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Dr Metzl did not disclose any financial relationships relevant to this article.

Objectives

After completing this article, readers should be able to:

1. Describe the current management of concussion.
2. Delineate the prescription for treatment of acute ankle injuries and prevention of subsequent injuries.
3. Describe appropriate handling of neck injuries to avoid additional damage.
4. Discuss the likelihood of sustaining an ankle injury if the patient has had a previous ankle injury.
5. Recognize which sports are more closely associated with head injury than others.

Introduction

With increasing numbers of young athletes participating in sports activities across the United States, the issues of sports participation, sports safety, and specific return-to-play decisions have become more common in the pediatric office. Athletic patients and their families are turning increasingly toward the pediatrician for guidance and safe decision-making regarding sports participation and injury prevention.

This article examines specific issues that pediatricians and pediatric residents in training should encounter during the practice of general pediatric medicine. These issues include concussion, cervical spine injury, and ankle injury. Case-based teaching examples are used to illustrate teaching points.

Current Management of Concussion

Case #1: Head Injury

A 15-year-old soccer player comes to her pediatrician for follow-up 1 day after suffering a head injury during a soccer game. She sustained a head-to-head collision with another player and quickly developed a headache. She tried to continue playing but was having difficulty remembering her position and on-field responsibilities. She did not lose consciousness. She came off the field voluntarily, was evaluated by the athletic trainer on the sideline, and was removed from the soccer game. Her parents were worried and took her to the emergency department, where she was evaluated. A computed tomography scan was negative for subdural or epidural hematoma.

Closed-head injury is a common medical problem in young athletes who play in high- and medium-contact sports (Table 1). Unfortunately, the majority of concussive episodes in young athletes are not reported, but the known incidence is approximately 300,000 cases per year in the United States. The actual number is much higher.

The head injury sustained by this adolescent soccer player raises a number of issues. How extensive are her injuries, which may be subtle in the cognitive realm, and when should she be expected to return completely to normal? How should her progress be monitored? When can she resume practice and competition?

Assessment

Concussion refers to a significant head injury that may cause a host of signs and symptoms, including alterations in consciousness, confusion, amnesia, visual and hearing impairment, irritability and mood changes, difficulties with balance, headache, lethargy, insomnia, memory impairment, nausea, and vomiting.

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Table 1. Common Sports Characterized by Level of Contact

High-contact Sports
• Basketball
• Football
• Soccer
• Martial Arts
• Rugby
Medium-contact Sports
• Baseball
• Fencing
• Cheerleading
• Skiing
• Volleyball
Noncontact Sports
• Running
• Swimming
• Tennis
• Weight Training

The Prague Conference on Concussion in 2004 defined concussion as "a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces." (1) The Conference also pointed out that the impairment of neurologic function typically has a rapid onset, is short-lived, and tends to resolve spontaneously. In addition, neuropathologic changes are indicative more of a functional derangement than of a structural injury and typically are associated with neuroimaging studies that appear grossly normal. The sequential resolution of symptoms and cognitive functioning was emphasized.

Guidelines for the management of concussion have been available for many years and, until recently, were based on systems that graded the injury, with loss of consciousness being a major criterion. These guidelines recommended return to activity based on the grade of concussion. More recent thinking emphasizes waiting until after symptoms have resolved before assigning severity; stresses physical and cognitive rest; and recommends a sequential, functional progression as symptoms clear and do not return with exertion, with careful monitoring by a physician. (1)

The patient's neurologic and cognitive status can be assessed through a variety of methods. Neurologic examination is indicated from the initial evaluation through the follow-up period. At one end of the spectrum, office assessment of mental status and cognitive functioning by use of a series of questions is part of neurologic testing. Intensive neuropsychological testing also is available through appropriate specialists. A middle approach involves the use of more formal instruments that can be administered by primary care physicians or certified athletic trainers.

Several instruments are available for an intermediate level of evaluation. One tool that has been constructed using a number of other instruments is the Sport Concussion Assessment Tool (SCAT), which contains both a medical evaluation and a checklist for the athlete, as well as information about concussion. (1) When combined with a neurologic examination, the SCAT can be useful in the office setting.

