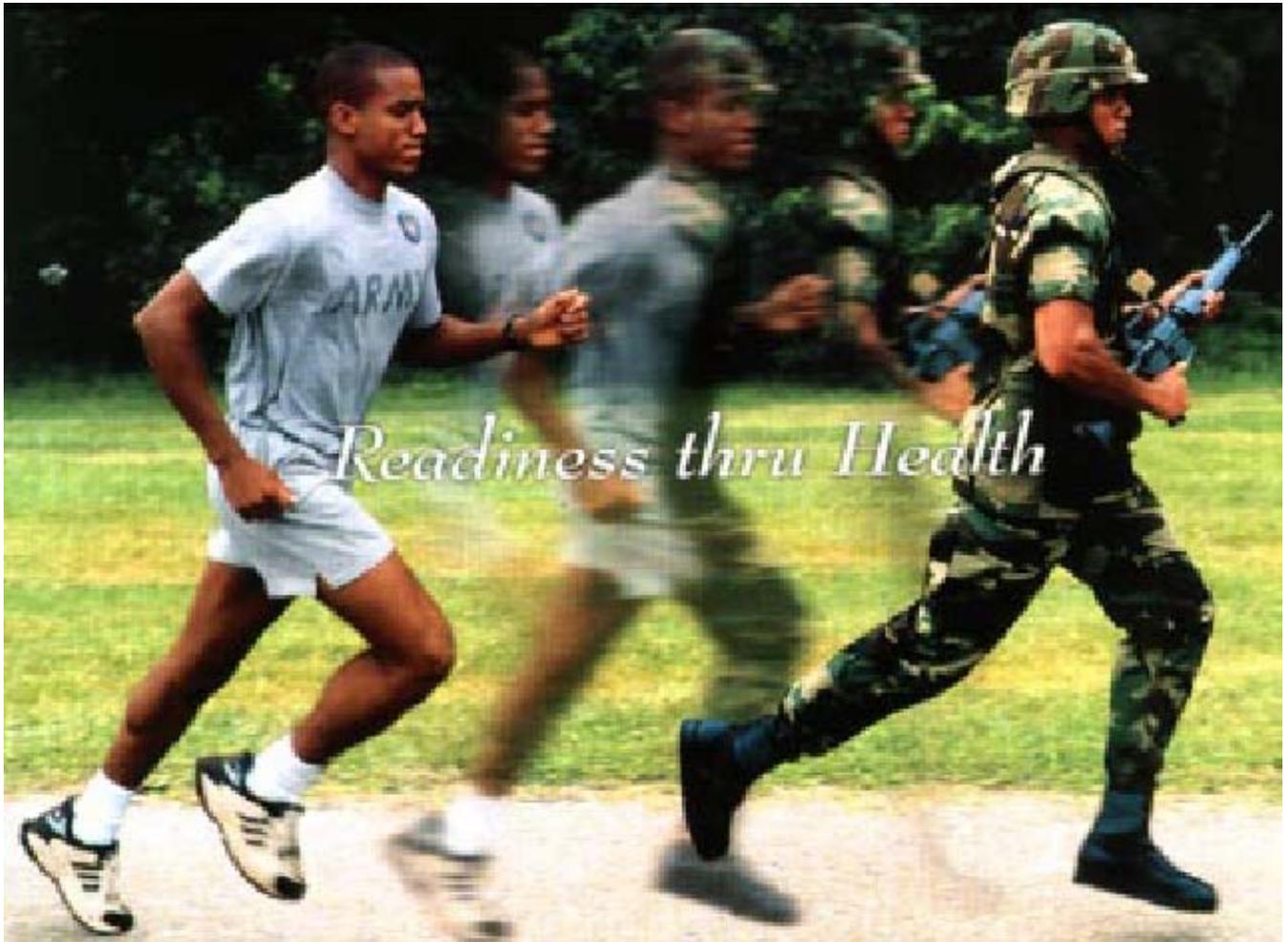




# Post-Deployment Injury Prevention



Cover Design by Wendy Folsie for the William Beaumont Medical Center Commander's Guide

