



7 SAFETY AND INJURIES

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O B J E C T I V E S

After reading the chapter, you should be able to do the following:

- Describe the risks associated with a physically active lifestyle
- Describe how to reduce one's risk of injury
- Discuss common injuries
- Discuss the general injury-treatment principles of P.R.I.C.E.
- Recognize the common signs and symptoms for heat- and cold-related injuries, as well as the methods to treat and to prevent them

A physically active lifestyle is critical to maximizing an individual's level of wellness. The benefits of regular exercise coupled with recreational activities are well known and proven. However, there are risks as well. Increased physical activity raises the possibility of injury, usually because of overexertion or a failure to follow safety guidelines. Though these injuries vary in severity, they almost always result in a reduction of physical activity for a time, and often prevent individuals from pursuing their preferred recreational and exercise regimens. Fortunately, almost all these injuries can be prevented or have their risk minimized by adhering to a few basic precautions. If an injury occurs, first aid and other treatments should begin at once to assist in the healing process.

–NOTES–**FOOT CARE**

Your feet are very important, especially with respect to any basic fitness program. You should take special care of your feet, and the best way to start is to give yourself (or have a professional do it) a pedicure regularly.



A pumice stone is useful for removing dry, rough skin from your feet.

The first step is to wash your feet thoroughly with soap and water. Then soak your feet in warm water for five to ten minutes. You may add oils or other ointments to the water if you desire.

The second step is to use a pumice stone to remove any dry, rough skin from your feet. Be careful here. You only need to rub lightly. If you have thick calluses, do not try to remove them in one session. It will take several sessions to remove them safely. Pay special attention to the heels and big toes, where the majority of dry skin develops.

You should trim your nails accordingly. Be careful to cut straight across the nail, especially if you are prone to ingrown toenails. Your nails should be filed to a smooth edge with an emery board. Your toenails

should be cut fairly short because you do not want your nails hitting the end of your shoes, which possibly could result in black nails.

Complete your pedicure by pushing back any excessive cuticle growth. Then, apply lotion to your feet to moisten the skin. Often you will need to cover your feet with cotton socks, not synthetic ones, as you want the moisture to stay on your skin.

CAUSES AND PREVENTION OF INJURIES

Each year thousands of Americans injure themselves, often unnecessarily, while exercising. The majority of these injuries result when individuals simply do too much too soon; that is, they fail to follow the 10 percent rule of progression while exercising, as discussed in Chapter 4. New or more-intense exercise regimens make increased demands on the body, and care must be taken not to overtax an individual's current state of physical fitness. Though exercise programs are designed to increase, not just maintain, one's current capabilities, a series of modest, successive, and graduated fit-

ness goals spread out over a period of time are much more likely to be realized than expecting to be at peak performance levels literally overnight. The human body simply cannot adapt fast enough to accommodate the stresses of this increased physical activity, and injury will occur. Taking things slowly is a must.

Additionally, many injuries result from improper or poor technique while exercising and/or not wearing appropriate apparel or gear. Proper technique and apparel are critical in any exercise regimen, both to maximize the effectiveness of the exercise and to reduce injury. Information on these is readily available from physicians and other fitness professionals, either in print or through personal contact. Lastly, performing a proper warm-up before a workout and a cool-down afterwards dramatically reduces the risk of injury from exercise.

INJURY RECOGNITION AND TREATMENT

Mild to moderate muscle soreness is common following certain types of physical activity and presents little danger to the individual. However, a sharp, shooting pain in or around a joint may indicate a serious injury. Other symptoms indicative of injury are swelling, deformity, redness, or increased temperature around a joint, and pain that lasts longer than two days. If any of these symptoms are present, appropriate first aid measures should ensue, and medical attention may be necessary.

The immediate goal of treating most exercise-related injuries is to control swelling, as swelling significantly increases the amount of time needed to recover from an injury.¹ A simple strategy to follow when treating an injury is the P.R.I.C.E. principle—Protect, Rest, Ice, Compression, Elevation.

PROTECT. The first thing to do is to protect the person from further injury. Doing so helps tissues in the area to relax, facilitating healing, while doing no further harm.

REST. The initial stages of healing can be delayed if damaged tissues or joints continue to be stressed, so rest is paramount. It is not necessary to be inactive completely, however. Injuries should be rested relative to normal

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The P.R.I.C.E. principle—Protect, Rest, Ice, Compression, and Elevation—is a simple strategy for treating common exercise injuries.

