

Foot & Ankle Overuse Injuries in Dancers

Megan Liberty, DO; Alyson Filipa, DPT; Paul Gubanich, MD

The physical demands placed on a dancer's body makes them as susceptible to injury as any athlete participating in mainstream sports. It is estimated that 75-95% of ballet dancers suffer at least one injury per year with an average of 3 injuries per dancer per year. Overuse injuries involving the foot and ankle can affect dancers of all levels and in multiple dance forms. Below is a review of some common foot and ankle overuse injuries affecting dancers.

Anterior/Posterior Ankle Impingement Syndromes

SYMPTOMS: In anterior impingement, dancers describe a pinching sensation at front of their ankle joint when they are at the bottom of their demi-plié (small squat) or when landing from jumps. In posterior impingement, dancers complain of pain in the back of the ankle when trying to reach their fullest relevé (on toes) or feel that they are unable to fully point their foot.

CAUSE: Excessive soft tissue or bone that leads to compression of structures limiting range of motion. In some cases this may be a result of prior ankle injuries.

DIAGNOSIS AND TREATMENT: If impingement is suspected, an x-ray to evaluate the bony anatomy is helpful. MRI may also be ordered to visualize the extent of swelling in the area. In both anterior and posterior impingement, conservative treatment with NSAIDs, rest, and possible immobilization and restricted weight bearing is the initial approach. A rehabilitation specialist with an understanding of dance can address a dancer's specific biomechanics and assist with workload modifications. If conservative measures fail, referral to an orthopedic surgeon may be required.

Tendonitis

SYMPTOMS: Gradual onset of pain that worsens with quick movements and high impact activity. In dancers, this is often felt over the Achilles tendon at the back of the heel, the flexor hallucis

longus tendon located under the big toe and the posterior tibialis tendon found on the inside of the foot and ankle.

CAUSE: Repetitive stress on the tendon without an adequate rest period to adapt to the increased load. Often fatigue, leading to poor technique, can worsen the problem, particularly if the dancer rolls their arches to maintain turnout, grips the floor with their toes or does not land jumps with heels down. Improperly fitting shoes should also be a consideration. Tying pointe shoe ribbons too tightly can compress the Achilles tendon. Shoes used in character dance, ballroom, Irish, and tap may not have an Achilles notch, which can increase stress on the tendon.

DIAGNOSIS AND TREATMENT:

Diagnosis is made based upon the patient's symptoms and physical exam. X-rays may rule out a bony injury, but MRI and ultrasound are usually more helpful because they can show swelling and microtears in the tendon. Treatment should focus on modifying workloads, attending rehab to increase strength and correcting technical errors.

Stress Fractures

SYMPTOMS: Progressively worsening pain, first after, then during, activity; sometimes limping and swelling. In dancers, they are most common in the long bones (metatarsals) of the foot.

CAUSE: Excessive stress on the bone without adequate rest. Occurs gradually and often correlated with increase in class or rehearsal schedules. Sometimes inadequate nutrition plays a role.

DIAGNOSIS AND TREATMENT:

On exam, swelling may be seen and dancers will complain of pin-point tenderness over the injury. X-rays are not always diagnostic, especially during the initial 2-3 weeks. An MRI is most commonly done for diagnosis, but CT or bone scan can be used. Nutritional deficiencies and body image disorders should be evaluated as dancers whose caloric intake does not meet their ex-

ercise demands are at an increased risk of stress fractures. Initial treatment is based on the location and severity of the fracture. It includes a period of rest in a boot or cast for 4-8 weeks, and possibly crutches if the stress fracture is high-risk. A surgical referral may be necessary in the case of prolonged healing, high-risk location or displaced fracture.

Tips for Parents:

- Research instructors and the reputations of various dance schools before enrolling your child. Training more hours does not necessarily mean your child will become a stronger dancer and may increase their injury risk of injury.
- Develop a strong technical base with quality instruction at an early age.
- If your dancer develops an injury, encourage them to let their instructors know. If the culture of the studio does not allow for this, it is time to find a new studio.
- When an injury occurs, start by scheduling an appointment with your dancer's primary care physician. Referral to a sports medicine physician and rehabilitation specialist familiar with dance can speed the recovery process and correct technical deficiencies to help prevent future injury.
- Ensure that your dancer is eating a well-rounded diet, getting adequate rest, and keeping up with academic studies. Check in regularly to ensure they are still having fun.

Madden, C., Putukian, M., McCarty, E., Young, C. *Netter's Sports Medicine*. 2nd ed. Elsevier, Inc. 2018

Smith TO, Davies L, de Medici A, Hakim A, Haddad F, Macgregor A. *Prevalence and profile of musculoskeletal injuries in ballet dancers: A systematic review and meta-analysis*. *Phys Ther Sport*. 2016; 19:50-56.

Mountjoy M, Sundgot-Borgen J, Burke L, et al. *The IOC consensus statement: beyond the Female Athlete Triad-Relative Energy Deficiency in Sport (RED-S)*. *Br J Sports Med*. 2014;48(7):491-497.