## Physical Therapy Clinic

## Acknowledgements

We would like to thank LTC Leanne Vonasek for sharing the Commander's Guide that she and MAJ Nikki Butler developed in Germany with the assistance of the Center for Health Promotion and Preventive Medicine – Europe. The complete guide is currently utilized at Fort Bliss through the Physical Therapy Clinic at William Beaumont Army Medical Center. A significant portion of this booklet came from LTC Vonasek's publication.

The views expressed in this guide are those of the authors and do not necessarily reflect the official policy of the Department of the Army, the Department of Defense, or the U.S. Government. This report is approved for public release; distribution is unlimited.

# Key Recommendations

1. Invest in a new pair of running shoes before starting a PT program again!  
(See shoe selection guide page 5)
2. **DO NOT** perform high impact exercise every day / two days in a row. (jogging, sprinting, vigorous sports, etc)
  - **Start** with one of the walk-to-run progression programs outlined on **pg 14 & 15**
  - Jog one day and then either rest, bike, swim, use ski machine, elliptical trainer or other low impact aerobic exercise the next.
3. Warm-up and then stretch major lower extremity muscle groups before and after exercise (Pages 10-13)
  - Hold each stretch 30 seconds
  - Repeat 2 to 3 times on each leg

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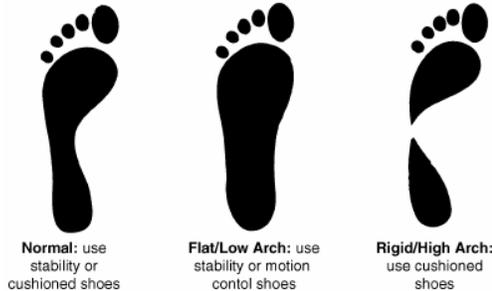
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## Running Shoes

The U.S. Army does not endorse or recommend any specific brand of running shoe, or any specific running publication. The following information is provided to assist the soldier in selecting the most appropriate running shoe for his/her needs. Some of the following information was taken from *Runner's World Magazine*.

All runners (recreational or competitive) should have a basic knowledge of shoe and personal foot anatomy to assist in selecting their running shoes. While the most frequent cause of running injuries is improper training, many problems can be traced to the use of inappropriate shoes, or shoes that are simply worn out.

The first thing you need to know is the best shoe is not always the most expensive shoe. However, keep in mind you need a good pair of shoes to avoid injury, so don't always hunt for the bargain either. All running shoes are different and you need a shoe specifically made for your foot. There are many new models every year with different features, new technology and new marketing strategies. With the information provided here, we hope you will be able to make a smart and well informed selection.



### **Three Basic Foot Types**

#### **1. Neutral: Normal Foot**

Normal feet, during running, will hit the ground (heel strike) in supination and then roll into pronation (roll to the inside) as the foot continues to come in contact with the ground (stance phase). Then the foot will supinate (roll to the outside) just prior to the foot leaving the ground (toe off). Eighty percent of runners are heel strikers, the other 20% are mid/forefoot strikers. Look for a stability or cushioned shoe.

#### **2. Hyperpronation: Flat Foot**

Excessive inward tilting. Some may only hyperpronate when running due to the increased force. Hyperpronation is the most common problem and the majority of running shoes are made to fit this type of foot. Look for motion control or stability shoes with firm midsoles. Stay away from cushioned shoes.