PAIN RELIEVER OR ANTI-INFLAMMATORY - WHICH ONE IS APPROPRIATE? - ROBERT RYAN, MA, ATC

Analgesics relieve pain, anti-inflammatory medications reduce inflammation, and antipyretics reduce fever. Acetaminophen and NSAIDs (Non-steroidal Anti-inflammatory Drugs) are proven over-the-counter (OTC) medications. Depending on your body chemistry, one may work better for you than another, and here are some examples.

Acetaminophen (Tylenol, APAP, paracetamol) – analgesic, antipyretic

NSAIDs – analgesic, anti-inflammatory, antipyretic

Acetylsalicylic Acid (Aspirin) – most effective but has the most adverse side effects

Ibuprofen (Advil, Motrin)

Naproxen sodium (Aleve)

Ketoprofen (Orudis)

What do you take if you have a headache? If the headache is not associated with a concussion, any analgesic should help. If it is associated with a possible concussion and an analgesic is needed, take acetaminophen since it has no effect on the body's blood-clotting mechanism. If the headache is associated with alcohol consumption, any analgesic, except acetaminophen, may help. Combining acetaminophen with alcohol has been linked to liver damage, if not failure. Also, drinking several glasses of water should be helpful; one component of an alcohol-induced hangover is dehydration.

What do you take if you just sprained your ankle? There is evidence that taking an anti-inflammatory immediately after an acute injury may result in inhibiting the inflammatory process. Inhibiting the inflammatory process at this point may result in a longer healing time. If you have just suffered an acute injury and the pain is unmanageable, take acetaminophen for the first 48-72 hours.

What should you take if you have the flu, you ache all over, and your temperature is 100.5°F degrees (Note: 98.6°F is normal)? Take any antipyretic except aspirin. Taking aspirin when suffering from a viral infection has been linked to the development of Reye's Syndrome. Be sure to follow the directions on the package.

Source: Paoloni JA, Orchard JW. The use of therapeutic medications for soft-tissue injuries in sports medicine. Med J Aust 2005; 183: 384-388.



Minor injuries should be treated with the P.R.I.C.E. principle and monitored for improvement over a few days.

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activity levels for approximately 72 hours before a rehabilitation program begins.²

ICE. Ice should be applied for 30 minutes immediately after an injury occurs, beginning no later than 20-30 minutes following the injury, to limit swelling and control pain and muscle spasms. Ice should continue to be used for 30 minutes every 2 to 3 hours for at least the first 72 hours after an injury.

COMPRESSION. Applying a compression wrap to an injury helps control swelling by limiting the space for fluids to accumulate, and helps spread the swelling over a larger area so the body can absorb it more efficiently. An elastic wrap should be applied continuously for the first 72 hours, beginning distally and wrapping proximally.

ELEVATION. Elevating an injured body part above the heart will allow gravity to aid in the reduction of swelling. Elevation facilitates the flow of fluids back to the central circulatory system for disposal.

TYPES OF INJURIES

The injuries resulting from physical activity are usually musculoskeletal in nature and include fractures, dislocations, sprains, and strains. These injuries are either chronic or acute. Chronic injuries occur over a long period of time, usually from overuse. Acute injuries happen suddenly, and can range from being very mild to severe. The American Red Cross³ lists the common signs and symptoms of musculoskeletal injuries as follows:

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- *Pain*
- *Swelling*
- *Deformity*
- *Discoloration of the skin*
- *Inability to use the affected part normally*
- *Loss of sensation in the affected part*

COMMON INJURIES

MUSCLE SORENESS. Muscle soreness either can be acute or have a delayed onset. Acute muscle soreness is the uncomfortable “burning” feeling you experience when walking very fast up a steep grade, and it usually disappears within a few minutes after you top the hill. Delayed onset muscle soreness (DOMS) is soreness that develops 24 to 48 hours after exercise, characterized by an achy or stiff feeling in the muscles. DOMS is caused by microscopic tears in the muscle, not lactic acid as is commonly believed, and will usually dissipate within a few days. You can reduce muscle soreness by simply progressing with exercise slowly and avoiding doing too much too soon.



Placing a doughnut pad around a blister is helpful to reduce future irritation.