An instrument used commonly by certified athletic trainers is the Standardized Assessment of Concussion (SAC), which can be employed for sideline evaluation. This instrument can be ordered through a medical bookstore or purchased through the Internet. Based on a scored scale, the SAC can be used to determine orientation, immediate memory, concentration, and delayed item recall. These different parameters are tabulated, providing a score that grossly assesses an athlete's ability to return to competition. In the office, findings on the SAC can be combined with evaluation of the presence of postconcussive symptoms such as ongoing headache, dizziness, memory loss, and irritability and a neurologic examination to assess the athlete's ability to return to competition.

Although the SCAT and SAC are good tests of cognitive functioning, they have a "ceiling effect," meaning that a patient could do well on these tests without having recovered fully. For this reason, a number of computerized tests are available that provide a more accurate assessment without the need for full neuropsychological testing. A full discussion of these instruments is beyond the scope of this article, but pediatricians should consult with local sports medicine physicians and athletic trainers to learn which tools are available and in use in their area.

For milder cases of concussion in which recovery is steady and complete over a 7- to 10-day period, mental status screening is necessary for monitoring, but the computerized instruments should not be necessary because physical examination and self-report of symptoms usually are sufficient. Primary care practitioners should be equipped to manage these injuries.

For patients who sustain a concussion and have persistent signs and symptoms or whose symptoms recur on exertion, both neuropsychological assessment and the involvement of specialists may be indicated. Many ath-

letes who sustain head injuries become totally symptom-free and do not need major intervention. Extensive neuropsychological testing is indicated for the minority of patients in whom there is a question about the cumulative effects of concussion or in whom there may be permanent academic impairment and questions about further participation in contact sports.

Postconcussive Syndrome

Whenever an athlete suffers a concussion, it is important to advise both the athlete and his or her parents about the possibility of postconcussive syndrome. Postconcussive syndrome involves residual symptoms from a concussion, including headache, dizziness, irritability, and difficulty concentrating. These symptoms can exist after any concussion, regardless of severity. The appearance and persistence of postconcussive symptoms is more likely with more severe concussion.

A repeated episode of concussion can result in a prolonged period of concussive and postconcussive symptoms and, therefore, a much greater period of time away from sports participation. A less common but much more severe consequence of concussion is the development of second impact syndrome (SIS), rapid and progressive brain injury resulting from a second episode of closed-head injury while the athlete still is symptomatic from the first episode. In this entity, an athlete who still is recovering from an initial concussive episode is struck in the head. The result is rapid mental deterioration, mental status change, and often fatal uncal herniation.

SIS is associated with a mortality rate of 70% to 80% but is completely preventable through the prompt recognition of concussive and postconcussive symptoms. The presence of this entity, although rare, demonstrates further the need to keep athletes out of any situation involving direct head trauma until recovery is complete.

Making the Important Decisions

Current concepts of managing concussions related to sports dictate that an athlete manifesting any signs or symptoms of concussion be removed from the practice or game immediately, not be allowed to return to play that day, be monitored carefully, and receive medical attention. These same principles should be relevant to nonathletic activity. Return to play is allowed only when the player's signs and symptoms have resolved and when he or she has demonstrated the ability to progress stepwise through several levels of activity without any recurring symptoms. Activity should move through the following steps, with advancement only if there are no symptoms. If symptoms recur, the athlete should rest for 24 to 48 hours and try to progress again, dropping back if symptoms recur. (1) The recommended steps for a logical and safe progression are:

1. Complete rest, although bed rest is not indicated; the patient may participate in activities of daily living.
2. Light (low-intensity) aerobic exercise, such as walking, without a component of resistance. Weightlifting is prohibited.
3. Activity specific to the sport, such as running or skating. At this step and the next, resistance training may be added.
4. Training drills without contact, followed by mental status testing.
5. Full-contact training after clearance by medical personnel.
6. Participation in a game.

Such a regimen must be individualized to each athlete, and progress should be monitored by clinicians who have the appropriate level of training. The primary care physician and the experienced athletic trainer make a good team in determining the appropriate course of action in most cases, and the trainer can serve as a liaison with the coach to make sure the plan is executed properly.

Prevention

One final note on concussion involves the screening of athletes. As in many types of injury that create a predisposition to future injury, athletes who have had one concussive episode are nearly six times more likely to have a second episode of concussion compared with their unaffected peers. Therefore, effective preseason counseling about the symptoms of concussion involves asking about the history of previous concussive events. In addition, it is important to stress the importance to athletes, particularly those who have had previous concussive events, of reporting postconcussive symptoms during the season.