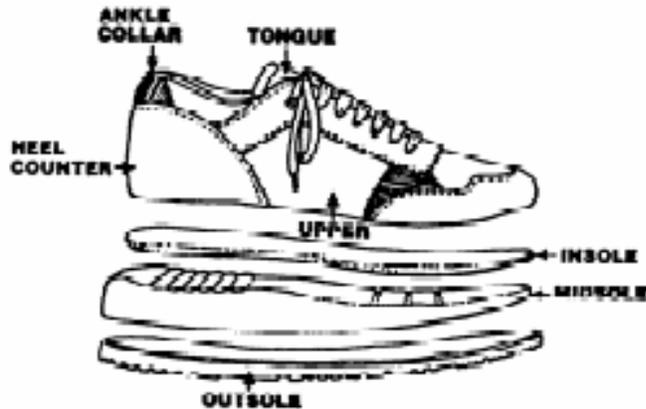
#### **3. Hypersupination: High-Arched Foot**

Excessive outward tilting. This foot type is less mobile, so more stress/force is translated through the bones, joints, muscles, and tendons. This foot does not adapt to the ground well and will need extra cushioning and flexibility built into the running shoe. Stay away from motion control or stability shoes.

### **Know Your Foot Type**

Check your foot print (step in water then step on a piece of cardboard or any surface that will leave an imprint of your foot). If you are able to see most of your foot then you have a low arch. If you see less of your foot then you have a high arch.

# Shoe Anatomy



**Midsole:** The life of the shoe. It is the padded area between the insole and outsole, now considered the crucial element for protecting runners from relentless pounding. It provides cushioning, comfort, and control during running. Midsoles can be made of EVA (ethylene vinyl acetate) which provides more cushioning, or PU (polyurethane) which is more dense and durable, or both. Alternative materials include air, silicone gels, gases, foams, liquids, or various combinations.

**Heel Counter:** The material that cups and encircles the heel. It is usually made of a durable, resilient, thermoplastic material. The heel counter's function is to hold the heel in place when the rearfoot makes contact with the ground.

**Outsole:** The rubber that meets the road. Its primary functions are traction and stability, and, to a lesser extent, cushioning (depending on the material used). Outsoles come in a variety of colors, but the important difference is the composition. A hard carbon rubber is used in the high wear areas of the heel (usually called heel plugs) and blown rubber is used in the midfoot and forefoot where durability is not as critical.

**Upper:** The leather or nylon that holds the foot in place on the midsole. From a purely technical standpoint, it is not as important in foot function as the midsole. The upper's function is largely one of comfort and cosmetics. This is where all the fancy designs and colors are used.

**Ankle Collar:** Usually notched and padded for comfort and to reduce rubbing and stress on the Achilles tendon.

**Last:** The foot-shaped form around which a shoe is constructed. There are three types and three shapes. You can determine which type you have by removing the insole and inspecting the stitching inside the shoe.

## The types are:

**Board Lasted** – full length piece of fiberboard or cardboard and is the most stable and stiffest. The stitching will be along the outside.

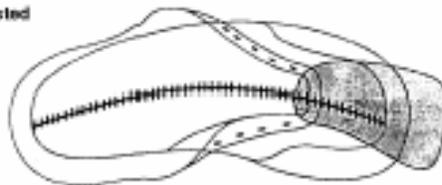
**Slip Lasted** – stitched together and is the most flexible. The stitching will be down the center.

**Combination Lasted** – board-lasted in the rearfoot for stability and slip-lasted in the forefoot for flexibility.

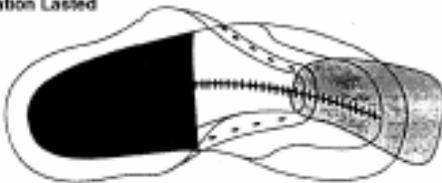
Board Lasted



Slip Lasted



Combination Lasted



## The shapes are:

**Straight**-best for flat feet

**Curved**-best for high-arched feet

**Semi-curved**-best for flat or normal feet.

### Shoe Shapes: Look at the sole



**Straight:** Best for Flat Feet



**Curved:** Best for high-arched feet



**Semi-curved:** Best for flat or normal feet

## How to Choose a Running Shoe

**Fit:** Try on shoes with athletic socks and preferably at the end of the day. The front (toe box) of the shoe should not be tight; you should have the width of a thumbnail between the longest toe and the end of the shoe. The shoe's heel should be snug with no excessive movement. Some shoe companies offer different widths. The shoes should feel comfortable right out of the box - you should not need to break them in.