BLISTERS. Blisters are a raised area of skin, usually filled with water or blood, and are caused by friction or pressure. Blisters are common in individuals who are beginners and are often associated with “breaking in” a new pair of shoes. (Note: It is always a good idea to wear a new pair of shoes for an hour or two while performing light activities such as simply walking around your house before you go out and exercise in them.) The best thing to do to prevent blisters from occurring in the first place is to wear properly fitting shoes and socks. Socks made from synthetic materials are usually better at preventing blisters because they help wick moisture away from your feet. To treat a blister, Arnheim and Prentice recommend:¹

1. *Leaving the blister intact for the first twenty-four hours.*
2. *Making a small incision (i.e., $\frac{1}{4}$ inch) with a sterile instrument along the periphery of the raised tissue to drain the fluid.*
3. *Cleaning the area with an antiseptic and cover with an antibiotic ointment.*
4. *Placing a doughnut pad around the dressed blister to avoid future irritation.*
5. *Monitoring the blistered area daily for signs of infection (e.g., redness).*

Blisters can be a real problem. Do not underestimate the seriousness of blisters and ignore them. You should take care to prevent blisters. The main cause of blisters is poorly fitting shoes, so when you try on a pair of shoes,

make sure they fit your feet properly. Do not think that they will “break in” and not cause problems. Your shoes should be comfortable from day one. If they are not, do not buy them.

TENDONITIS AND BURSITIS. The inflammation of a tendon, called tendonitis, is one of the more common types of chronic injuries. Tendons connect muscles to bones and are often irritated and inflamed with increased levels of physical activity, especially through overuse. Bursitis is the inflammation of a bursa, a fluid filled sac that helps reduce friction in sites where muscles, tendons, or ligaments pass over bones. Tendonitis and bursitis are common overuse injuries. The P.R.I.C.E. principle is the treatment of choice for these overuse injuries. These types of injuries generally will heal quickly if you back off with your intensity.

STRAINS AND SPRAINS. Strains and sprains are common acute injuries. Strains are the tearing of a muscle or tendon. Sprains are the result of damage to a ligament, the tissues that connect bones together. First aid treatment for these injuries includes the P.R.I.C.E. principle. If these injuries are minor, returning to full activity can happen usually within a few days with rest and ice. However, more serious injuries may require medical treatment. So if the injury does not improve after a few days of using the P.R.I.C.E. principle, see a physician.

SHIN SPLINTS. The term “shin splints” refers to pain in the front or inside portions of the lower leg. Signs and symptoms of shin splints include pain in the lower legs with weight-bearing activities and swelling and tenderness to the touch. Individuals who are overweight, in poor physical condition, and those starting a new exercise program are prone to shin splints. Excessive mileage when walking or running (especially on hard, unforgiving surfaces), wearing worn-out shoes, and lower-leg muscle imbalances can contribute to this problem. Treatment of shin splints primarily includes rest from weight-bearing activities and applying an ice massage to the irritated area. An anti-inflammatory (e.g., ibuprofen) may be taken to help reduce inflammation. Follow the recommendations on the package for the appropriate dosage. Also, stretching the calf muscles, making sure to isolate the gastrocnemius and the soleus, and strengthening exercises for the muscles on the front of the legs should be performed. If the pain does not improve in 7 to 10 days, you should see a physician to rule out the possibility of a stress fracture.

STRESS FRACTURES. Stress fractures, sometimes called march or fatigue fractures, are hairline breaks in the bone. Stress fractures may be caused by

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Stretching the muscles of the lower legs helps to prevent shin splints.

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a repetitive overload from a muscle contraction or excessive weight bearing activity such as walking or running, and they are rather commonplace today. Some 10 percent of all athletic injuries are stress fractures,² and they affect some 1 percent of the athletic population.³ The symptom for a stress fracture is straightforward: a rapid onset of localized pain to a bone. Often stress fractures occur in the bones of the lower extremities, especially the tibia (the large bone in the lower leg). Basically, if you begin to have localized pain after a marked increase in the duration or intensity of your exercise routine, then you may have a stress fracture. Often, the bone will be very painful if you simply push rather lightly on the area in question with your fingertips. If you suspect you have a stress fracture, you should consult your physician to rule out any serious problems. However, keep in mind that stress fractures usually take up to two to three weeks before they are visible on x-rays. (Note: For most stress fractures, the definitive diagnosis is your body's response to eight weeks of complete rest.)⁴ Advanced imaging techniques such as magnetic resonance imaging (MRI), computer tomography

(CT), and bone scintigraphy can aid in the diagnosis and help your physician determine the proper course of action. The main thing you want to avoid is to continue to train excessively on a stress fracture, especially if the suspected injury is in the femoral neck (upper leg bone by the hip), patella (knee cap), medial malleolus (inside ankle bone), or the small bones in the feet. Stress fractures in these areas are considered high risk because of their propensity to heal improperly, and special care is warranted. By all means, see a physician if you have localized pain in any of these areas.

