KNEE INJURY PREVENTION PROGRAM FOR MIDDLE AND HIGH SCHOOL AGE ATHLETES
FACULTY WHO CONTRIBUTED TO THIS HANDOUT (in alphabetical order)

Michelina Cassella, PT, Department of Physical and Occupational Therapy, Children's Hospital, Boston

Dan Connors, PT, JumpStart Physical Therapy

Jennifer Connors, PT, Department of Physical and Occupational Therapy, Children's Hospital, Boston

Brian Fitzgerald, ATC, Division of Sports Medicine, Children's Hospital, Boston

Carl Gustafson, ATC, PT, Sports and Physical Therapy Associates

Claire McCarthy, PT, Department of Physical and Occupational Therapy, Children's Hospital, Boston

Lyle J. Micheli, MD, Division of Sports Medicine, Children's Hospital, Boston

James Miller, Orthotist, NOPCO

Martha Murray, MD, Division of Sports Medicine, Children's Hospital, Boston

Dana Oleznak, PT, Department of Physical and Occupational Therapy, Children's Hospital, Boston

Kathleen Richards, PT, Department of Physical and Occupational Therapy, Children's Hospital, Boston

FOR MORE INFO, CONTACT:

Division of Sports Medicine, Children's Hospital of Boston, (617) 355-3501, www.kidssportsmed.org

Department of Physical and Occupational Therapy, Children's Hospital of Boston, Boston, MA, (617) 355-7212


NOPCO (National Orthotics and Prosthetics Company), Boston, Burlington, and Avon (617) 355-6887
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INTRODUCTION TO PRESEASON TRAINING FOR THE MIDDLE AND HIGH SCHOOL AGE ATHLETE

Preseason training is critical at helping athletes prepare for their season and avoid injury. In this packet, we detail six main components of a preseason training program found by other investigators across the country to successfully reduce knee injuries in collegiate athletes. The physical therapists from Children’s Hospital of Boston, Sports and PT Associates and JumpStart Physical Therapy have modified the specific exercise programs to accommodate the needs of the younger athlete.

The six facets of the program include the dynamic warmup/cooldown, plyometrics (or jump training), agility training, strengthening, flexibility and proprioceptive training. In each module, exercises range in difficulty, with the easiest exercises started first and progression made to more difficult exercises as the athlete gains skill. A key component of the program is to maintain good position throughout the exercise routines and to avoid compromising this position due to fatigue or attempting exercises too difficult for the athlete at that stage of training. Specific warning signs or red flags for each component are detailed in each module.

Today, after a few brief presentations, all attendees will be split into twelve groups of four or five and will rotate through each of six stations, learning the techniques of the six components with physical therapists and athletic trainers schooled in the specific exercises. General, as well as specific, guidelines will be given to guide coaches, athletic trainers and physical education teachers in important ways to help their athletes train in the preseason to obtain better performance and avoid injuries.

GENERAL PRINCIPLES

Progression: Fundamental skills and fitness base must be developed before progressing any exercise program.

Overload: The training and conditioning program must be more difficult over time to be beneficial for the athlete. Therefore, the intensity, volume, modified rest periods and complexity of the exercise much be made more difficult.

Sport Specificity: It is important to determine the demands of the sport in order to design an effective conditioning program. The quality and quantity of the sport movements must be considered. The energy need, anaerobic, or aerobic, should be incorporated into the program.

Athlete as an Individual: Each athlete will respond different to an exercise program. Programs my need to be individualized based on the athlete’s response.

Equipment Check: Shoes, surface and safety equipment should be checked before each game or practice.
SAFETY IN SPORTS – GENERAL GUIDELINES

Preparing for Sports

• Sporting activities should be fun for your athlete. Encourage your athlete to try different activities and do not force him/her to play a certain sport.
• Get clearance from your athlete’s primary care doctor for your athlete to play in a specific activity. Your athlete should have seen his/her primary care doctor within the past year.
• Make sure your athlete is in good enough physical condition to participate in his/her chosen activity.
• Activities should be appropriate for your athlete’s age, skill level, ability and interests.

Avoiding Risks During Sporting Activities

• Before games and practices, check that all apparatus, fields, and playing surfaces to ensure that they are in good repair and will not cause injury.
• Monitor the weather. Heat, cold and electrical storms can all present health risks to your athlete. When conditions are dangerous, stop and go inside.

Sports Activities: Training

• Listen to your athlete. If they are too tired or ill to participate, let them rest.
• Do not let your athlete train too much. Conditioning, practice or competing in sports more than 20 hours a week can significantly increase the risk of injury to young athletes.
• For higher-level players, consider “cross training”. Playing one sport year round will significantly increase the risk of overuse injuries. Have your athlete take a season off and play something else.
Sports Activities: Stretching
• Stretch all major muscle groups before and after every practice and game.
• Stretches should not be done quickly. Hold each stretch for several (30) seconds. Repeat each stretch 2-3 times each muscle.
• NEVER bounce when stretching. This will cause injury to the muscle. Instead hold the stretch at the point when you feel the stretching sensation.

Sports Activities: Drink Plenty of Water
• Athletes need to be adequately hydrated with water before, during and after sports. During play, your athlete should drink water every 20 minutes.
• Water is best for most athletes to stay hydrated. Sports drinks may be used, in addition to water, only for adolescents during prolonged (60 minutes or more) strenuous activity.

