

# Injury Prevention for the Legs (posted Sept. 24, 2008)

Stretching Basics improve your flexibility with a good stretching program

Stretching is a fundamental way to improve your overall health and fitness. By incorporating a regular flexibility program into your exercise routine you will:

- improve circulation
- improve range of motion
- improve posture
- decrease joint stiffness
- decrease muscle tension
- improve performance (there is limited evidence to support this)
- improve your ability to relax
- allow time for mental training, such as visualization

A complete stretching routine can take as little as 10 minutes. The best time to stretch is after you have warmed up and the muscles are warm. The best time to perform your flexibility routine is after exercise. This is when the muscle is the warmest and when you can use the relaxation. Focus on stretching the muscles you use the most during your specific exercise or sport.

## Proper Stretching Technique

Perform balanced stretching. This means you should always stretch the muscles on both sides of your body evenly. Don't stretch one side more than the other side.

Avoid over-stretching. Never stretch to the point of pain or discomfort. You will feel slight tension or a pull on the muscle at the peak of the stretch.

Go slow! Always stretch slowly and evenly. Hold the stretch for about fifteen seconds and release slowly as well.

Never bounce or jerk while stretching. This can cause injury as a muscle is pushed beyond its ability. All stretches should be smooth, and slow.

Don't forget to breathe. Flexibility exercises should be relaxing. Deep easy, even breathing is key to relaxation. Never hold your breath while you stretch.

## Recommended Stretches

**Hamstrings:** Sit on the floor with one leg straight in front of you and the other leg bent (with the sole of the foot touching the inside thigh of the outstretched leg). Keep your back straight and lean forward from the hips. Slide your arms forward toward your outstretched foot. Stop when you feel a pull in the hamstring. Hold for 15 seconds and repeat with the other leg extended.

**Hips:** Lie on your back. Bend your left leg and bring it toward you. Grasp your left knee gently with your right hand and pull it slightly down and to the right until you feel a stretch. Turn your head to the left. Your right leg should stay flat on the floor. Hold for 10 seconds and repeat with the other leg.

**Low back:** Lay flat on the floor with knees bent. Use your hands to pull them toward your chest. Lift your head and shoulders off the floor until your head is approximately six inches from your knees. Cross your ankles. Gently rock yourself back and forth in this position for 30 seconds.

**Quadriceps:** Lie on your right side with your right knee bent at a 90-degree angle. Bend your left leg and hold onto the ankle with your left hand. Gently pull your left heel in toward the left side of your butt. As soon as you feel a stretch in your left quad, slowly lower your left knee toward the floor behind your right knee. Hold for 15 seconds and repeat with the other leg.

**Calves:** Stand an arm's length away from a wall with your feet shoulder-width apart. Slide the left foot back approximately 18 inches, keeping the knee straight and both heels flat on the floor. Bend your right knee and slowly move your pelvis forward until you feel a stretch in the calf and Achilles of the left leg. Hold for 15 seconds and repeat with the other leg.

### Balance Training:

A simple, targeted balance training exercise may **reduce the risk of ankle injuries in high risk athletes**. That's the conclusion of a study by researchers at Nicholas Institute of Sports Medicine and Athletic Trauma. The same research team previously found that high school football players who are overweight and have a history of ankle sprains are more likely to have a repeat ankle injury. In this follow-up study, they decided to see if a balance conditioning program could reduce that risk.

The more recent study found that these ankle injuries can be avoided by performing a simple balance exercise for five minutes several times a week. The study followed 175 high school varsity football players for three years. Players were categorized as minimal risk, low risk, moderate risk, and high risk based on the history of previous ankle sprain and their current body mass index. Players in the low-, moderate-, and high-risk groups (any player with a high body mass index and/or a previous ankle sprain) were placed on a balance training intervention on a foam stability pad.

Players balanced for 5 minutes on each leg, 5 days per week, for 4 weeks in preseason and twice per week during the season. They found that these high-risk players were able to reduce their incidence of injury by 77 percent after this simple intervention.

Study results showed the injury incidence for players with increased risk was 2.2 injuries per 1000 exposures before the intervention and 0.5 after the intervention, or a 77 percent reduction in injury incidence.

Because this is a simple and low-cost strategy for reducing injuries many coaches and athletes who participate in field sports are adopting the routine and adding more balance training as a fundamental basic training principle.

One of the best programs for preventing knee injuries, particularly ACL injuries, has been seen in the [Santa Monica ACL Injury Prevention Project \(PEP\)](#). This program, designed based upon the results of a research project, involves a specific routine of exercises and skills training. While designed to address the increase ACL injury rates in **female soccer players**, the exercises can be used successfully by anyone who wants to avoid knee injuries, as the core concepts are the same for all knee injuries.