The general treatment for stress fractures is recognizing and eliminating the predisposing risk factor. Generally, stress fractures originate from doing “too much too soon,” but other factors such as hormonal imbalances and malnutrition can hasten their development. Women who are amenorrheic or oligomenorrheic often have lower bone mineral density that can make them more susceptible to developing stress fractures.⁵ Often, stress fractures can be prevented by wearing properly fitting shoes (and shoes that are not worn out), varying training surfaces by avoiding only hard, unyielding surfaces, and progressing slowly with your training. Regardless of the cause, the predisposing factor needs to be eliminated, and care must be taken when exercise resumes. Remember, you want to exercise to be healthy, not injured.

PLANTAR FASCIITIS. The plantar fascia is an inelastic band running from your heel across the bottom of your foot that can become irritated, resulting in a condition known as plantar fasciitis. The primary symptom of plantar fasciitis is heel pain when you awake in the morning and first put your feet on the ground. The pain usually lessens after the tissues warm up, but can return after any lengthy period of sitting or resting. Plantar fasciitis is a serious injury. The fascia itself is damaged, and it takes some time to have it heal properly. The main cause for plantar fasciitis is overpronation coupled with a tight Achilles tendon and tight calf muscles. Often, individuals who have flat feet are prone to developing this problem. The treatment for plantar fasciitis involves rest for two to four weeks at a minimum, and avoiding sudden stress to the fascia when it is tight (e.g., stepping out of bed the first thing in the morning). Mildly stretching the plantar fascia before applying weight to the foot will decrease the stress that is placed on it. Simply flex your feet by moving your toes toward and away from your knees several times before standing. If you are bare footed, roll your feet over a tennis ball for about 30 seconds before you stand. You should incorporate the P.R.I.C.E. principle, taking care to ice the affected area for no less than 20 minutes three to four times a day. An easy way to ice your plantar fascia effectively is to fill a plastic soda pop bottle about three-fourths full of water and freeze it, then place the bottle on the ground and roll your foot over it while you are seated. Moreover, you should not walk barefooted, as that can put a lot of unnecessary stress on your plantar fascia. Modest stretching of the Achilles tendon and the calf muscles is important, but be careful not to place excessive tension on the plantar fascia. Consider cross-training activities such as cycling or swimming to maintain cardiovascular endurance. In all likelihood, you will need to see a physician or podiatrist to be fitted for orthoses if the condition does not go away after two to four weeks of active rest. Be very careful with this injury, as it can linger and become a chronic problem. It is important to treat the cause of this injury and not just the symptoms.

ILIOTIBIAL BAND FRICTION SYNDROME. Iliotibial (IT) band friction syndrome is an overuse injury that commonly manifests with pain on the outside of the knee. This occurs because at approximately 30° of knee flexion the IT band changes from being a knee extensor to a knee flexor. Ordinarily, this movement happens without mishap. However when someone has tight muscles in the hips and down the outsides of the legs, weak hip muscles, and/or poor running form, the repeated movement of the IT band over the lateral epicondyle of the femur as the knee flexes and extends leads to irritation.

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Being fitted for custom orthoses often helps to alleviate plantar fasciitis.

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Treatment for this condition includes the P.R.I.C.E. principle discussed previously. It may be necessary to take 2 – 3 days off, completely resting the area. When beginning to exercise again, consider adjusting your training routine. If workouts are typically performed on a treadmill, run outside. Vary the routes taken or cross train. It may also be necessary to use a foam roller or a tennis ball to help loosen tight muscles or to perform hip strengthening exercises, particularly strengthening the gluteus minimus, gluteus medius, and the hip external rotators. Last of all, gait analysis can help correct any problems associated with running form. This analysis may also indicate whether new shoes or orthotic inserts would be beneficial.

INGROWN TOENAILS. Ingrown toenails can be very painful and debilitating. They are caused mainly by poorly fitting shoes and how you cut your toenails. Ingrown toenails typically occur on the big toe and are characterized by red, swollen skin around the nail. They can become infected, resulting in a serious injury. To prevent ingrown toenails, simply cut your nails in a straight line so that they will not grow into the skin. It is very important not to have sharp edges, so file them down to where they are smooth. The treatment for ingrown toenails is best left to trained professionals. Go and see your physician or podiatrist if the nail begins to grow into the skin. Do not attempt to dig or cut it out by yourself. You run a great risk of developing a nasty infection if you do. Further, you could permanently damage your nail bed, thus leading to more problems.

