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With less than 2 months before the annual Sun Run, many runners are well into their training programs. As with any sport, running injuries cannot always be avoided when you are following a vigorous training regime. Some researchers have estimated up to 60 percent of runners will experience an injury that will limit their activities. While some of these injuries are due to actual trauma, the majority fall into the category of overuse syndromes.

Most running injuries are not the result of recent acute injury; they develop gradually, over a period of weeks or months. These "overuse" injuries are caused by excessive, repetitive motion. The end result is a microtrauma injury - the body is unable to keep up with the repair and re-strengthening needs, so the muscle and ligaments begins to fail and becomes symptomatic. If it is not particularly painful (or if the pain is eliminated by painkilling drugs), the runner continues to run, eventually leading to complete failure, such as a stress fracture or ligament tear. The causes of these types of injuries are often categorized into extrinsic (outside the body) and intrinsic (inside the body) sources.

Causes of Microtrauma Injuries	
Extrinsic Factors	Intrinsic Factors
training program	muscle imbalance
running surfaces	structural alignment
equipment (shoes)	biomechanical function

Extrinsic factors. Causes of microtrauma injuries external to the runner are not difficult to modify, and should be addressed without delay. Extrinsic factors include the training program (such as miles per week, number of interval or hill workouts, recent mileage increases, and amount of rest time); running surfaces (such as pavement, artificial track, or trails); and equipment (construction and composition of running shoes). Recent research has shown that exposure to high amounts of intense training (duration, frequency, or running distance) increases the risk of injury; thus, modification of the training schedule can reduce the incidence of injury. Modifications in the running routine (such as less mileage on

more forgiving surfaces) and newer, better shoes should be introduced at the start of the rehab program for any running injury. One often-overlooked extrinsic source of problems is the forced rotation of the foot inward (ie pronation) and "environmental" leg-length discrepancy caused by repetitive running on a banked surface, such as along the sides of roads that have a pronounced slant for water run-off.

Intrinsic factors. The individual variables associated with overuse injuries are either muscle imbalances or structural alignment problems. These factors are more difficult to modify, but a good rehab program should be able to make significant progress once the problem has been identified. A well-designed examination is necessary to investigate the structural, biomechanical and dynamic aspects, searching for evidence of muscle imbalances, misalignments and dysfunctions. Frequently, several intrinsic factors combine to interfere with a runner's muscular efficiency and performance. When the runner increases his or her training intensity, the system breaks down and becomes symptomatic.

When a runner has sound joint alignment and muscular balance, even a taxing training program is endured. Runners with biomechanical problems, however, can't withstand even a moderate training program without developing various types of overuse injuries. A change in running surface or shoes may bring out the fact that a runner has an underlying foot or leg alignment problem that had previously gone unrecognized. In other words, the intrinsic and extrinsic factors are closely intertwined, and both contribute significantly to most running injuries.

In my next article, I'll discuss what a runner can do to help reduce his or her chances of being injured through a proper rehabilitation program.