**Cushioning:** All shoes should have some form of cushioning, some shoes offer more than others. Those with high-arched feet need more cushioning.

**Flexibility:** All shoes, no matter what foot type you have must have a flexible forefoot, i.e., flexible at the ball of your foot.

**Activity:** Running shoes can be used for walking, but walking shoes **should not** be used for running. Court shoes are constructed for a different type of movement and **should not** be substituted for running shoes. They lack the needed shock absorption, are too heavy, and rob the ankle of the freedom of motion it needs. Cross-trainers work well as court shoes, but not running shoes.

**Price:** Shoes come in all price ranges from \$10 to over \$100. You should plan on spending at least \$65-\$85.00. Remember the most expensive shoe is not always the best, but also remember that your body is worth more than a cheap shoe. We recommend going to the local athletic shoe stores to try on a variety of shoes that fit your foot type before deciding on one you like. To save money, you can then check if the PX carries the shoe, or order through a catalog. Running magazines have catalog offers in the back. Stay away from cheap discount store brands or from fake copies while stationed in Korea.

**Body Weight:** The more you weigh, the more force you will generate. Heavier runners need a shoe that offers more shock absorption and added durability. You may need a motion control shoe.

**Shoe Life:** On average, running shoes will last 6-9 months before you need to replace them (if used ONLY for running). Shoes last longer if you run on dirt, trails, or grass. The heavier you are, the sooner you'll need to replace them. If the midsole starts to show through or begins to form horizontal lines . . . you need new shoes. If you notice new aches and pains in your body . . . you may need new shoes. To prolong the life of your shoes, don't wash them in a washing machine, don't dry them in a dryer, don't let them stay wet (air dry them), don't wear them for any activity except running, and don't kick them off by pulling on the heel while they are still tied (this will destroy the heel counter and other stability devices). Clean your shoes with a soft bristle brush (toothbrush) and mild soap and water, then allow them to air dry.

### **In Summary:**

**Flat Foot:** look for motion control, board last, straight last and PU midsole

**High Arch:** look for cushioning, slip last, curved last, and EVA midsole

**Normal arch:** look for stability or cushioning, combination or slip last, semi-curved last and a midsole to fit your running needs

**Heavy runner:** look for motion control or stability and increased midsole density

One useful reference to find a variety of running shoes for a variety of needs is the *Runner's World Shoe Buyer's Guide* that comes out twice a year.

**Manufacturer's Phone Numbers and Web Sites:**

ADIDAS 1-800-677-6638 [www.adidas.com](http://www.adidas.com)

AVIA 1-800-848-8698 [www.aviashoes.com](http://www.aviashoes.com)

ETONIC 1-800-334-0008 [www.etonic.com](http://www.etonic.com)

MIZUNO 1-800-925-4292 [www.mizunousa.com](http://www.mizunousa.com)

NIKE 1-800-344-6453 [www.nike.com](http://www.nike.com)

PUMA 1-800-662-7862 [www.puma.com](http://www.puma.com)

RYKA 1-800-352-3331 [www.ryka.com](http://www.ryka.com)

ASICS 1-800-678-9435 [www.asicstiger.com](http://www.asicstiger.com)

BROOKS 1-800-227-6657 [www.brookssports.com](http://www.brookssports.com)

FILA 1-800-717-5757 [www.fila.com](http://www.fila.com)

NEW BALANCE 1-800-253-7463 [www.newbalance.com](http://www.newbalance.com)

REEBOK 1-800-843-4444 [www.reebok.com](http://www.reebok.com)

SAUCONY 1-800-365-4933 [www.saucony.com](http://www.saucony.com)