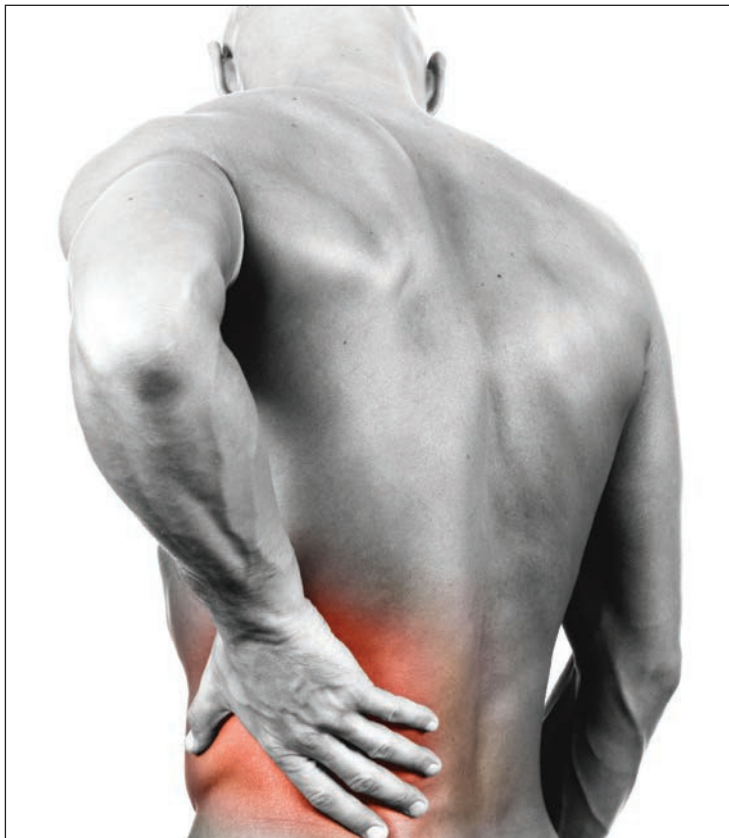
BLACK TOENAILS. When your toes repeatedly hit the end of your shoe while you are walking or running, the toes can bruise, causing blood to pool under the nails. The pressure on the nails causes them to be very painful, and they can even throb with each beat of the heart. Eventually, the blood turns black, hence the name. The major cause of this is poorly fitting shoes, which are too small. Remember, you want a solid thumb's width between your toes and the tip of the shoe. The treatment for black nails involves relieving the pressure built up beneath the nail. The easiest way to do this is to heat the straightened end of a paperclip to "red-hot" and burn a hole in the top of the nail. Be careful not to apply too much pressure. You do not want to poke through the nail into your nail bed. You simply want to make a hole in the nail where the blood can escape, thus reducing the pressure. The nail should be covered with an adhesive bandage for two to three days to prevent it from refilling. For this treatment to be effective, however, you need to do it within the first hour or so of the injury. Often the bruise under the nail is minimal, and these injuries should be left alone to heal naturally. Either way, in time your nail will grow out and fall off.

Do not worry, a new nail will grow back in a few months. Be sure to wear properly fitting shoes to reduce your risk of developing black nails.

SWOLLEN FINGERS AND HANDS. When you walk with your hands by your side and below your waist, your fingers and hands have a tendency to swell. This is not a major problem, but it can lead to some mild discomfort, especially if you wear rings on your fingers. To prevent your fingers and hands from swelling, use proper form with your arm swing. Keep your arms bent at a 90-degree angle, with your hands staying above your waist. It also is helpful to open and to close your hands periodically while you are walking, and occasionally, you should lift your hands and arms out in front of you, about shoulder height, and simply shake them for a few seconds.

LOW BACK PAIN. Low back pain is the leading complaint of pain today. Nearly 80 percent of the population will suffer from a severe episode of low back pain at some point in their lives. The main factors contributing to low back pain include weak abdominal muscles, tight hamstring and spinal

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Nearly 80 percent of the population will suffer from a severe episode of low-back pain at some point in their lives. A well-rounded fitness program that includes flexibility and strengthening exercises is recommended as prevention.

