



Injury Prevention: Just the Facts

Musculoskeletal Injuries

FACT SHEET 12-011-0417

What are musculoskeletal (MSK) injuries?

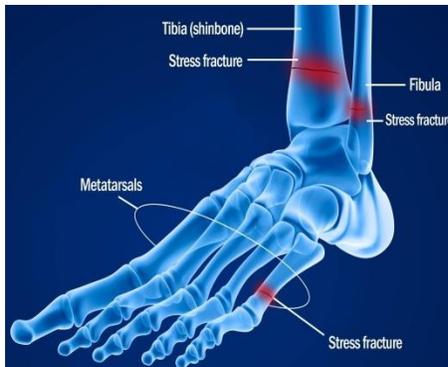
Musculoskeletal (MSK) injuries occur when energy (physical stress) applied to bones, muscles, tendons, joints, ligaments, cartilage, or associated tissues exceeds the capacity for normal tissue function. This can result in trauma to the MSK tissues all at once or as less obvious “micro-traumas” that accumulate over a period of time.¹⁻⁴

Traumatic (Acute) injuries occur instantaneously from a high intensity force or abrupt movement such as from a fall, a blow to the body, an awkward twist when lifting, or a sharp pivot. Traumatic MSK injuries include fractures, dislocations, sprains, and strains.¹⁻⁴ (See next page).

Overuse (Cumulative Micro-trauma) injuries occur over several minutes, hours, weeks, or months from a repeated, low intensity force. Tissue damage occurs as the stress overwhelms the

tissue’s normal ability to recover. Pain is usually the first symptom and can start suddenly or gradually.

Stress fractures, medial tibial stress syndrome (aka “shin splints”), Achilles tendinitis, bursitis, back pain, and carpal tunnel syndrome are examples of common overuse injuries.¹⁻⁹ (See next page). When these injuries are due to job-related activities they may be referred to as occupational or ergonomic-related MSK disorders.³



MSK injuries may be exacerbated by individual or external factors and result in **long term effects that can cause the injury to recur, become chronic, or be permanently disabling**. For example, an acute knee sprain can result in later chronic pain, or even traumatic arthritis. These long term effects continue to degrade the physical and mental health status of Army Soldiers and contribute to some of the highest military medical costs.⁷⁻¹²

Why are MSK injuries important to the Army?

MSK injuries among Active Duty Soldiers result in over 10 million limited duty days (LDD) each year and account for over 70% of the medically non-deployable population.⁹ Most MSK injuries are to the lower extremities (body region at or below the knee) and are from overuse.⁴⁻⁸ Military training-related MSK injuries have been called “the single most significant medical impediment to military readiness.”¹⁰⁻¹² MSK injuries and their long-term effects are also a leading cause for medical disability and discharge.¹⁰⁻¹²

Serious MSK injuries can require hospitalization but most (including those requiring surgery) are treated through outpatient visits, physical therapy, and restricted activity. For example, a fractured foot is estimated to result in *120 days of lost duty*, and a serious ankle sprain can take up to *90 days to fully recover*.⁴

What causes military MSK injuries?

Traumatic MSK injuries in the Active Duty Army are most frequently attributed to **falls**[‡], **sports**, **motor vehicle**[‡] and **motorcycle**[‡] accidents, and **parachuting**[‡] as well as strains/sprains from handling equipment.⁴ Fall-related injuries are caused by walking on icy, slippery, or uneven surfaces, getting in and out of vehicles, improper parachute landings, and sports (e.g., basketball[‡], snowboarding or skiing).¹³ Sports (e.g., basketball, football) are also a leading cause of medical evacuations during deployment. Some of these injuries can be prevented with better equipment and others with proper technique and training.^{6†} † see separate APHC Injury Prevention Factsheets on these topics

Overuse MSK injuries in lower limbs (foot, ankle, lower leg, knee) are the most common types of injuries in the military.^{7,8,14,15} These are attributed primarily to **running** and **foot marching** long distances with heavy loads.^{15, 16} Marching with loads and **routinely lifting heavy objects on the job** are also associated with lower limb injuries and pain in the lower back. Pain in tendons (tendonitis) and joints are most common. Stress fractures are costly injuries that occur especially during basic training.⁶

What factors increase risk of MSK injuries?

Those who are **less fit** (e.g., low fitness test scores) are especially at risk **when starting a new strenuous training activity** or restarting a routine after a rest period (this is why initial entry trainees are at high risk).^{1,8,10,14} Though **female** Soldiers have higher risk of stress fractures and higher overall MSK injury rates, they have also tended to be less fit.^{12,14} **Smoking** has been shown to increase injury risk, plausibly because it slows bone and other tissue healing.¹⁴ While evidence shows that a **high body-mass index (BMI)** increases injury risk, Soldiers with extremely **low BMI** may also be at higher risk especially if they are not very fit.¹⁴ Both Soldiers who are **extremely flexible** and those who are **not flexible** have increased injury risk.¹⁴ Data is currently less robust regarding injury risks attributed to age, rank, or military occupation.¹⁷

How can you prevent MSK injuries?