Shoes on the web: [www.runnersworld.com](http://www.runnersworld.com) click on "shoes" link, then click on the name of the company that most interests you. You can save some money by ordering from a shoe warehouse such as [www.holabirdsports.com](http://www.holabirdsports.com) or [www.roadrunnersports.com](http://www.roadrunnersports.com)

# The Warm-Up

**Purpose of the Warm-Up:** To prepare the body for more intensive exercise

## **Physiological Benefits of a Proper Warm-Up**

- \* Increased blood flow to muscles
- \* Increased rate of oxygen exchange between the blood and muscles
- \* Increased metabolic rate, therefore, you burn more calories
- \* Increased muscle flexibility
- \* Increased force and speed of muscle contraction
- \* Rehearsal effect (the body prepares itself for the muscular patterns to be used later)
- \* Reduced stress on the heart
- \* Reduced injury rate

Both competitive and recreational athletes often make the mistake of equating the words “warm-up” and “stretching”. Although stretching exercises can be included in the pre-workout routine, the most important goal when preparing to exercise should be to increase the body temperature and to prepare the muscles, connective tissue, and circulatory system to safely accommodate more intensive exercise.

## **How to Warm-Up**

To warm up, you must perform a physical activity. Hot baths, saunas, heating pads or massages **do not work** because they raise only the body’s **surface** temperature. Alterations in chemical, neural and cellular muscle function are dependent on changes in the body’s **deep core** temperature. Therefore, the above methods do not work. The U.S. Army generally uses calisthenics to warm-up, however, the following are other methods used to prepare the body for exercise:

- \* Slow jogging or swimming
- \* Stationary bicycling or slow cycling
- \* Walking with exaggerated arm movements
- \* Low intensity, low impact aerobic dance routines
- \* Side steps with forehand and backhand swings (without the racquet)

A warm-up can be just a slower version of the upcoming exercise. Walk before jogging. Jog before running. Bicycle, row, or aerobic-dance at a slower pace than the actual exercise.

Depending on the exercise, you may need to do both overall and specific warm-ups. For example, weightlifters should warm-up the entire body first. A jog or fast walk to the weightlifting facility is a good general warm-up. If this isn’t convenient, use a stationary bicycle, stairmaster, or treadmill. Five to ten minutes should be enough time for a general warm-up prior to weightlifting. Then warm-up specific muscles by using lighter weights for the first few repetitions.

How much time you spend warming up depends on how hard you intend to exercise. If you jog at a relatively comfortable pace, such as a twelve-minute mile, then five minutes of fast walking is all you need to warm-up. An elite athlete who is about to race at a five-minute mile pace needs at least fifteen minutes of moderate running to warm-up. In other words, the more intense the exercise, the longer you need to warm-up.

# Stretching

Stretching cold can be more harmful than not stretching at all. The best time to stretch is after cardiovascular exercise or a muscular workout when the body temperature is elevated. The goal of stretching is to optimize joint range of motion while maintaining stability in the joint. It is crucial to do the stretches correctly to avoid injury.

## Benefits of a Proper Stretching Program

- \* Improves posture and body symmetry
- \* Increases range of motion for each joint
- \* Minimizes low back pain
- \* Minimizes muscle soreness
- \* Promotes relaxation and reduces anxiety

## General Rules for Stretching Safely

Stretching involves gradually going into a position that lengthens the muscle until tension is felt. For this to occur, the stretch must be held for at least 30 seconds.

## Avoid Quick Bouncing Movements

The momentum generated can cause damage to muscle, tendons and other tissues.

## Never Force a Movement

Do not place your body in unnatural positions and do not perform movements that cause discomfort. Muscles stretch best when relaxed. Many injuries can be attributed to tight muscles; therefore, stretching should always be an important part of any exercise program.