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muscles, poor posture, and obesity. To prevent low back pain, a well-rounded exercise program that includes both flexibility and strengthening exercises for the muscles in the back is recommended. Treatment of low back pain includes rest, ice, and modifying daily activities to reduce stress on the back. If symptoms persist for more than a few days, or if there is tingling or numbness in the legs and feet, medical attention is needed.

ATHLETE'S FOOT. Athlete's foot is caused by a fungus. Generally, a fungus infects your feet, typically appearing between the toes and on the soles of the feet. The fungal infection results in your feet itching and burning, often resulting in the skin becoming dry and flaky, which in turn, can cause the skin to crack and hurt. Moreover, the fungal infection can spread to the nails. The adage "an ounce of prevention is worth a pound of cure" is never more fitting than it is with respect to athlete's foot. It is essential to prevent athlete's foot, as the fungus can get out of hand very quickly and result in a persistent problem. The first step is to wear clean socks every time you exercise. Again, your socks should be made from synthetic materials, which allow your feet to breathe by wicking the moisture away from the skin so that it can evaporate. If you do happen to get a fungal infection, wash the affected area with soap and water and dry it completely. Be sure to dry in between your toes! Liberally apply an antifungal cream to the infected area as directed. The key here is to continue to apply the cream for several weeks after all symptoms of the fungal infection have disappeared. Remember, the fungus can be around for a very long time. It is important to get a fungicidal spray to treat the interior part of your shoes as well. If the fungal infection returns, which happens quite often, apply a different brand of fungicidal cream, as the fungus may have mutated and become tolerant to your old brand. Again, it may be necessary to use the cream up to several weeks after all signs of the infection are gone. It is always better to be safe than sorry with respect to athlete's foot. Lastly, be sure to clean your bed linens regularly so as not to get reinfected from your bed linens. In the end, try to keep your feet clean and dry to prevent the infections from ever beginning.

CONCUSSIONS. Many believe concussions only happen in high-risk sports such as football, lacrosse, and ice hockey. It is important to note that many recreational activities have a risk for suffering a concussion as well, including skiing, snowboarding, and cycling, essentially sports where wrecks can happen at high speeds.

Concussion has been defined in a number of different ways. One of the simplest is listed in the *NCAA Sports Medicine Handbook* as "a complex pathophysiologi-

cal process affecting the brain, induced by traumatic biomechanical forces.” Signs and symptoms of a concussion fall under four categories: physical, cognitive, emotional, and sleep. Physical signs and symptoms include headache, nausea, vomiting, photophobia, and balance problems, while cognitive issues would include the inability to concentrate, confusion about recent events, and memory loss. Individuals acting differently than normal (angry or sad) are common emotional signs and symptoms, whereas drowsiness, the inability to sleep or feeling excessively tired are sleep-related signs and symptoms.

Regardless of the signs and symptoms the individual is experiencing, it is crucial that this condition be taken seriously. If you have suffered a head injury, even a very minor one, and any of the above signs and symptoms are manifest, seek medical attention. The diagnosis of a concussion is multifaceted – the initial evaluation will include a medical provider using neurological and mental status examinations, as well as neurocognitive testing to assess memory function. If a brain bleed or a skull fracture is suspected, an MRI or CT scan also may be ordered. The clinical manifestation (i.e., how you are acting and feeling) plays a major role in determining the extent of the injury as well. Honesty is crucial.

Management of a concussion should happen under the direction of a medical provider. Modifications should be made to physical and mental activities. Complete rest from physical activity is necessary until all symptoms have subsided. It also may be necessary to avoid watching television, working on a computer, and reading, as these activities tax the healing brain. Once symptoms subside, activities should be added back gradually over a period of several days, making sure that symptoms do not return prior to progressing to a more intense activity. The significance of this injury cannot be overstated.

Minor injuries are often overlooked and if left unattended, can result in even more serious problems. Pain in a joint or pain localized over a tendon or ligament is your body’s way of communicating to you that something is wrong. Even minor pain should be taken seriously and treated with the P.R.I.C.E. principle that was outlined earlier. If pain continues for several days, see a physician.

EXERCISE AND THE ENVIRONMENT

Exercise can be very difficult in certain environmental conditions. Humans can adapt and handle these conditions, but specific precautions must be taken so that serious injury can be avoided.