The ACL Prevention Project training program was created by the Santa Monica Orthopaedic and Sports Medicine Foundation to decrease the number of ACL injuries in female soccer players. In the recent past there has been a significant increase in the number of injuries in female athletes, particularly among soccer players. Studies show that female soccer player's risk of an ACL injury is two to eight times that of men. Adding neuromuscular and proprioceptive exercises to the training regimen can reduce the number of ACL injuries by two to four fold.

## ACL Injury Prevention Program Overview

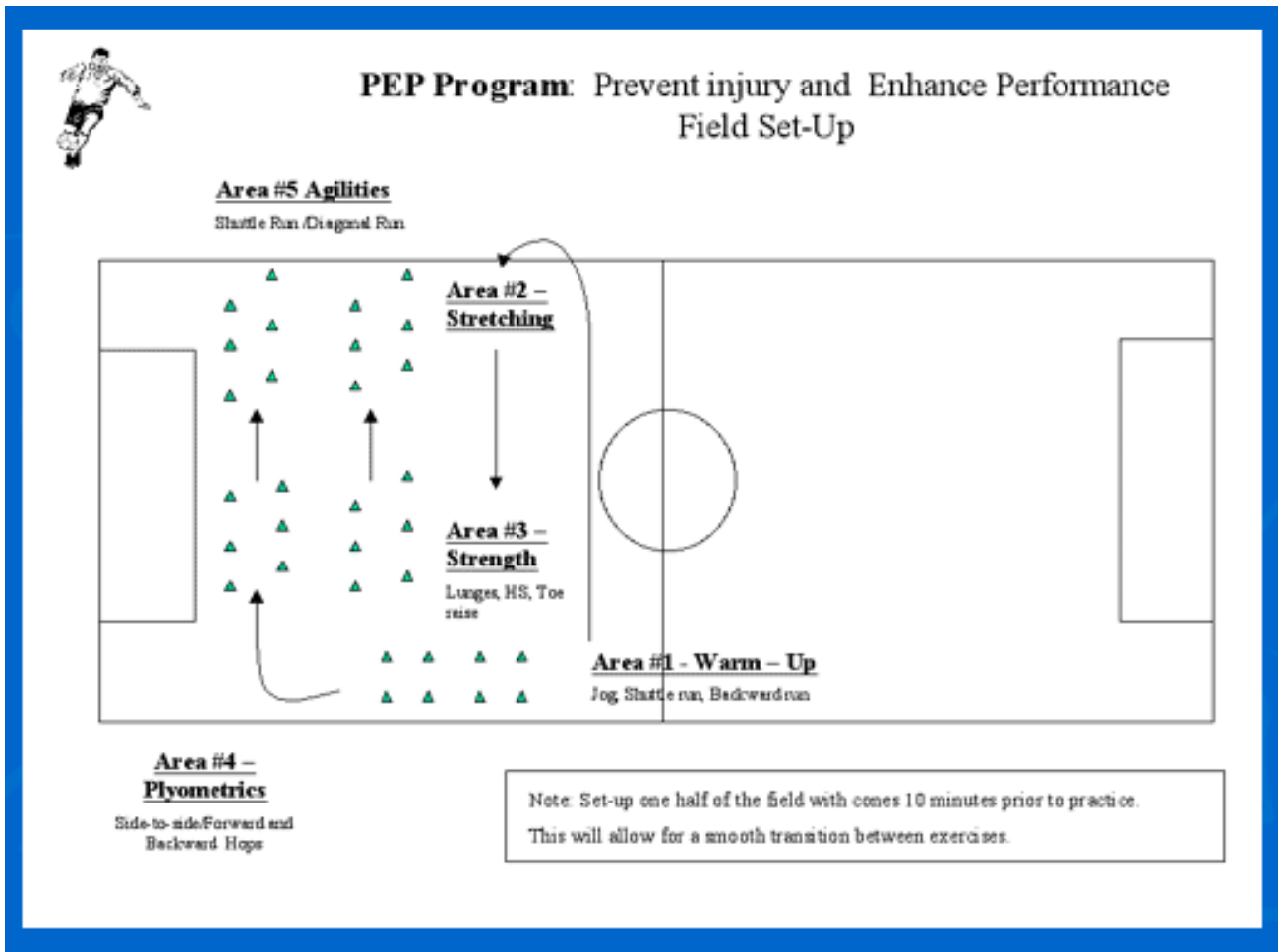
The ACL Injury Prevention Program is a highly specific 15-minute training session that replaces the traditional warm-up. It was developed by a team of physicians, physical therapists, athletic trainers and coaches. The program goal is to teach players strategies to avoid injury by:

1. Avoiding vulnerable positions
2. Increasing flexibility
3. Increasing strength
4. Including plyometric exercises in training
5. Increasing proprioception

Optimally the program should be performed at least **2-3 times per week** during the season.

