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Epidemiology and Aetiology of Marathon Running Injuries

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Abstract

Over the last 10–15 years, there has been a dramatic increase in popularity of running marathons. Numerous articles have reported on injuries to runners of all experience, with yearly incidence rates for injury reported to be as high as 90% in those training for marathons. To date, most of these studies have been cohort studies and retrospective surveys with remarkably few prospective studies. However, from the studies available, it is clear that more experienced runners are less prone to injury, with the number of years running being inversely related to incidence of injuries. For all runners, it is important to be fully recovered from any and all injury or illness prior to running a marathon. For those with less experience, a graduated training programme seems to clearly help prevent injuries with special attention to avoid any sudden increases in running load or intensity, with a particularly high risk for injury once a threshold of 40 miles/week is crossed. In both sexes, the most common injury by far was to the knee, typically on the anterior aspect (e.g. patellofemoral syndrome). Iliotibial band friction syndrome, tibial stress syndrome, plantar fasciitis, Achilles tendonitis and meniscal injuries of the knee were also commonly cited.

During the course of a year, approximately two-thirds of runners sustain at least one injury that causes an interruption in their normal training programme.^[1] For those training for marathons, the yearly incidence rate can be higher and has been reported to be as high as 90%.^[2] Numerous articles have reported the number of running injuries to runners of all experience levels, from novice to elite athletes, but mainly non-elite. To date, most of these studies have been cohort studies and retrospective surveys with remarkably few prospective studies.^[3] This is especially true for evaluating lower extremity alignment risk factors for marathon injuries. We

are aware of only one prospective study^[4] that examined possible risk factors independent from the injury. The main goal of the current article is to review the literature evaluating the epidemiology and aetiology of marathon injuries and provide suggestions for future research.

1. Foreground

Owing to the fact that more people run today than ever before (mainly for preventive cardiology, which by most accounts recommends a healthy range of 10–25km per week or 1–2 hours of endurance sports a week),^[3,5] we need to know why inju-

ries occur in runners. In the last 10–15 years, there has been an emphasis on remaining healthy via balanced diets and choosing running programmes up to marathon distances. Thus, there has been a rise in running injuries.^[5] However, there are not much data from which to generate recommendations for prevention or treatment strategies.

Efforts have been made to gather as much data as possible for marathon runners of all skill levels. This has provided a relatively high number of runners to study and to estimate how much certain factors have influenced the incidence and prevalence of marathon running injuries, from the level of runner, relative number of miles run weekly, markers of lower extremity alignment and the degree of stretching prior to and after a race, to a host of other confounding and contributing factors.

2. Epidemiology and Aetiology

One in three of those injured stated that s/he was adversely affected by injury.^[6] In spite of this, there was a reluctance to seek treatment.^[6] Data from Switzerland noted that running injuries are 2–2.5 times less frequent than injuries from all other sports and six times less frequent than ski injuries on average.^[3] Older, more experienced runners were least affected by injury across the majority of the data.^[3,7] Serious health problems were rare.^[2]

Injuries in marathon runners can be multifactorial, but are often attributable to training errors.^[1] The three most commonly cited independent factors for injury are: (i) an increase in weekly mileage too quickly; (ii) previous injury; and (iii) a competitive training motive.^[3] Clearly, running distance is one of the strongest risk factors associated with injury, as well as any sudden increase in running mileage or change in training volume or intensity.^[5,7,8] There is a particularly high risk for injury when crossing a threshold of 40 miles/week. If running >40 miles, the adjusted relative risk for injury was 2.88.^[8] A very strong second predictor is previous injury.^[7,8] It was essential that injured runners fully recover before participating to prevent reinjury.^[3,5] For those with previous musculoskeletal problems, the associated odds ratio was very high.^[5]

First-time marathon participants had increased difficulty if they had an illness in the 2 weeks prior to the race, consumed alcohol (even only one beverage a month) or were using other medications for different medical problems.^[9] Experienced runners were found to be at a decreased risk of injury because they were able to listen to the “language of their body.”^[7] They were able to avoid overuse injuries and developed musculoskeletal adaptation to running but were found to heal slower when injured. They were also less susceptible to constitutional problems than younger, less-experienced runners.^[9]

We know of one study that has evaluated alignment measures and marathon injuries.^[4] The data from that study suggest the following: (i) high arch index is protective against overall injuries and knee injuries in particular; (ii) increased heel valgus appears to be protective against knee and foot injuries; and (iii) increased knee varus and increased tubercle-sulcus angle were both associated with greater shin injuries.

The preceding study was limited by its reliability of alignment measures, poor power and, perhaps, by sample bias (healthy participant effect).^[4] For these reasons, further study is recommended to substantiate or disprove these findings.

3. More Common Injuries

In both sexes, the most common injury by far was to the knee.^[6,7,9] Knee injuries were most common on the anterior aspect, namely patellofemoral pain syndrome. Iliotibial band friction syndrome, tibial stress syndrome, plantar fasciitis, Achilles tendonitis and meniscal injuries of the knee were also common.^[6] Additional complaints included thigh muscle soreness, blistered feet, chaffing, abrasions, malaise, lateral ankle sprains, alimentary disorders and extreme exhaustion.^[2,7,9] Men were seen to have hamstring and calf problems more than women, whereas women tended to have hip problems more than men.^[9]

Of the non-musculoskeletal injuries, light-headedness, nausea, stomach upsets, chills, headaches and diarrhoea were common. These were at-

tributed to dehydration, although we suspect some of these cases were secondary to excessive water intake and hyponatraemia.^[2]

4. Prevention

The best advice to help avoid injury is to pay close attention to the overall training load and use moderation with respect to increasing distance and number of consecutive days running.^[7,8] It is especially important to be fully recovered from any and all injuries prior to any competition.^[5,9] Alternatives to running for injured runners could include running in water, swimming, biking and cross-country skiing to help reduce the training impact load.

Stretching was not substantiated to be helpful to prevent injury by most of the studies that evaluated it. Several articles have suggested that muscle imbalances in the hip muscles, especially weakness of the hip abductors, may be a predisposing factor in lower-extremity, overuse injuries in runners.^[10] Further research is needed to determine a direct cause-and-effect relationship and whether distance runners can prevent injury with specific strengthening exercises.

5. Conclusion

There remains a need for prospective studies that better define the underlying aetiology, epidemiology and potential risk factors of marathon running injuries. However, several factors are clear from the studies available:

1. More experienced runners are less prone to injury, with the number of years running being inversely related to incidence of injuries.
2. A graduated training programme seems to clearly help prevent injuries with special attention to avoid any sudden increases in running load or intensity.
3. There appears to be a particularly high risk for injury once a threshold of 40 miles/week is crossed, especially in less-experienced marathon runners.

4. It is especially important to be fully recovered from any and all injury or illness prior to running a marathon.

5. Knee injuries are the most common injury seen in marathon runners.

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