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–NOTES–**HEAT INJURIES**

The body uses several mechanisms to maintain its normal temperature when exercising. As the body temperature rises, sweating occurs, and the blood vessels in the skin dilate to dissipate the heat. Exercising in humid environments can be especially dangerous, as sweat accumulates on the skin and does not evaporate as quickly as it does in less-humid conditions. If the heat is not dissipated, heat illness may result. The three most common types of heat illness are heat cramps, heat exhaustion, and heat stroke.

HEAT CRAMPS. Heat cramps are forceful, involuntary muscular contractions. These muscle spasms are usually seen during periods of intense physical activity, and may be caused by a loss of body fluid and an imbalance of electrolytes (e.g., sodium and potassium). Individuals suffering from heat cramps should immediately stop exercising, find a shaded area to rest, and drink fluids (e.g., water, sports drink). In addition, gentle stretching of the muscle and application of ice may help alleviate the cramps. If symptoms persist for more than 20 to 30 minutes or increase in severity, medical attention is warranted.

STUDY TIP:

If the heat generated by the body during exercise is not dissipated, heat cramps, heat exhaustion, or heat stroke may result.

HEAT EXHAUSTION. Heat exhaustion is the most common form of heat-related illness and simply is the initial stage of the body's thermoregulation system beginning to falter.³ Signs and symptoms of heat exhaustion include fatigue, dizziness, moist and clammy skin, nausea, and increased breathing and heart rate.⁴ The treatment for heat exhaustion involves the following:⁵

1. *Stop any physical activity.*
2. *Get to a cool, shaded area, and loosen or remove any tight-fitting clothing.*
3. *Lie down on the back and elevate the feet and legs about 12 inches off the ground.*
4. *Seek immediate medical attention if a full recovery does not occur within 30 minutes.*

HEAT STROKE. Heat stroke is a condition wherein the body's thermoregulatory system has shut down. This condition is far more serious than heat exhaustion. The body is no longer able to cool itself, and the core temperature can rise to very dangerous levels. Heat stroke usually occurs when temperatures are in excess of 95° Fahrenheit, but can occur with lower temperatures and conditions of high humidity.⁶ The signs and symptoms of heat stroke include red, hot, and dry skin, nausea, vomiting, dizziness, and confusion. Often, individuals stop sweating during heat stroke, and some even lose consciousness.⁷ If heat stroke is suspected, medical care should be sought immediately! The individual should be moved to a cool, shaded area, and ice and cold, wet towels should be applied to the body, particularly the head, arm pits, and groin, to decrease the temperature.

PREVENTING HEAT-RELATED INJURIES. Heat-related injuries, for the most part, are easily preventable because they follow an established pattern of signs and symptoms, progressing from mild to severe. However, many individuals who suffer from a severe heat-related injury ignore the early signs and continue to engage in physical activity, which, in turn, allows the condition to worsen and become quite severe.

A number of strategies can be utilized to help reduce the risk of a heat-related illness. When temperatures are high, and especially if humidity is also high, exercise should occur in the morning and later in the evening, when temperatures are generally lower. Clothing should be minimal, lightweight, light in color (e.g., white), and made from materials that allow for perspiration to be evaporated and pulled from the skin (e.g., polypropylene). Lastly, liquids (e.g., water, sports drinks) should be ingested before, during, and after exercise to keep an individual properly hydrated. If an individual is going to be extremely active for several hours in a high-temperature environment, a sports drink containing electrolytes should be ingested to avoid hyponatremia, also known as “water intoxication.” Hyponatremia develops because of low sodium concentrations in the blood, and can be fatal. However, an individual would have to exercise excessively for several hours while drinking several quarts of nothing but plain water for the con-

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Staying adequately hydrated during exercise can help reduce the risk of heat-related illnesses. Water should be ingested before, during, and after exercise in hot, humid conditions.



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dition to develop. To maintain proper hydration levels, the American College of Sports Medicine⁸ recommends the following:

1. *Consume a nutritionally balanced diet and maintain normal hydration in the 24 hours before activity.*
2. *Drink about 500 ml of fluid (~17 oz.) in the two hours before activity (up to 300 ml should be drunk directly before exercise).*
3. *Drink enough fluids, preferably cool (~50° Fahrenheit), during exercise to equal the amount of fluid lost from sweating.*

Additionally, fluids should be ingested at a steady rate during exercise. Research indicates that drinking small amounts of fluid (i.e., ~3 oz.) at 5-minute intervals helps reduce the harmful effects of dehydration.⁹⁻¹⁰ However, no more than 32 ounces of fluid should be drunk in an hour. If activities are going to last several hours, a sports drink (e.g., Gatorade) should be drunk to avoid hyponatremia.

