

Musculoskeletal injuries in performing artists.

CHARLOTTE LoBUONO

Dancers and musicians are predisposed to characteristic injuries that can be difficult to diagnose. Knowing how to evaluate, treat, and prevent disorders in this unique population will help you optimize patient outcomes.

Professional musicians and dancers spend years perfecting their art. Not only are they emotionally invested in their performance, but their livelihoods depend on their ability to perform well. Even artists who do not dance or play music professionally have made a significant commitment to the activity. The demands that such performers make of their bodies can lead to chronic musculoskeletal problems, and physicians who treat such patients must remember that these disorders can cause financial and emotional havoc as well as significant pain.

INJURIES IN DANCERS

In dancers, injuries tend to affect the back and lower extremities, particularly the ankle and foot, and are usually caused by overuse. Acute injuries common in dancers include sprains and contusions, and problems associated with overuse range from stress fractures and tendinitis to arthritis.

Dancers experience stress fractures of the metatarsals and tibia caused by impact on landing, in addition to muscle fatigue and joint-related problems such as chondromalacia of the knee and patellar tendinitis. Injuries to the meniscus of the knee attributable to the stress of impact and overuse are also seen frequently among professional dancers. The pronounced turnout at the hips that is sometimes required, especially in classical ballet, can cause bursitis or tendinitis of the hip.

Dancing frequently causes disorders of the toenails and toes, such as onychomycosis, corns, ingrown toenails, and deformities such as hammertoes (extension of the proximal phalanx of the toe while the second and distal phalanges remain flexed) and claw toes (hammertoes with dorsiflexion of the metatarsophalangeal joint). Ill-fitting toe shoes are the most common cause of claw toes and hammertoes and can cause painful calluses as well. Hard corns can develop over bony prominences and metatarsal heads as a result of pressure between the toe and either the floor or the dancer's shoe. Soft corns usually occur between the toes because of pressure exerted by bone.

Although dancers do complain of discomfort, often they see a physician only when they need treatment for a functional problem or a visible deformity. Dancers are reluctant to seek medical attention because they fear losing their jobs, even if they have been injured and experiencing symptoms for some time.

INJURIES IN MUSICIANS

Many injuries in musicians are similar to computer overuse injuries and involve soft tissue damage at the shoulder, elbow, or wrist. Although shoulder problems such as rotator cuff injuries are common, tendinitis at the elbow is also frequently diagnosed. In the wrist, tendinitis or nerve entrapments such as carpal tunnel syndrome (CTS) are often seen. Other problems noted in musicians include cubital tunnel syndrome, bursitis, tenosynovitis, myofascial pain syndrome, and trigger finger (a sudden locking of the finger midway in the flexed position). The pain or nagging muscle aches correlated with these injuries are what usually motivate musicians to go for medical care.

DIAGNOSING PERFORMING ARTS INJURIES

The nature of injuries sustained by performing artists may not always be apparent. In addition to taking a history and performing a physical examination, you may need to ask the person to demonstrate their dance or playing technique so you can accurately diagnose the problem.

A targeted history

When taking a history, establish if the injury is occupational, correlated with an underlying medical problem, or congenital; if the person has attempted to treat it; and if the person has continued to participate in the chosen activity after the onset of symptoms. Is there a family history of an associated specific condition? The problem may not be caused by performing at all, but could be an underlying malady.

Recent change in rehearsal or performance schedules or patterns is often evident. Did the patient first notice the symptoms after doing something new or different during a performance or rehearsal? Has there been a change in repertoire or instructor? A different instructor may be pushing the performer more than usual or may not be correcting improper technique. Has practice intensity or frequency changed? Have the duration of rehearsals or the stress level related to practice been extended? A marked increase in practice intensity or frequency could put a musician or dancer at greater risk for injury. Performers may drive themselves harder than usual in high-pressure situations, such as when preparing for a big audition or performance.

The problem might be ongoing. Has the patient experienced these symptoms before and under similar circumstances? How long have the symptoms persisted and when did they begin? If the pain appears to be attributable to the activity, try to discern its pattern. Even before beginning to play the instrument or dance, does the patient feel pain? Does the patient experience pain only during the activity, or does the pain continue afterward? Has participation in music or dance continued in spite of symptoms? Do symptoms persist with similar intensity and duration when the activity is discontinued for a prolonged period of time such as a week?