## Guidelines for Increasing Flexibility

- \* Perform an easy warm-up to increase blood flow and tissue temperature
- \* Never stretch a cold muscle
- \* Never stretch beyond your personal range of motion
- \* Avoid ballistic (quick, bouncing) stretches
- \* Hold the stretch for at least 20-30 seconds
- \* Allow for individual differences and use modifications for tight muscles or inflexible/hyper-flexible joints

## Final Stretch

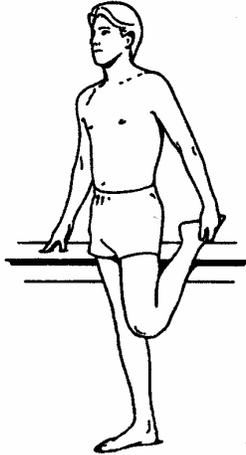
The final stretch is the last segment of your workout and should consist of five to fifteen minutes of stretching and relaxation exercises. This will improve your flexibility and may reduce the chance of muscle soreness. Since your muscles and connective tissue are completely warm, it is okay to stretch using more tension than you did after your pre-exercise warm-up. Always release slowly from the stretched position. In addition to increasing or maintaining flexibility, this last segment serves as a final cool-down from the aerobic and muscular conditioning exercises.

**Stretching should never be painful. If it is, then you are pushing it too far!!!**

**HIP / KNEE - 37**

**Stretching: Quadriceps Stretch**

Pull heel toward buttock until a stretch is felt in front of thigh.



Hold 30 seconds.  
Repeat 3 times.

**HIP / KNEE - 39**

**Stretching: Standing Hamstring Stretch**

Place foot on stool. Slowly lean forward, reaching down shin until a stretch is felt in back of thigh. Hold 30 seconds.

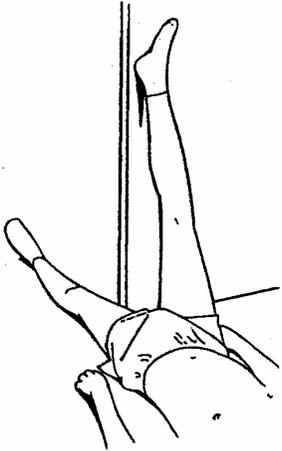


Repeat 3 times.

**HIP / KNEE - 33**

**Stretching: Hamstring Wall Stretch**

Lying on floor with involved leg on wall and other leg through doorway, scoot buttocks toward wall until a stretch is felt in back of thigh. As leg relaxes, scoot closer to wall.

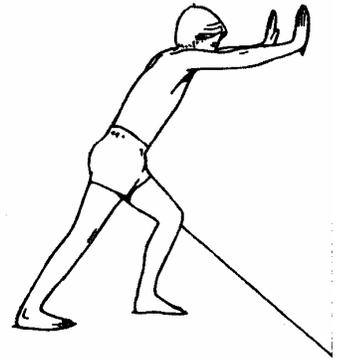


Hold 30 seconds  
Repeat 3 times.

**HIP / KNEE - 41**

**Stretching: Gastroc Stretch**

Keeping back leg straight, with heel on floor and turned slightly outward, lean into wall until a stretch is felt in calf. Hold 30 seconds.



Repeat 3 times.

**HIP / KNEE - 42**

**Stretching: Soleus Stretch**

Keeping back leg slightly bent, with heel on floor and turned slightly outward, lean into wall until a stretch is felt in calf. Hold 30 seconds.

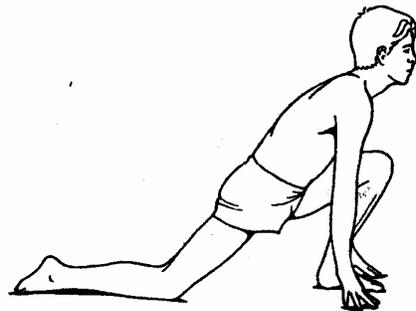


Repeat 3 times.