Prevention involves the creation of an increased awareness in coaches and athletic trainers who might be involved with the care of a young athlete who had a concussive predisposition in previous seasons. Mouthguard use in high-contact sports, in addition to reducing oral and dental injuries, is theorized by some to reduce the risk of concussion and should be strongly encouraged in all athletes. All of this advice and surveillance can be accomplished during the preparticipation evaluation and can ensure greater safety by targeting athletes who are at greater risk and creating both an educational and health supervisory framework on their behalf.

Unlike professional athletes who are paid to put their

bodies at risk for money, pediatric and adolescent athletes are volunteer athletes. Therefore, special care should be given to protect against closed-head injury and, more importantly, to ensure that the athlete has recovered completely before he or she returns to sports participation.

The Centers for Disease Control and Prevention supply information for patients, parents, and clinicians that provides guidance in the management of head injuries at http://www.cdc.gov/ConcussionInYouthSports/ and http://www.cdc.gov/ncipc/tbi/Facts_for_Physicians_booklet.pdf.

Current Management of Cervical Spine Injury

Case 2: Cervical Spine Injury

You are on the sideline of a football game when a 17-year-old player suffers an injury while tackling another player. When trying to tackle a running back, he uses his head as the initial contact device (spear tackling), suffers an axial load with a flexion injury, and falls to the ground, lying motionless. He is prone. After the initial shock, the athletic trainer rushes onto the field and immediately calls for your assistance. As you approach the athlete, he lies motionless in a prone position on the field.

Epidemiology of the Cervical Spine Injury

Cervical spine injury represents a rare but potentially life-threatening event in youth sports. Approximately 60% of all acute pediatric spinal injuries occur in the cervical spine. Cervical spine injury occurs most frequently in high- and medium-contact sports, typically occurring through a head-first injury mechanism, as described in Case 2.

Preparation

The appropriate sideline management of the acute cervical spine injury starts with effective preparation. Rather than waiting for an injury to occur before devising a algorithm for treating a cervical spine injury on the field, treatment protocols are implemented best before the start of the sports season.

The essential elements in preseason event preparation for a cervical spine injury include:

1) On-site emergency personnel or the ability to access emergency medical services through the use of a charged cell phone that is fully accessible during the sporting event.

2) Discussion with a certified athletic trainer who is most likely to be on the sideline regarding responsibility in the case of a cervical spine injury.

3) Immobilization equipment, including a back board, for use in the event of a cervical spine injury.

4) An understanding of the steps required in the event of an acute cervical spine injury, including airway control, cervical spine immobilization, and plan for transporting injured athletes to the emergency department.

On-field Management

Appropriate on-field management of a suspected cervical spine injury follows a similar protocol to basic life support, which begins with a focus on airway management, breathing, and circulation (ABCs). In the United States, American football poses the greatest risk for cervical spine injury and accounts for approximately 50% of such injuries in youth sports. Cervical spine injuries also can occur during water sports, particularly diving, when an athlete hits the water at a high velocity with the neck flexed, similar to the spear tackle in football.

When approaching the athlete who is suspected of having a cervical spine injury, an initial desire to assess and treat the neck directly is common. Appropriate management of the injured cervical spine, however, begins with assessment of the ABCs while attempting to keep the head and neck in a stable position. If the injury occurs in football, an appropriate initial step includes listening for breathing or putting a hand beneath the jersey and shoulder pads to check for thoracic expansion. If the athlete is unconscious, it is imperative to establish the airway first, which includes assuring that the tongue is not obstructing the airway. The football helmet never is removed on the field. If the airway is obstructed, the face mask should be removed, but the helmet and shoulder pads should remain in place to ensure neutral alignment of the cervical spine.

If the athlete is found in the prone position, establishing airway control can be difficult. Treating the prone athlete involves initial assessment of the airway. If the athlete is unconscious and not breathing, the airway is established in the supine position. In this scenario, the log roll technique (Fig. 1) is used to move the patient to the supine position. This technique, which should be practiced before any injury occurs, involves rolling the injured player by two assistants controlling the body and the team leader controlling the head. It is essential to keep the head turning at the same speed as the body to lessen any chance of additional injury to a potentially unstable cervical spine.