Is the pain or symptom related to a specific motion or activity that the patient can demonstrate for you? Is the problem in the right or left extremity, or both? Is the patient right or left handed? The patient may be placing extra stress on the dominant extremity. Is the pain and swelling localized, or is the pain radiating? Does the pain travel? Has the patient experienced any altered sensation, or heard a pop, snap, or grind? A popping or snapping sound can indicate that a tendon has been torn. Localized pain and swelling may be associated with a fracture or soft tissue injury due to stress or overuse. Muscle weakness and pain that travels are signs of a neurologic problem such as nerve entrapment. Sensory changes usually indicate nerve damage as well. Patients may have been treating the injury themselves, perhaps to avoid seeking medical care. If so, what have they used? They may be using an inappropriate therapy, or they may have received poor advice.

Physical examination techniques

Equality of balance, flexibility, strength, and alignment are important. A young dancer or musician with scoliosis, for example, will experience different sensations on one side than the other. For a comparison of muscle tone, strength, and flexibility, divide the body into equal parts when examining a patient from left to right or anterior to posterior.

The physical examination should assess the strength and joint stability in the upper or lower extremities, in addition to overall strength, flexibility, and range of motion. Both elbows and ankles should have adequate range of motion and flexibility. In the trunk region, strength and flexibility in the back and abdominal muscles are important because if a musician plays an instrument in front of the body, for example, this shifts the center of mass forward. Hamstrings and quadriceps should be sufficiently flexible because tightness in these muscle groups could lead to lower back problems.

Bones, joints, and soft tissues may show evidence of injury upon examination. Palpating tendons and bones to determine the origin of the pain can identify problems such as stress fractures or tendinitis. It has become clear that factors such as aging and primary tendon degeneration are very important in the development of these problems. [1] These intrinsic changes predispose the structure to tendinopathy. Mechanical factors such as overuse and ergonomics may not always explain the strong age-related incidence of these conditions. Patients with stress fractures may present with pain directly over the fracture site. Pain could also originate from visible deformities such as bunions that are noted during the exam.

Numbness, paresthesia, or muscular weakness is indicative of a neurologic problem involving the surrounding nerve. Selective activation of the abductor pollicis brevis (APB) muscle is a good method for evaluating muscle weakness if CTS is suspected. To assess APB strength, ask the patient to extend the thumb out to the side of the hand and then, without bending it, raise the thumb until it is perpendicular to the palm. The strength of the ulnar muscles in the hand can be evaluated by asking the patient to place the hand

perpendicular to a surface such as an examining table and then raise the first (index) finger upward. This test determines the strength of the first dorsal interosseous muscle, which is selectively innervated by the ulnar nerve.

Evaluation of performance technique

Evidence of tissue disruption can be elusive, particularly in musicians. Assessment of the whole patient, or at least an entire region of the body, becomes important because you will be looking for very subtle findings. A demonstration of performance technique is thus useful, if not essential. If the pain or other symptoms are the result of playing an instrument, watching what the patient does can show you the relationship of the patient to the instrument. Problems in the forearm of a pianist, for example, may have their roots in the back or shoulders, or be related to posture. A musician may use the wrist inappropriately or try to reach for a piano key or guitar string incorrectly

The physical evaluation for dancers may be more straightforward because their injuries are similar to those suffered by athletes, and thus the findings may be more objective. The problem may not be immediately obvious, however, and may best be brought out by a similar holistic approach that includes a demonstration of dance technique or the motion or position that elicits symptoms (see Figure 1, page 30, and Figure 2).

Radiologic and neurologic testing

Dancers, who are more susceptible to stress fractures, may need to be x-rayed more than musicians. If a stress fracture is suspected, a bone scan might be ordered in addition to a plain film. If the bone scan indicates that a soft tissue injury is likely, more specific testing such as MRI and CT may be required to illuminate the exact location and nature of the injury.