This program consists of a warm-up, stretching, strengthening, plyometrics, and sport specific agility training. It is important to use proper technique during jumping moves (jump straight up and down jumps without excessive side-to-side movement), and aim for soft landings.

The field should be set up 10 minutes prior to the warm-up (Click [Here](#) to see field). This will allow for a smooth and quick transition between all of the activities.



This program should take approximately 15 minutes to complete. Alongside each exercise you will notice a box with the approximate amount of time that should be spent on each activity. This will serve as a guideline to you in order to conduct your warm-up in a time-efficient manner.

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**Warm-up:**

Warming up and cooling down are a crucial part of a training program. The purpose of the warm-up section is to allow the athlete to prepare for activity. By warming up your muscles first, you greatly reduce the risk of injury.

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**1. Jog line to line (cone to cone):**

Elapsed Time: 0 - .5 minute

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**Purpose:** Allows the athletes to slowly prepare themselves for the training session while minimizing the risk for injury. Educate athletes on good running technique; keep the hip/knee/ankle in straight alignment **without the knee caving in or the feet whipping out to the side.**

**Instruction:** Complete a slow jog from near to far sideline

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**2. Shuttle Run (side to side)**

Elapsed Time: .5 to 1 minute

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**Purpose:** engage hip muscles (inner and outer thigh). This exercise will promote increased speed. Discourage inward caving of the knee joint.

**Instruction:** Start in an athletic stance with a **slight bend at the knee.** Leading with the right foot, **sidestep pushing off** with the left foot (back leg). When you drive off with the back leg, **be sure the hip/knee/ankle are in a straight line.** Switch sides at half field.

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**3. Backward Running**

Elapsed Time: 1-1.5 minutes

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**Purpose:** continued warm-up; engage hip extensors/hamstrings. Make sure the athlete **lands on her toes.** Be sure to watch for locking of the knee joint. As the athlete brings her foot back, make sure she maintains a **slight bend to the knee.**

**Instruction:** **Run backwards from sideline to sideline. Land on your toes without snapping the knee back. Stay on your toes and keep the knees slightly bent at all times.**

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The warm up before stretching is very important to decreasing risk of injury. The following exercises help improve range of motion, reduce stiffness, reduce post-exercise soreness, reduce the risk of injury and improve overall mobility and performance.

Don't bounce or jerk but gently stretch to a point of tension and hold. Hold the stretch for 30 seconds, Breathe normally (don't hold your breath).

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**Calf stretch (30 seconds x 2 reps)**

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- Elapsed Time: 1.5 to 2.5 minutes
  - Purpose: Stretch the calf muscle of the lower leg.
  - Stand leading with your right leg.
  - Bend forward at the waist and place your hands on the ground (V formation).
  - Keep your right knee slightly bent and your left leg straight.
  - Make sure your left foot is flat on the ground.
  - Do not bounce during the stretch.
  - Hold for 30 seconds.
  - Switch sides and repeat.

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**Quadricep stretch (30 seconds x 2 reps)**

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- Elapsed Time: 2.5 to 3.5 minutes
  - Purpose: Stretch the quadricep muscle of the front of the thigh.
  - Place your left hand on your partner's left shoulder.
  - Reach back with your right hand and grab the front of your right ankle.
  - Bring your heel to buttock.
  - Make sure your knee is pointed down toward the ground.
  - Keep your right leg close to your left.
  - Do not allow knee to wing out to the side and do not bend at the waist.
  - Hold for 30 seconds and switch sides.

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**Hamstring stretch** (30 seconds x 2 reps)

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- Elapsed Time: 3.5 - 4.5 min
- Purpose: To stretch the hamstring muscles of the back of the thigh.
- Sit on the ground with your right leg extended out in front of you.
- Bend your left knee and rest the bottom of your foot on your right inner thigh.
- With a straight back, try to bring your chest toward your knee. Do not round your back.
- If you can, reach down toward your toes and pull them up toward your head.
- Do not bounce.
- Hold for 30 seconds and repeat with the other leg.