Figure 1. Log roll technique for stabilization of pediatric cervical spine injury. It is always important for the helmet to stay on unless airway problems are present. This technique requires two or three people to complete, with the person in charge at the head giving commands and keeping the cervical spine in line with the rotating torso.

Figure 2. Normal anteroposterior view of the cervical spine.

Figure 3. Normal flexion view of the cervical spine.

Five radiographic views should be obtained in all patients in whom cervical spine injury is suspected (Figs. 2 through 6). Note that all of these radiographs show a normal cervical spine, with the exception of the lack of the normal lordosis on the lateral view in Figure 6, which suggests paracervical muscular spasm. Flexion and extension views never should be obtained when cervical instability is suspected, as is the case with the patient in Figure 7.

Prevention

Prevention of cervical spine injury is an important consideration for the pediatrician. Effective prevention includes the use of proper-size equipment during practice and games, proper coaching and refereeing that discourages risky tackling, and strengthening programs that involve sport-specific exercises for the prevention of cervical spine injury.

Figure 4. Normal extension view of the cervical spine.

In Case 2, involving a player who is unconscious and not breathing, the physician should use the athletic trainer and a coach to assist in the log roll technique. Once the player is supine, the face mask should be removed quickly by the athletic trainer while the physician keeps his knees around the player's helmet to minimize motion. The airway subsequently is secured quickly with appropriate jaw positioning, and the athlete is transported to the emergency department.

Returning to Activity

Athletes who are suspected of having a cervical spine injury but have normal radiographic findings can be returned safely to activity when:

1) There is no pain with motion of the cervical spine.

2) There is no pain with palpation of the cervical spine.

Figure 5. Odontoid view showing the relationship between the first and second cervical vertebrae. The dens, so named because of its resemblance to a tooth, extends from the second vertebrae into the first vertebrae for stability. The space around the dens should be equal on both sides. Inequality of space suggests instability between the first two vertebrae.

3) There is no report of radicular symptoms emanating from the cervical spine.

4) Results of all neurologic examinations and associated tests are normal.

Current Management of Ankle Injury

Case #3: Ankle Injury

A 12-year-old soccer player limps into your office one day after "rolling her ankle." When asked, she describes a rolling episode that occurred during soccer practice yesterday when she stepped in a hole on the field. She sits on the examination table and asks when she can return to play.

History

As with all medical problems, obtaining a history is an essential first step in the diagnostic approach to injury (Table 2). In this case, the mechanism of injury, "rolling" of the ankle, needs proper clarification. One helpful method of assessment is to ask the patient to demonstrate the mechanism of injury in the uninjured extremity. The most common mechanism, the inversion injury, accounts for approximately 80% of ankle injuries and is the result of a twisting or rolling of the ankle when stepping into a hole or running on an uneven portion of the field. In contrast, the eversion injury, a less common and more

Figure 6. Lateral view of the cervical spine showing straightening of the normal cervical lordosis but otherwise no evidence of bony abnormality.

forceful injury pattern, is associated with more severe injuries, often involving both the medial and lateral ankle. The examiner also should ask about the patient's activity after the injury occurred, including ability to bear weight and return to activity. The more serious the injury, the less likely is the ability to continue playing and to bear weight comfortably during running or walking. Finally, assessing the past history of ankle injury is essential. The most common reason for an ankle injury in an athlete is the presence of a previous injury that has been rehabilitated incompletely. Therefore, the presence of previous injury provides important clues in terms of present injury patterns and likely diagnoses.

Physical Examination

The physical examination begins with observation and inspection. Observation of how a patient is walking is essential and can assist greatly in differentiating the more serious fracture from the less serious ligament injury. Inspection for swelling and ecchymosis also is important; swelling often is noted in the area of injury in many foot and ankle injuries.

Figure 7. Lateral view of the cervical spine showing a cervical fracture with cervical instability. This patient requires complete immobilization and immediate referral to a trauma center for consultation with an orthopedic spine specialist or neurosurgeon.