**HIP / KNEE - 34**

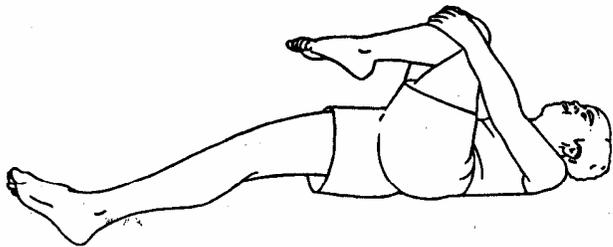
**Stretching: Hip Flexor Stretch**

Slowly push pelvis downward while slightly arching back until a stretch is felt on front of hip. Hold 30 seconds.



Repeat 3 times.

**HIP OBLIQUE - 5 External Rotators**



Clasp hands around knee and gently press it toward opposite shoulder. Hold 30 seconds. Feel stretch in buttocks and outside of the hip. Repeat with other leg.

Repeat 3 times.

**HIP OBLIQUE - 8 Internal Rotators**



Gently pull foot and knee toward shoulder, rotating at hip. Hold 30 seconds. Repeat with other leg.

Repeat 3 times.

**HIP OBLIQUE - 10 External Rotators**



With left leg over right, bring right arm over left leg. Push left leg across body until stretch is felt. Turn head over left shoulder. Hold 30 seconds. Repeat with other side.

Repeat 3 times.

**PHYSICAL THERAPY CLINIC  
IRWIN ARMY COMMUNITY HOSPITAL  
FORT RILEY, KS 66442**

## **WALK TO RUN PROGRESSION PROGRAM**

The following program may be beneficial to a soldier recovering from an injury or just coming off profile. There are no set timeframes – progress slowly as tolerated.

Guidelines:

1. Perform every other day only. Do not run two days in a row.
2. Perform at easy pace on level surfaces – no hills.
3. Use good jogging shoes that are not more than 6-9 months old.
4. Stop if you experience increased pain, swelling, or stiffness.
5. Try each Phase at least twice and progress if you experience no increased pain, swelling, or stiffness.
6. After Phase VII eliminate the walk portion and then gradually increase the distance over time.
7. Apply ice to the affected area immediately after exercise for 15-20 minutes.

Phase I: Walk 2 miles at your own pace and tolerance

Phase II: Progress to walking 2 miles in 35 minutes

Phase III: Walk Run Walk Run  
(miles) 1/4 1/4 1/4 1/4

Phase IV: Walk Run Walk Run Walk Run Walk Run  
(miles) 1/4 1/4 1/4 1/4 1/4 1/4 1/4 1/4

Phase V: Walk Run Walk Run Walk Run  
(miles) 1/4 1/2 1/4 1/2 1/4 1/2

Phase VI: Walk Run Walk Run  
(miles) 1/4 1 1/4 1

Phase VII: Walk Run Walk Run  
(miles) 1/4 1 1/2 1/4 1 1/2

**PHYSICAL THERAPY CLINIC  
IRWIN ARMY COMMUNITY HOSPITAL  
FORT RILEY, KS 66442**

## **WALK TO RUN PROGRESSION PROGRAM**

The following program may be beneficial to a soldier recovering from an injury or just coming off profile. There are no set timeframes – progress slowly as tolerated.

Guidelines:

1. Stretch and warm-up for 10-15 minutes before exercise.
2. Perform every other day only. Do not run two days in a row.
3. Perform at easy pace on level surfaces – no hills.
4. Use good jogging shoes that are not more than 6-9 months old.
5. Stop if you experience increased pain, swelling, or stiffness.
6. Try each Phase at least twice and progress if you experience no increased pain, swelling, or stiffness.
7. Apply ice to the affected area immediately after exercise for 15-20 minutes.