Neurologic testing of sensory activity is important because patients may experience altered sensation as a result of their injuries. Electrodiagnostic neuroevaluation is of particular importance in musicians, because CTS or other nerve entrapment syndromes may develop in their upper extremities. [*]

TREATMENT AND PREVENTION OF INJURIES

Injured musicians and dancers may benefit from therapies including rest, anti-inflammatory medication, or modalities such as ice and heat. Surgical intervention should be considered only for the most recalcitrant cases. Proper conditioning and flexibility, in addition to ergonomically correct technique and the right equipment, are essential for preventing injuries and perhaps permanent damage.

Nonsurgical therapies

A large majority of arts injuries problems should be resolvable without surgery (see "Protocol for treating musicians," page 34, and "Treating jumper's knee," page 36). The dancer or musician must first understand the exact nature of the problem and why it occurs. Relative rest--restricting the patient from the offending activity to some degree at least temporarily--will allow the person to remain active as a dancer or musician while working around the problem. A dancer with problems in the toe flexors would continue to dance but not go en pointe, for example. Keep in mind that you may lose patient compliance if you are too rigid in your prescription, and you may cause psychological damage as well because dancers and musicians are very concerned about losing proficiency and conditioning. Relative rest thus becomes a compromise.

Myofascial release through physical therapy may be used to treat soft tissue conditions. Some patients seek massage therapy for muscle tension and pain. A physical therapy program can also be designed to increase flexibility in joints that have become stiff or increase strength in weakened muscles. A regimen of gentle stretching can be used to treat early Achilles tendinitis as inflammation begins to decrease.

Ultrasound and modalities such as heat and ice are efficacious in treating tendinitis. Hot and cold contrast soaks are often recommended to reduce inflammation. Ultrasound can alleviate inflammation by delivering heat to the tendons.

A course of anti-inflammatory medication can provide relief of pain and the inflammation of tendinitis and bursitis. Healing of the injury often will ultimately result from time and relative rest. NSAIDs can be prescribed for as few as 3 weeks (possibly less) or as many as 12 weeks. NSAIDs are of marginal benefit, however, if tendinitis is due to intrinsic factors such as age related degeneration.

Immobilization may be very helpful, particularly with conditions such as CTS. Splints should hold the extremity in a neutral position, and some even allow the patient to engage in most normal activities. Use of a nonweight-bearing cast for 1 to 2 weeks is sometimes recommended for advanced Achilles tendinitis.

Eradicating problems in the toes can require a combination of oral medication, protection of the toes, and paring down the affected nail or area of skin. Antifungal medications can be given to treat onychomycosis. Ingrown toenails usually require trimming of the nail edge and debridement of the affected area. Oral antibiotics may also be necessary.

Lambskin or moleskin can provide relief from the pain associated with claw toes and hammertoes or prevent the recurrence of corns by reducing the pressure from external surfaces. Paring down the callused tissue and treating local infection are other common therapies for hard and soft corns. When hammertoes and claw toes develop in dancers, reevaluate the fit of the shoes that they have been using.

Preventing injuries

Proper biomechanics are important in preventing overuse problems in dancers and musicians. Adequate flexibility and strength conditioning will allow the muscles to perform more efficiently and to be more physiologically effective under unusual and sometimes extreme demands.

Performers should be sure to adequately warm up their muscles before a practice or performance, as an athlete would. A cool-down or stretch after a rehearsal or performance promotes circulation to bring in oxygen and other substances to cleanse the muscle. In addition to overuse, other facilitators of injury include stress, incorrect posture, lack of rest, awkward playing or dance technique, and the use of too much force when playing music or dancing. Advise patients to take short breaks every few minutes and longer breaks every hour. Ideally, performers may wish to have 2 short rehearsals a day instead of one long practice. Instructors may be able to recommend alternative dancing or playing styles and techniques.

Musicians should be playing an instrument that is the correct size for them and that is set up in the most ergonomically correct position. A strap, instrument stand, or lighter strings or reeds may be necessary for maximum comfort and proper posture. A cart may be required to move big and heavy instruments from place to place.

Suggest that dancers avoid forced turnout at the hips and other similarly awkward and often painful positions. Excessive jumping during dance classes or rehearsals should also be avoided, and care must be taken to land jumps correctly. Toe shoes should fit properly. Old or soft pointe shoes should not be worn. To develop muscle strength, recommend dance classes, yoga, tai chi chuan, or stretching.

