

Youth Running: Injuries and Prevention Strategies

Running is a common exercise choice for adolescents. And in fact, similar to adult runners, there is a high incidence of running-related injuries in this age group. More than 50% of all pediatric sports injuries are due to overuse. Youth athletes commonly have injuries unique to their age, so it is important for these athletes, their parents, coaches, and healthcare providers to consider the developmental and growth factors of the athlete to ensure safe participation in sport.

Injuries related to: Growth

In the injured adolescent athlete, the hormonal stimuli during puberty and the variable rates of change in bone, growth plate, tendon, cartilage, and muscle need to be considered. Youth are considered “skeletally immature” until they have reached puberty and their growth plates have closed.

Timing of the pediatric growth spurt varies, but will typically occur at 12 years for girls and 14 years for boys. During this time of rapid growth, there is increased tension on the tendons that are attached to the relatively weaker growth centers (apophysis), which can become irritated (apophysitis) or even pulled off (avulsed).

The common growth centers that can be injured in youth runners are in the lower limbs and include:

- 1) Around the hip: Anterior Superior Iliac Spine (ASIS), Anterior Inferior Iliac Spine (AIIS), and the Ischial Tuberosity (“sits bone”)
- 2) Around the knee: Tibial Tuberosity (Osgood-Schlatter) and bottom of the knee cap (Sinding-Larsen-Johansson)
- 3) Around the foot: back of the heel (Sever’s disease) and the outer side of the midfoot (Iselin)

Tenderness over these specific areas can signal an apophysitis or avulsion injury. These injuries typically do well with rest and activity modification but persistent pain should be referred for evaluation from a sports medicine physician.

Injuries related to: Nutrition and Relative Energy Deficit

Relative energy deficiency in sport is the concept of low energy availability (poor nutrition that is not balanced with the amount of exercise the athlete is doing) that results in multiple impaired physiologic functions for both male and female athletes. This would be similar to not having enough gas in the tank for a long road trip!

Nutritional deficits can result in decreased bone density, which puts the runner at risk for stress fractures (now more commonly called “bone stress injuries”). Stress fractures are overuse injuries that result from the accumulation of multiple small injuries (microtraumas) related to repetitive movement and impact transferred to the bone. An *insufficiency* stress fracture is seen in runners with already weakened bone (low bone density). A *fatigue* stress fracture is the more typical “overuse” injury to bone from overtraining or a sudden increase in training volume. In runners, most bone stress injuries occur in the foot or lower leg. A tibial stress fracture can easily be mistaken for “shin splints” (medial tibial stress syndrome) and thus, evaluation from a sports medicine doctor should be considered because the specific cause will determine treatment and how quickly one can get back to running.

Low energy availability can also negatively affect female runners' menstrual function, which additionally increases risk for bone stress injuries. Although not as well studied, relative energy deficiency can also impair bone health in males. A well-balanced and varied diet is fundamental and should be tailored to meet the energy needs of the runner’s training level, and if helpful, can be coordinated with a sports dietician.

Injuries related to: Strength and Flexibility

Hip, core, and lower limb muscle imbalances may contribute to injury risk. Weakness in these areas may be due to inflexibility, resulting in inadequate muscle activation with sport-specific movements.

Common overuse running injuries include Achilles tendinosis, hamstring strain, IT band syndrome, patellofemoral pain (“runner’s knee”), plantar fasciitis, and tibial bone stress injury. Addressing muscle imbalances that may contribute to these overuse injuries can be done in conjunction with a physical therapist or other exercise specialist to ensure proper running mechanics as well as monitor progression into more functional and demanding movements.

Injuries related to: Cognitive, Behavioral, and Emotional Development

Many athletes, parents, and coaches may not realize the emotional maturity required when participating in sports competitively. This can result in unattainable expectations leading to frustration, low self-esteem, burnout, and overuse injuries. Burnout, which is the withdrawal from a previously enjoyable activity due to stress related to performance, may also be linked to early sport specialization. Youth runners should identify the motivation for their goals and participate in a well-structured and supervised training program. It is important that these goals are driven internally by the athlete and not externally by a parent or coach.

Training plan:

There is no consensus regarding the appropriate age to start training, nor the volume, intensity, or distance to safely support youth runners. The readiness for running should be based on *individual* growth relative to the energy demands required for the sport and emotional maturity.

The training plan should be carefully individualized to monitor volume progression and rest periods in training and off-season.

A reasonable training recommendation for the adolescent runner is to have:

- 1 rest day per week
- 1-2 week breaks every 3 months
- Limit running to 9-10 months per year

Alternating between high and low running volume days and varying training terrain should also be considered.

It is important for the growing child to engage in different types of sports because each sport requires different body movements. Youth runners should be encouraged to participate in high impact multi-directional activities (e.g. ball sports) to improve neuromuscular control and promote bone health.. Any athlete with a previous bone stress injury or other sport-related injury should be screened for training errors, poor biomechanics, and nutritional deficiencies. Good nutrition and sleep can improve performance potential. The ultimate goal for our youth runners is to allow lifelong participation in running while reducing overuse injuries and consequences from burnout.