COLD INJURIES

Frostnip and frostbite are two conditions that may occur when skin and body tissues are exposed to extremely cold temperatures. These conditions are easily prevented, but can be very serious once they develop.

Frostnip involves the freezing of the outer layers of the skin, and is not as serious as frostbite. Early signs and symptoms of frostnip include white- or yellowish-colored skin, tingling, numbness, or an aching sensation over the exposed area. Early recognition and treatment of frostnip are important so the condition does not progress to frostbite.

Frostbite is a more serious condition involving the freezing of the underlying body tissues (e.g., muscle). Skin temperatures must range between 28-21° Fahrenheit for tissue freezing to occur.⁵ Signs and symptoms of frostbite include pain; pale, waxy skin; and a loss of sensation in the affected area.

Immediate treatment for frostnip and frostbite must be given. The National Safety Council⁴ suggests immediate medical attention. If medical help is not nearby, then slow rewarming of the area must occur. To rewarm the area properly, follow these recommendations:

1. *Remove wet clothing and items such as rings that can limit circulation.*
2. *Soak the affected area in warm water (102-106° Fahrenheit) for 20 to 40 minutes. (Be careful not to let the affected area touch the sides of the water container.)*

3. *Treat the ears and face with warm, moist towels.*
4. *Do not thaw areas that have a chance of refreezing before an individual can be taken to a hospital. It is better to leave the body part as is than to have the tissues thawed and refrozen.*
5. *DO NOT rub the affected area. Rubbing can cause further tissue damage.*

HYPOTHERMIA. Hypothermia occurs when the core body temperature falls to dangerously low levels (e.g., below 95° Fahrenheit). Temperatures do not have to be below 32° Fahrenheit for an individual to become hypothermic. Cold water or windy conditions can increase the risk of this condition (e.g., 40° Fahrenheit combined with a 20 mph wind results in a wind-chill temperature of 18° Fahrenheit). Signs and symptoms of hypothermia include decreased body temperature, an altered level of consciousness, shivering, and an irregular heart rate. If someone exhibits these signs and symptoms, the following steps should be taken:

1. *Warm the body gradually by moving the person to a warm environment.*
2. *Remove wet clothing, and wrap the person in a blanket or sleeping bag.*
3. *Active the EMS system immediately if an individual is disoriented or has an irregular heart rate.*
4. *DO NOT place the individual in a hot tub or whirlpool to warm the body, as this could cause severe abnormalities in the heart rate and even cause a heart attack.*



Frostnip and frostbite result when skin and body tissues are exposed to extremely cold temperatures.

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PREVENTING COLD-RELATED INJURIES. The following strategies can be used to prevent cold-related injuries.

1. *Stay properly hydrated and drink fluids before exercising outside.*
2. *Dress appropriately for the weather by wearing layers—a wicking material close to the skin (e.g., polypropylene), tight-woven materials (e.g., wool) as an insulation layer, and a wind- and waterproof outer shell.*
3. *Cover the head to prevent excessive heat loss.*
4. *Keep the extremities (e.g., fingers) from being exposed in extremely cold temperatures by wearing gloves or mittens.*

SUMMARY

Each year, thousands of injuries occur. Usually, these injuries result from individuals doing too much too soon and not following the principle of graduated progression in their physical activities. Injuries are either acute or chronic, and should be treated with the P.R.I.C.E. principle—protect, rest, ice, compression, elevation. Additionally, environmental factors can make exercise dangerous. Adequate apparel, proper technique, and appropriate fluid consumption are critical in minimizing the risk of injury while exercising.

CHECK YOUR UNDERSTANDING**REVIEW QUESTIONS**

1. What are the risks associated with a physically active lifestyle?
2. How can one reduce one's risk of injury?
3. What are the most common types of injuries?
4. What is the P.R.I.C.E. principle?
5. What are the common signs and symptoms of musculoskeletal, heat, and cold injuries?
6. How are heat-related injuries treated?
7. How are cold-related injuries treated?

RELATED WEBSITES

American College of Sports Medicine
www.acsm.org

American Red Cross
www.redcross.org

Medline Plus
www.nlm.nih.gov/medlineplus/sportsinjuries.html

National Athletic Trainers' Association
www.nata.org

National Safety Council
www.nsc.org

American Podiatric Medical Association
www.apma.org

Canadian Podiatric Medical Association
www.podiatrycanada.org

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