

## INVESTIGATION

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### A survey of running injuries in 1505 competitive and recreational runners

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**A 33 item multiple choice questionnaire was circulated; completed questionnaires from 1505 runners (1130 male and 375 female) were obtained. Questions focused upon training, injuries sustained, and medical care. Biomechanical imbalances such as leg length inequality appear to be a major contributing factor to running injuries. Correction of an underlying biomechanical defect may be important in the treatment of many running injuries. Female runners were found to be more susceptible than males to stress fractures at higher mileages. The cause of this increased incidence may be attributable to lower bone mineral density levels as a result of hormonal factors. Factors such as running surface, age and stretching techniques do not appear to play a significant part in the pathogenesis of running injuries.**

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**Key words: Stress fracture · Running injury · Leg length inequality · Osteoporosis · Running biomechanics.**

In the last 20 years there has been an explosion in the popularity of running. While much has been written on running and its associated injuries, there is disagreement as to the incidence, etiology and proper treatment of these conditions.<sup>1</sup> The widespread popularity of running has been accompanied by an increase in the number of associated injuries. Brody<sup>2</sup> reported an overall injury rate of 60% in a study of 3,000 runners. This injury rate is not surprising when one considers that

the lower extremity is loaded with 1.2-2.1 times body weight at heel strike, 2.5 times body weight at toe-off,<sup>3,4</sup> and that a runner strikes the ground an average of 1000 times per mile. Whether or not the repetitive loading over long periods of time leads to the development of osteoarthritis is a topic of current research.<sup>5,6</sup>

In reviewing the literature on running<sup>7-16</sup> and overuse injuries associated with basic training in the military,<sup>17-20</sup> there is disagreement on the incidence of injuries sustained. The knee is the most common site of injury. Estimates are that between 25 and 40% of all runners sustain at least one of the common injuries to the knee at some point. The foot, including hindfoot, arch, and forefoot, is the second most common site of injury reported.

The pathogenesis of running injuries is a controversial issue. Running injuries may be caused by either extrinsic (excessive mileage, running surface, training techniques, shoes, etc.); or intrinsic (a biomechanical instability or decreased ability for self-repair) factors. Intrinsic or biomechanical imbalances have been implicated in several running injury mechanisms. Friberg<sup>21</sup> reported leg length asymmetry in 84.1% of 371 Finnish Army conscripts by radiological method. Friberg found a positive correlation between the degree of leg length inequality and the incidence of stress fractures and demon-