With the information gleaned from the history, the examiner can use the hands-on portion of the ankle examination to look for specific injuries. The more common inversion mechanism produces injury to the lateral portion of the foot and ankle, including the distal fibula and the ligaments around the distal fibula, specifically the anterior and posterior talofibular ligaments and the calcaneofibular ligament as well as the proximal fifth metatarsal (Figs. 8 and 9). In addition, a fracture of the fibular physis (growth plate) is the most likely injury in the

Table 2. Important Questions to Ask of an Athlete Who Has an Ankle Injury

1. How did this injury happen?	
	Examiner should gain appreciation of the mechanism of injury, inversion, eversion, direct loading, often with the aid of patient demonstrating the uninjured ankle.
2. What happened after the injury?	
	Examiner should gain appreciation for the severity of injury. The ability to continue playing denotes a less serious injury than an injury that required assistance from the field and cessation of playing.
3. Have you injured this ankle before?	
	Examiner should gain insight into previous injuries and underlying predisposing injury patterns.

athlete who has inverted the ankle, has open growth plates, and experiences pain on palpation of the lateral ankle.

Figure 8. Palpation of the lateral ankle at the area of the anterior talofibular ligament (ATFL). This is the most common site of pain in the athlete who has had closure of the distal fibular physis. This closure generally occurs by age 13 years in girls and 15 years in boys, but depends on sexual and skeletal development rather than chronologic age. Pain and swelling at this site are suggestive of an injury to the ATFL, otherwise known as a "sprain." Such injuries are graded on a scale of 1 to 3, depending on severity. The line across the distal fibula in the photo is that of the distal fibular physis. Pain on palpation of this location is diagnostic for a distal fibular physeal fracture.

Figure 9. Palpation of the proximal fifth metatarsal. This site can be injured during an inversion injury. The examiner must palpate the proximal fifth metatarsal in any inversion injury. If pain and swelling are present, radiographs of the foot should be obtained to rule out a fifth metatarsal fracture.

Further Studies

Radiographs of the ankle and possibly of the foot are indicated in any suspected bony injury. Bony injury usually is accompanied by swelling and pain. Ankle views should include anteroposterior (AP), lateral, and mortise views of the ankle, which provide a complete assessment of the bony architecture (Figs. 10 and 11). In the case of a suspected lateral foot injury to the fifth metatarsal, AP, lateral, and oblique views of the foot are indicated.

Prevention

If there is no bone-specific tenderness and the athlete can walk without much of a limp, the pediatrician can suggest exercises as a precursor or possible alternative to physical therapy. The premise is that the initial regimen of RICE (Rest, Ice, Compression, Elevation) is helpful for the first 48 hours after injury. The process of ankle mobilization can proceed after that time. The initial step is to start the ankle moving (tracing the alphabet with the first toe is a good start), after which progressive strengthening can proceed. The following exercises can enhance strength and can be learned easily in the pediatric office.

An elastic band is used to strengthen the muscles gradually as they flex against resistance (Figs. 12 and 13). These exercises are done in three sets of 15 repetitions daily for a 6-week period. After 6 weeks, the exercises usually can be discontinued. If the ankle injury persists for more than a few weeks and if radiographs are negative

Figure 10. Normal mortise view of skeletally immature ankle. This view is taken with the ankle plantar flexed and the foot rotated inwards, thus exposing the spatial relationship around the talotibial and talofibular joints in the ankle. Alteration of these spaces, which should be equal, as shown in this radiograph, suggests ligamentous instability in the ankle.

and there is no bone-specific tenderness, referral to a physical therapist is indicated.

The prevention of ankle injuries is especially important in any young athlete who has suffered a previous ankle injury. Multiple studies have demonstrated that the most common cause of an ankle injury is the existence of a previous ankle injury. The prevention of an ankle injury involves the implementation of programs designed to strengthen the muscles around the ankle, including the peroneus muscle groups on the lateral aspect of the lower leg and the tibialis posterior muscle on the medial aspect

Figure 11. Mortise view of the ankle in a skeletally immature patient who suffered an eversion injury. In this case, there is subtle widening and pain at the medial ankle in the area of the distal tibial physis, consistent with a growth plate fracture of the medial malleolus. The arrow points to the site of subtle widening on the radiograph, which also correlates to the site of the patient's pain. This patient should be referred for additional treatment.

of the leg. The same exercises used to strengthen the injured ankle are useful in preventive strengthening.