Surgical referral

Signs of a major injury, such as a torn ligament or tendon, would necessitate surgical referral. Tears in the Achilles tendon or rotator cuff are the more common injuries of this type. Patients whose symptoms do not respond to more conservative therapies may also be candidates for referral to an orthopedist or a neurosurgeon. Surgical referral should be considered if nerve conduction or EMG studies show severe damage to the underlying axon of the nerve or if you note an overriding risk factor, such as diabetes, indications of major muscle wasting, or complaints of persistent numbness or weakness.

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(*) For more information on electrodiagnostic assessment of nerve entrapment syndromes, see "Nerve conduction studies and electromyography" in "Identifying entrapment and compression neuropathies," *Patient Care*, December 15, 1999, page 147.

This article at a glance

Performing arts injuries

* In dancers, injuries typically occur to the back and lower extremities and are usually caused by overuse.

* Many injuries in musicians are similar to computer overuse injuries and involve soft tissue damage at the shoulder, elbow, or wrist.

Diagnosis

- * When taking a history, establish if the injury is occupational, associated with an underlying problem, or congenital; if the person has attempted to treat it with anything; and if the person continues to participate in the chosen activity.
- * The physical examination should assess strength and joint stability in the upper or lower extremities, in addition to overall strength, flexibility, and range of motion.
- * Evidence of tissue disruption can be elusive. Assessment of the whole patient thus becomes important.

Treatment and prevention

- * Proper biomechanics, adequate flexibility, and strength conditioning are important in preventing overuse problems.
- * A majority of problems should be resolvable without surgery.

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Protocol for treating musicians

1. Separate the symptoms of pain, numbness, and incoordination.
2. Identify the cause of the symptoms (eg, tendinitis, focal neuropathy, soft tissue injury, dystonia).
3. Treat the impairment. For soft tissue pain and tendinitis, use medication and other therapies for analgesia and restoration of strength, function, and movement. For sensory symptoms, evaluate and identify focal neuropathies. Treat the specific pathology, and relieve pressure. For incoordination, determine whether the cause is extrinsic, for example a faulty instrument, or intrinsic, such as decreased sensation.
4. Review and modify practice and performance technique.
5. Review playing technique and review and modify instrument

Adapted with permission from Potter PJ, Jones IC. Medical problems affecting musicians, can Fam Physician. 1995;41:2121-2128.

Treating "jumper's knee"

Repetitive trauma, such as the tremendous impact of landing a jump while dancing, can cause degeneration and microtearing of the collagen fibrils of the extensor mechanism over a period of time. This tendinitis of the extensor is referred to as "jumper's knee" and often occurs at the tendo-osseous junction at the inferior pole of the patella. The inferior pole may feel tender upon examination, which may also expose associated conditions such as chondromalacia.

Jumper's knee has 4 progressive stages, which are based on symptoms. Appropriate therapy is dictated by the severity of the condition.

Stage 1 Pain occurs only following a performance or first thing in the morning. Dancers complain of symptoms when they have stopped performing or practicing and their endorphin

levels have decreased. Appropriate therapy consists of sufficient warming up of the muscles before activity, application of ice following the activity, use of NSAIDs, physical therapy that includes isometric quadriceps exercises and quadriceps and hamstring stretching, and a knee brace.

Stage 2 Pain is increasing during and after a performance, but there is no notable functional impairment. Therapies appropriate for stage 1 tendinitis are also appropriate for stage 2, with the addition of heat application before performing or rehearsing, in addition to occasional rest.

Stage 3 Increasing pain begins to affect the performance. Therapy is the same as for stage 2, but more rest is required as a result of the increased intensity. The patient must consider either giving up dance or undergoing surgery.

Stage 4 The extensor mechanism is disrupted. Surgical intervention is necessary.

Source: Phillips BB. Traumatic disorders. In: Crenshaw AH, ed. Campbell's Operative Orthopaedics. 8th ed. St Louis, Mo: Mosby; 1992:1921-1922. This staging system for jumper's knee was originally published in Blazina ME, Kerlan RK, Jobe FW et al. Jumper's knee. Orthop Clin North Am. 1973;4:665-678.

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