and it is therefore not surprising that similar injuries occur despite differences in training volume and race speeds. When women's race walking first entered the Olympic programme, DUNSTER et al.[15] found that many female race walkers did not perform any strength training at all. However, this study showed that there was no difference between men and women in terms of participating in resistance training, and indeed there were no gender differences for any other aspect. This emphasises the need for both men and women to undertake injury-prevention measures including appropriate strength and conditioning programmes.

The questionnaire used in this study was kept relatively straightforward to make it undemanding and quick for participants to answer, as well as simplifying the process of translation (which was considered important in recruiting as many international athletes as possible). The focus on breadth of information gathered rather than depth meant that participants were asked about injured areas of the body rather than specific diagnoses, which could be recorded in future research with the assistance of sports medical teams at major championships[2,3]. In general, injuries were more com-

monly reported for the previous 12 months rather than the previous five or 10 years; this might be because it is more difficult to recall older injuries but also because many of the athletes had taken up race walking relatively recently. In addition to research that includes medical practitioner data on sustained injuries on elite race walkers, longitudinal studies that monitor the long-term effects of the abnormal gait used are recommended.

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