- **Acclimate to physical training:** increase the body’s resilience to physical stressors by *gradually* building up training regimens (running, lifting, marches with heavy loads) –e.g., follow 10%/week intensity increase rule¹⁵
- **Use recommended safety equipment:** seatbelts in cars; helmets approved for motorcycling or skiing/snowboarding; mouthguards[‡] for football and combatives; ankle braces for basketball especially after having a serious ankle sprain
- **Follow safety protocols:** don’t speed; use correct lifting techniques; use 3-points of contact when climbing; use harnesses when working at heights
- **Live a healthy lifestyle:** exercise and get proper sleep, nutrition; avoid drugs, alcohol, and smoking
- **Participate in a balanced fitness program:** aerobic, muscle strength, endurance, agility, & balance activities
- **Stop activity if pain develops,** visit your doctor and do not return to activity until medically advised to do so

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What are common MSK injuries and how can they be prevented?[‡]

Injury	Description	Examples and Prevention Evaluation
Fracture	<p>A break in a bone or cartilage.</p> <p>Traumatic acute fractures OR overuse stress fractures; Fracture may increase long term risk of traumatic arthritis.</p> <p><i>Fracture classifications include:</i></p> <ul style="list-style-type: none"> - Closed (skin intact) vs open (bone exposed through skin) - Complete or incomplete (“green stick”) which do not go all way through bone - Single or multiple bones 	<p>Wrist: slipping on ice, falling on outstretched arm</p> <ul style="list-style-type: none"> - Review ice warnings and removal procedures <p>Ankle: improper land during parachute jump</p> <ul style="list-style-type: none"> - Review training techniques; use ankle brace <p>Stress fractures of Foot, Lower Leg, Hip, Pelvis</p> <ul style="list-style-type: none"> - Review training program; ensure increases are gradual/progressive - Avoid excessive multiple load bearing activities that stress legs (e.g., running AND road marching)
Dislocation	<p>The displacement of a bone from a joint (aka “subluxation”).</p> <p>Traumatic acute injury; but can become a recurrent injury.</p> <p>Most common in finger/thumb, shoulder, or hip.</p>	<p>Shoulder: lifting excessive weight</p> <ul style="list-style-type: none"> - Use certified trainer/coach to evaluate weight training exercise program and instruct/supervise to ensure proper occupational lift types and loads
Sprain	<p>Stretch or tear of one or more ligaments (the tough bands of tissue that connect two bones in a joint to provide joint stability).</p> <p>Traumatic acute injury that results from a single incident. At time of injury, one may hear a “pop” in the joint.</p> <p>Severity depends on extent of the injury (partial or complete tear) and number of ligaments involved. A complete tear may be referred to as a rupture.</p> <p>Possible symptoms: pain, swelling, bruising, inability to move joint, or unstable joint that gives way.</p>	<p>Ankle: twisting during physical activity</p> <ul style="list-style-type: none"> - Rigid braces have been shown to reduce occurrence of ankle injuries during basketball¹³⁻¹⁴ <p>Knee (e.g., tear of anterior cruciate ligament (ACL) while pivoting during sports (e.g., basketball, soccer))</p> <ul style="list-style-type: none"> - Warm up prior to activity - Include agility drills in fitness training - Prophylactic knee brace may help (though evidence is still inadequate to prove)
Strain	<p>A stretch or tear of muscles or tendons (tendons are the fibrous cords that connect muscle to bone).</p> <p>Traumatic acute injury from one “over-reaching/doing” event OR</p> <p>overuse injury from repeated excessive use (e.g., tendonitis is/can be (see below) a type of overuse strain)</p> <p>Severity can range from a simple overstretch to a partial or complete tear. A complete tear may be referred to as a rupture.</p> <p>Possible symptoms: pain, swelling, muscle spasms, limited ability to move muscle.</p>	<p>Back: using poor lifting techniques or lifting excessive occupational loads</p> <ul style="list-style-type: none"> - Institute training for proper lifting techniques - Reduce weights (use smaller or lighter containers) - Use two persons or equipment to lift heavy items - Increase core muscle strength and endurance <p>Shoulder: using poor lifting techniques or lifting excessive weights during weight training</p> <ul style="list-style-type: none"> - Use certified trainer/coach to evaluate weight training technique and program; instruct/supervise lifts, loads, repetitions, rest)
Other common MSK injuries and symptoms		
Tendonitis	<p>Inflammation and/or pain in tendon.</p> <p>Most commonly considered an overuse injury with possible recurrent or long term effect. Can also result from an acute incident, or be associated with individual/genetic factors.</p>	<p>Common areas affected: Shoulder (rotator cuff), elbow, wrist, knee (patella and iliotibial band), Achilles tendon (heel)</p> <p>Risk Factors: Repeated vibration, cold temperatures, intense/sustained exertion, awkward postures</p>
Bursitis	<p>Pain and inflammation of a bursa (pad-like sac that cushions movement of bones, tendons, and muscles near joints).</p> <p>Usually an overuse injury associated with an occupation or sport; possible long term, permanent effect.</p>	<p>Common areas affected: Hips, knee, elbow</p> <p>Risk Factors: Repetitive motion of a specific joint in occupational task or sports activity (e.g., runners knee, swimmers elbow)</p>
Inflammation and pain	<p>A general diagnosis that may be associated with nerves but may be a symptom of MSK injury or a precursor to MSK injury.</p> <p>Can be acute (initiated by single event) or as result of repeated stress (overuse), and may become chronic long term effect.</p>	<p>Common areas affected: Lower back, knees</p> <p>Risk Factors: Awkward posture/inappropriate lifting technique and/or excessive weight; intense/sustained exertion</p>

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[‡] Factsheets for specific activities and injury types available at: <https://phc.amedd.army.mil/topics/discond/ptsaip/Pages/default.aspx>