Safe Return to Sports

The safe return to sports following an injury is a complicated and important decision made by thousands of pediatricians daily. The decision can include medical issues, such as the safe return after a concussion or acute asthma attack, and orthopedic issues, such as the safe return after an ankle, knee, or shoulder injury. In all cases, the question must be asked: "Does the return of this athlete to sports put him or her at greater risk for additional complication?" The answer always should be "no."

Important questions to ask in the case of nonorthopedic conditions are:

1. Have all medical considerations been addressed (eg, is there an inhaler on the sideline for an athlete who has asthma)?

Figure 12. Elastic band strengthening exercises with the band positioned along the lateral ankle and the foot flexed to 90 degrees is a good approach to starting the process of increasing lateral strength in the ankle. Over a 4-week period, this type of lateral strengthening can increase the baseline strength in the ankle, reducing the risk of additional injury. Such exercises also can be helpful with acute injury. For moderate-to-severe injuries, it is best to refer the patient to physical therapy for an individualized program.

2. Is there a system in place to report symptoms if they recur?

3. Are the athlete and his or her family aware of the importance of reporting early symptoms (eg, dizziness with an injury can mean a concussion)?

Helpful questions for orthopedic injuries and safe return to sports include:

1. Is there any limitation of normal athletic function with the injury? If so, the athlete should be held until this limitation resolves (eg, the soccer player who has shin pain that limits his or her ability to run or the gymnast who has back pain that limits his or her ability to bend backwards).

2. Is there any ongoing swelling or loss of motion in an affected joint? If so, this injury may require additional evaluation before clearance.

3. Has the proper preventive strategy been employed? Prevention can include ankle strengthening for ankle injuries, shoulder strengthening for shoulder injuries, and back strengthening for back injuries. In each case, has the athlete learned preventive strengthening, often through the assistance of a certified athletic trainer or physical therapist, to reduce the likelihood of reinjury?

Figure 13. Medial strengthening of the ankle. As with lateral strengthening of the peroneal muscles, medial strengthening of the tibialis posterior muscles aids greatly in the prevention of additional injury.

Reference

1. McCrory P, Johnston K, Meeuwisse W, et al. Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004. *Clin J Sport Med*. 2005;15:48–55

Recommended Reading

The Pediatric Clinics of North America, June and August, 2002. Both editions are dedicated to pediatric sports medicine and are very helpful.

Pediatric Annals, 2000;29(3) and 2002;31(1). The first number is orthopedic-focused and the second is focused on medical sports issues (ie, concussion).

American Academy of Pediatrics. *Care of the Young Athlete*. Elk Grove, Ill: American Academy of Pediatrics; 2002, 2008 (in press). This book is very helpful and comprehensive.

Sports Medicine: The School-aged Athlete. Philadelphia, Pa: Saunders; 1997. An excellent resource for the office that is orthopedic-focused and covers most adolescent sports injuries.

Sports Medicine in the Pediatric Office: Multimedia Text with DVD Companion. Elk Grove Village, Ill: American Academy of Pediatrics; 2007. This comprehensive book uses both written material and DVD/video technology to teach musculoskeletal skill examination technique.

PIR Quiz

Quiz also available online at www.pedsinreview.org.

1. Which of the following statements about current understanding and management of head injury is true?

   A. A history of previous concussion is irrelevant to the management of a present concussion.
   B. A sequential, functional progression of activity is a critical aspect of the management of concussion.
   C. Grade of concussion is the most significant factor in planning management.
   D. In the recovery from concussion, symptoms that recur with exercise can be ignored.
   E. The role of the athletic trainer ceases when a concussion victim consults a physician.

2. The management of a suspected cervical spine injury in an athlete who is lying prone on the field can include all of the following *except*:

   A. Assessment of breathing.
   B. Assessment of circulation.
   C. Removal of the face mask.
   D. Removal of the helmet.
   E. Use of the log roll to bring the athlete to a supine position.

3. In the United States, a cervical spine injury is *most* likely to occur in which of the following sports?

   A. Basketball.
   B. Football.
   C. Lacrosse.
   D. Soccer.
   E. Wrestling.

4. Of the following, the *most* common reason for an ankle injury in an athlete is:

   A. Flat feet.
   B. Improper shoes.
   C. Incorrect training methods.
   D. Participation in a contact sport.
   E. Presence of a previous ankle injury.

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