Phase	Walk	Run	Repetitions	Total Time
I	5 minutes	1 minute	5 times	30 minutes
II	4 minutes	2 minutes	5 times	30 minutes
III	3 minutes	3 minutes	5 times	30 minutes
IV	2 minutes	4 minutes	5 times	30 minutes
V	1 minute	5 minutes	5 times	30 minutes
VI	5 minutes	10 minutes	2 times	30 minutes
VII	None	15 minutes	1 time	15 minutes
VIII	None	20 minutes	1 time	20 minutes
IX	None	25 minutes	1 time	25 minutes
X	None	30 minutes	1 time	30 minutes

## Exercise Recommendations

The following recommendations are from a physical therapy perspective and our experience in treating soldiers injured by specific activities. Recommended alternatives are given throughout this guide.

### Exercises Recommended

- \* Run in ability groups!!
- \* Warm-up (run in place 2 mins) followed by stretching
- \* Exercise followed by stretching
- \* Back strengthening exercises
- \* Abdominal crunches, side bridges and hip raises **instead of sit-ups**
- \* Alternative cardiovascular workouts at gym (cross country ski machine, bicycle, stairstepper, cross trainer)

### Exercises Not Recommended

- \* Excessive repetitions of any exercise (i.e., side straddle hops, knee benders)
- \* Daily long distance runs
- \* Flutter kicks; leg spreaders
- \* Sit-ups on hard surfaces; “Rocky” sit-ups; excessive sit-ups
- \* Diamond or goal post/field goal push-ups
- \* Neck rotation
- \* Standing hamstring stretch (standing toe touch)
- \* Turn & Bounce and Turn & Bend exercises

**“Physically fit soldiers can perform almost any type of exercise with little risk of injury. However, not all soldiers are fit and some may be prone to injuries. Therefore, not all exercises are recommended for all soldiers.”** -----US Army Physical Fitness School

## Improve APFT Scores While Preventing Injuries

### Run in ability groups!!

(Group soldiers based on their 2 mile run times)

### More groups = Better results

- \* Include warm-ups and stretching exercises
- \* Run every other day (not every day)
- \* Vary the type of running surface
- \* Increase the intensity and duration of exercise **gradually**
- \* Use alternate forms of training (bike, stairstepper, cross country ski machine, swim)  
instead of running or speed walking, especially for those on profile
- \* **Running twice a day leads to overuse injuries, NOT improved APFT scores**
- \* Exercise consistently during all training cycles
- \* Stretch (30 second holds) after each exercise session

Emphasize **Battle Focused Physical Training**: train your unit based on its wartime mission, i.e., if strength is important, incorporate weight training into your program

**Refer to FM 21-20**

## Treatment Recommendations for Injuries (P.R.I.C.E.)

**Prevention** is the best way to avoid injuries. By following the recommendations and guidelines at the beginning of this booklet, many injuries can be avoided.

### For acute injuries:

**Rest** is essential to prevent further injury and to allow ligaments to heal. This does NOT mean total immobilization, but means avoiding any activity that causes further pain or swelling. Soldiers may be put on crutches to assist the healing process - they must USE THEM. While using the crutches, they should walk naturally and put as much weight on the injured extremity as they can tolerate without excessive pain.

**Ice** should be used until swelling has resolved. Place an ice pack around the injured joint for twenty minutes every hour. **To make an ice pack**, place ice cubes or crushed ice in a plastic bag, or freeze two parts water and one part rubbing alcohol in a baggy, or use a bag of frozen vegetables. Wrap the ice pack with a moist towel before applying to the injured area. An **ice massage** may be more effective - freeze water in a paper or styrofoam cup, then rub directly on the injured area for 5 minutes. **Do not** switch to heat unless instructed to do so by a Physical or Occupational Therapist.

**Compression** is usually in the form of an “ace wrap”. Compression should be used until the swelling is gone. Remove the wrap for showering and for placing an ice pack on the injured joint.

**Elevation** means that the injured joint needs to be positioned above heart level. For example, if the knee or ankle is injured, the soldier should lie on his/her back with the foot propped on pillows. This prevents further swelling and assists in decreasing the swelling that is already present.

\*\*\*Returning to activities after an injury is individualized; it depends on the extent of the injury and the ability to keep the initial inflammation under control.