Foot & Ankle Overuse Injuries in Dancers

Megan Liberty, DO; Alyson Filipa, DPT; Paul Gubanich, MD

Dance may not spring to mind when one thinks of high-level athletics, but the physical demands placed on a dancer's body makes them as susceptible to injury as any other athlete. It is estimated that 75-95% of ballet dancers suffer at least one injury per year with an average of 3 injuries per dancer, per year. Overuse injuries involving the foot and ankle can affect dancers of all levels and in multiple dance forms. Below is a review of common foot and ankle overuse injuries affecting dancers.

Anterior/Posterior Ankle Impingement Syndromes

SYMPTOMS: In anterior impingement, dancers will complain of a pinching sensation in the front of their ankle joint when they are at the bottom of their demi-plié (small squat) or when landing from jumps. In posterior impingement, dancers will complain of a pinching sensation in the back of the ankle when trying to reach their fullest relevé (up on toes) or feel that they are unable to reach full ankle plantarflexion.

CAUSE: Excessive soft tissue or bony abnormalities that lead to compression of structures limiting range of motion. This may be a result of prior ankle injuries or an accessory bone such as an os trigonum.

DIAGNOSIS AND TREATMENT:

If posterior impingement is suspected, a lateral x-ray with the dancer in plantarflexion may show an os trigonum or Steida process from the talus. MRI may also be helpful to visualize associated edema. In both anterior and posterior impingement, conservative treatment with NSAIDs, rest, and possible immobilization and restricted weight bearing should be the initial approach. A rehabilitation specialist with an understanding of dance can address a dancer's specific biomechanics and assist with workload modifications. If

conservative measures fail, referral to an orthopedic surgeon for potential ankle arthroscopy may be required.

Tendinopathies

SYMPTOMS: Tendonitis presents as gradual onset sharp pain that worsens with quick movements and high impact activity. In dancers, this is often felt over the Achilles tendon, the flexor hallucis longus tendon and the posterior tibialis tendon.

CAUSE: Tendinopathies refer to a broad spectrum of tendon injuries and are caused by repetitive overloading of the tendon without an adequate rest period to adapt to the expected load. Often fatigue leading to poor technique can exacerbate the problem, particularly rolling arches to maintain turnout, gripping the floor with toes or not landing jumps with heels down. Improperly fitting shoes should also be a consideration. Tying their pointe shoe ribbons too tightly can compress their Achilles tendon. Shoes used in character dance, ballroom, Irish, and tap may not have an Achilles notch, which can increase stress on the tendon.

DIAGNOSIS AND TREATMENT:

Diagnosis is made based on history and physical exam findings. X-rays may be obtained to rule out a stress fracture and MRI or ultrasound is used to visualize the amount of edema and micro-tears in the affected tendon. Treatment should focus on modifying workloads, attending rehab to increase strength and correcting technical errors.

Stress Fractures

SYMPTOMS: Common complaints include progressive pain after activity, swelling, and a limp. The most common location for a stress fracture in the foot of a dancer is at the base of the second metatarsal. Stress fractures can also be seen in the third and fourth metatarsals, the proximal diaphysis of the fifth metatarsal, and the navicular.

CAUSE: Stress fractures are overuse injuries that present as a continuum of fatigue failure of the bone from micro-fracture to complete structural failure. They typically occur insidiously and are correlated with an increase in class or rehearsal schedules.

DIAGNOSIS AND TREATMENT:

On physical exam dancers will complain of pin-point tenderness and swelling over the injury. X-rays are not always diagnostic, especially during the initial 2-3 weeks. Advanced imaging may not be necessary for diagnosis but can be useful in guiding return to dance decisions. MRI offers superior sensitivity and specificity for soft tissue abnormalities and can demonstrate fracture location and extent of injury. CT and bone scan may be helpful for diagnosis but do not have a role in establishing a return to dance timeline. Nutritional deficiencies and body image disorders should be evaluated, and it is important to have a multidisciplinary team-based approach if risk factors associated with Relative Energy Deficiency in Sport (RED-S) are identified. Initial treatment is based on the location and severity of the fracture. It includes a period of rest in a low-tide boot or cast, possible non-weight bearing on crutches if high grade injury or high-risk location for 6-8 weeks. A surgical referral may be necessary in cases of non-union, high-risk location or displaced fracture.

Madden, C., Putukian, M., McCarty, E., Young, C. *Netter's Sports Medicine*. 2nd ed. Elsevier, Inc. 2018

Smith TO, Davies L, de Medici A, Hakim A, Haddad F, Macgregor A. *Prevalence and profile of musculoskeletal injuries in ballet dancers: A systematic review and meta-analysis*. *Phys Ther Sport*. 2016; 19:50-56.

Mountjoy M, Sundgot-Borgen J, Burke L, et al. *The IOC consensus statement: beyond the Female Athlete Triad-Relative Energy Deficiency in Sport (RED-S)*. *Br J Sports Med*. 2014;48(7):491-497.