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**Inner Thigh Stretch** (20 seconds x 3 reps)

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- Elapsed Time: 4.5 - 5.5 min
- Purpose: Elongate the muscles of the inner thigh (adductor group).
- Remain seated on the ground.
- Spread your legs evenly apart.
- Slowly lower yourself to the center with a straight back.
- You want to feel a stretch in the inner thigh.
- Now reach toward the right with the right arm.
- Bring your left arm overhead the stretch over to the right.
- Hold the stretch and repeat on the opposite side.

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**Hip Flexor Stretch** (20 seconds x 2 reps)

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- Elapsed Time: 5.5 - 6.5 min
- Purpose: Elongate the hip flexors of the front of the thigh.
- Lunge forward leading with your right leg.
- Drop your left knee down to the ground.
- Placing your hands on top of your right thigh, lean forward with your hips.
- The hips should be square with your shoulders.
- If possible, maintain your balance and lift back for the left ankle and pull your heel to your buttocks.
- Hold for 30 seconds and repeat on the other side.

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The **strengthening phase** of the program focuses on increasing leg strength. This will lead to increased leg strength and a more stable knee joint. Technique is everything; close attention must be paid to the performance of these exercises in order to avoid injury.

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**Walking Lunges** (3 sets x 10 reps)

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- Elapsed Time: 6.5 - 7.5 min
- Purpose: Strengthen the thigh (quadriceps) muscle.
- Lunge forward leading with your right leg.
- Push off with your right leg and lunge forward with your left leg.
- Drop the back knee straight down.
- Make sure that you keep your front knee over your ankle.
- Control the motion and try to avoid your front knee from caving inward. I
- If you cannot see your toes on your leading leg, you are doing the exercise incorrectly.

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**Hamstrings** (3 sets x 10 reps)

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- Elapsed Time: 7.5 - 8.5 min
- Purpose: Strengthen hamstrings muscles.
- Kneel on the ground with hands at your side.
- Have a partner hold firmly at your ankles.
- With a straight back, lean forward leading with your hips.
- Your knee, hip and shoulder should be in a straight line as you lean toward the ground.
- Do not bend at the waist.

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- You should feel the hamstrings in the back of your thigh working.
  - Repeat the exercise for 3 sets of 10, or a total of 30 reps.

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#### **Single Toe Raises** (30 reps x 2 reps)

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- Elapsed Time: 8.5 - 9.5 min
  - Purpose: This exercise strengthens the calf muscle and increases balance.
  - Stand up with your arms at your side.
  - Bend the left knee up and maintain your balance.
  - Slowly rise up on your right toes with good balance.
  - You may hold your arms out ahead of you in order to help.
  - Slowly repeat 30 times and switch to the other side.
  - As you get stronger, you may need to add additional repetitions to this exercise to continue the strengthening effect of the exercise.

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**Plyometrics** exercises are explosive and help to build, power, strength and speed. The most important element when considering performance technique is the landing. It must be soft. When you land from a jump, you want to softly accept your weight on the balls of your feet slowly rolling back to the heel with a bent knee and a straight hip. These exercises are basic, however, it is critical to perform them correctly. Please take the time to ensure safe and correct completion of these exercises

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#### **Lateral Hops over Cone** (20 reps)

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- Elapsed Time: 9.5 - 10 min
  - Purpose: Increase power/strength emphasizing neuromuscular control.
  - Stand with a 6" cone to your left.
  - Hop to the left over the cone softly landing on the balls of your feet and bending at the knee.
  - Repeat this exercise hopping to the right.

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#### **Forward/Backward Hops over cone** (20 reps)

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- Elapsed Time: 10 - 10.5 min
  - Purpose: Increase power/strength emphasizing neuromuscular control.
  - Hop over the cone/ball softly landing on the balls of your feet and bending at the knee.
  - Now, hop backwards over the ball using the same landing technique.
  - Be careful not to snap your knee back to straighten it.
  - You want to maintain a slight bend to the knee.
  - Repeat for 20 reps.

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#### **Single Leg hops over cone** (20 reps)

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- Elapsed Time: 10.5 - 11 min
  - Purpose: Increase power/strength emphasizing neuromuscular control.
  - Hop over the cone/ball landing on the ball of your foot bending at the knee.
  - Now, hop backwards over the ball using the same landing technique.
  - Be careful not to snap your knee back to straighten it.
  - You want to maintain a slight bend to the knee.
  - Repeat for 20 reps.
  - Now, stand on the left leg and repeat the exercise.
  - Increase the number of repetitions as needed.

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#### **Vertical Jumps with headers** (20 reps)

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- Elapsed Time: 11 - 11.5 min
  - Purpose: Increase height of vertical jump.
  - Stand forward with hands at your side.
  - Slightly bend the knees and push off jumping straight up.
  - Remember the proper landing technique; accept the weight on the ball of your foot with a slight bend to the knee.
  - Repeat 20 times and switch sides.

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### Scissors Jump (20 reps)

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- Elapsed Time: 11.5 - 12 min
  - Purpose: Increase power and strength of vertical jump.
  - Lunge forward leading with your right leg.
  - Keep your knee over your ankle.
  - Now, push off with your right foot and propel your left leg forward into a lunge position.
  - Be sure your knee does not cave in or out.
  - It should be stable and directly over the ankle.
  - Remember the proper landing technique; accept the weight on the ball of your foot with a slight bend to the knee. Repeat 20 times.
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Agility skill exercises are designed to improve the power and strength in the muscles.

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### Shuttle run with forward/backward running

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- Elapsed Time: 12 - 13 min
  - Purpose: Increase dynamic stability of the ankle/knee/hip complex.
  - Starting at the first cone,
  - sprint forward to the second cone,
  - run backward to the third cone,
  - sprint forward to the fourth cone (etc.).
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### Diagonal runs (3 passes)

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- Elapsed Time: 13 - 14 min
  - Purpose: To encourage proper technique/stabilization of the outside planted foot to deter the position from occurring.
  - Face forward and run to the first cone on the left.
  - Pivot off the left foot and run to the second cone.
  - Now pivot off the right leg and continue onto the third cone.
  - Make sure that the outside leg does not cave in.
  - Keep a slight bend to the knee and make sure the knee stays over the ankle joint.
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### Bounding run (44 yds)

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- Elapsed Time: 14 - 15 min
  - Purpose: To increase hip flexion strength/increase power/speed.
  - Starting on the near sideline, run to the far side with knees up toward chest.
  - Bring your knees up high.
  - Land on the ball of your foot with a slight bend at the knee and a straight hip. Increase the distance as this exercise gets easier.
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Cooling down is essential to the program and shouldn't be skipped. It allows the muscles that have been working hard throughout the training session to elongate and deters the onset of muscle soreness.

It is helpful to drink water during the cool down.

The cool down takes about 10 minutes. It includes light strength training and stretching exercises.

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### Bridging with Alternating Hip Flexion (30 reps)

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- Purpose: Strengthen outer hip muscles (Hip abductors, flexors) and buttocks
- Lie on the ground with your knees bent with feet on the ground.
- Raise your buttocks up off the ground and squeeze. Now, lift your right foot off the ground and make sure that your right hip does not dip down.
- Lower your right foot and now lift your left foot making sure your left hip does not dip down.
- Repeat 30 times on each side. A

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- s you get stronger, you will place your feet on top of a ball and repeat the exercise.

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#### **Abdominal Crunches (30 reps x 2 reps)**

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- Purpose: Strengthen the abdominals (rectus abdominus, obliques)
- Lie on the ground with you knees bent.
- Place your hands behind your head with your elbows out wide.
- Support your neck lightly with your fingers.
- Take a deep breath in and slowly contract your abdominal muscles as you exhale.
- Repeat 30 times.
- Drop your legs off to the right side.
- Slowly crunch up with your elbows out wide.
- You should feel your oblique muscles working on the side of your waist.
- Repeat 30 times and switch to the other side.

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#### **Single and Double Knee to Chest (30 sec x 2 reps)**

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- Purpose: Elongate the low back muscles.
- Lie on your back.
- Bring your right knee toward your chest and hug firmly.
- Keep your left leg out straight in front of you.
- You should feel a stretch along your low back and into your buttocks.
- Hold the stretch for 30 seconds and switch sides.
- Now bring both knees to chest.
- If you feel any pain in the low back, discontinue the stretch and inform your coach/trainer.

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#### **Piriformis stretch- supine (30 sec x 2 reps)**

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- Purpose: Elongate the rotators of the hip.
- Lie on your back and bend both of your knees.
- Fold your left ankle over your right knee.
- Place your hands behind your right thigh and pull your right knee to chest.
- You should feel a good stretch in the left gluteals region and the side of the thigh.
- Hold for 30 seconds and repeat on the other side.
- If you experience and low back pain with this stretch, slowly lower your legs down and let your coach/trainer know.

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#### **Seated Butterfly stretch - seated (30 sec x 2 reps)**

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- Purpose: Elongate the inner thigh muscles (adductors).
  - Sit up bringing your feet in so that the soles of your feet are touching.
  - Gently place your elbows on your knees and slowly push down.
  - You should feel a good stretch of the inner thigh.
  - Hold this for 30 seconds and repeat 2 to 3 times.
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