Sports Activities: Protective Gear and Clothing
• Make sure your athlete wears the necessary protective gear; helmets, protective pads, and mouth guards are all important in preventing injury.
• Mouth guards should be worn for almost all sports. They prevent injury to the teeth and may decrease the shock the brain receives during a blow to the head or a fall.
• All clothing and equipment needs to be well fitting, in good repair, and worn correctly.
• Athletes who wear eyeglasses should wear safety glasses or protective eyewear when playing sports.
First Aid

- The adult responsible for the activity should have an emergency plan and be able to contact emergency medical services without leaving the players. Ask about the availability of cell phones.

- For most minor injuries follow the “RICE” rule:
  - Rest- stop the activity
  - Ice- apply ice to reduce pain and control swelling
  - Compression- apply an elastic bandage to control swelling.
  - Elevation- Raise the injured limb above the level of the heart to reduce swelling.

- If pain, swelling, and immobility continue, seek medical help.

Neck/Back Injuries

- Athletes who complain of neck or back pain following an injury should not be moved from the playing surface.

- Get medical attention (or call 911) if your athlete sustains a blow to the head or if he/she has any of the following: headache, nausea, dizziness, loss of consciousness, excessive sleepiness, confusion or change of personality.

- If your athlete has received an injury significant enough to keep them out of practice for more than a couple of days, have them cleared by a sports medicine professional prior to return to sports, so they don’t re-injure themselves.
THE KNEE INJURY PREVENTION PROGRAM FOR MIDDLE AND HIGH SCHOOL AGE ATHLETES

THE STABILITY POSITION

- Knee bent 25 to 30 degrees
- Hip knee and ankle in neutral alignment
- Control Valgus
- Greatest level of ham to quad co-contraction

This position is important to maintain in stance, jumping and landing. This is a position not typically favored by the adolescent female athlete and needs to be encouraged and trained into the athlete’s motion patterns.

The athlete should be encouraged to maintain a slight bend to the knee and avoid knee hyperextension (snapping the knee past straight).

On landing a jump, the weight should be accepted on the ball of the foot with a slight bend to the knee.

Avoid allowing the knee to drop into a position of valgus (knock-knee) at any time.
MODULE ONE: DYNAMIC WARMUP AND COOL DOWN

• 10-20 minutes
• May be dependent on:
  • the age of the athlete
  • current physical condition and prior exercise experience
• Prepares the body for the demands of a work out or practice
  • Increases heart rate, respiratory rate and blood flow to the muscles
  • Increases core body temperature
  • Enhances muscle elasticity
  • Warm up should include exercises for both the upper and lower extremities
  • Progress from low to a higher intensity
  • Include all planes of motion
  • Start in the sagittal plane and progress to multidirectional
  • The athlete should break a sweat during the dynamic warm-up without becoming fatigued

• Warning: May induce fatigue prior to activity in deconditioned athlete – watch for signs of fatigue before progressing to next module.

Specific exercises for the dynamic warmup (ranging from easy to difficult):

Slow jog 30’ x 2

Walk on toes 30’ x 2: Works on ankle motion, strengthening of gastroc and balance

Arm swing (chin to wallet): 10-15 sec. Works on running form, start at slow speed and increase, work through shoulder range of motion, maintaining a 90 degree angle at the elbow. Cues: chin to wallet.
Arm hugs: Works on shoulder ROM, start at slow speed, then increase. Slowly increase the range of motion. 10-15 sec in each direction.

Arm circles: Works on shoulder ROM, start with small circles and increase the range. Work in both directions. 10-15 sec x 2 each direction.
**Straight leg kicks:** Hamstrings, hip flexion, core stability. Stand tall, kick leg up in front. Keep knee straight and dorsiflex the ankle. Reach for the toes. Alternate legs while walking forward. Avoid slouching forward when reaching for toes. Maintain alignment of stance leg. 30’ x 2

**Leg swings**
- Can be performed front/back and side
- Hip range of motion
- Hold onto something for support
- Maintain control of the limb
- Avoid excessive forward trunk flexion and lumbar lordosis
- 15 sec
“Open and close the gate”
- Hip motion, balance
- March leg up in front and then abduct hip
- Keep ankle dorsiflexed
- Leg back to midline
- Step forward and switch legs
- Avoid excessive trunk lean
- Maintain alignment of stance leg
- 30’ x 2

High knee walk: Hip flexion, sprinting component
- Walking forward lift the knee as high as possible
- Ankle is dorsiflexed
- Upper extremities, proper running form
- Verbal cue: to step over tall object
- Can incorporate a hug around the leg, just below the knee
- Maintain alignment of stance leg
- 30’ x 2
Butt kickers
- Kick leg up so that foot approaches butt while jogging forward
- Hamstrings
- Maintain alignment of stance leg
- 30’ x 2

Hip internal rotation
- Kick feet out to the side, alternating legs
- Hand touches foot
- Avoid excessive trunk rotation
- 30’ x 2
Hip external rotation
- Kick legs across body with a “skipping” type motion
- Hand touches opposite foot
- Avoid excessive trunk rotation
- 30’ x 2

High knee while jogging laterally
- Higher level activity
- Maintain ankle dorsiflexion, upright trunk, and proper running form for arms
- 30’ x 2
Ankle flips
- Up on toes, knees straight, jogging motion
- Push off through the feet while moving forward
- 30’ x 2

Lunge walk
- Moving forward or backward
- Slowly lowering into lunge position
- Maintain upright trunk and lower extremity alignment, thigh parallel with floor, knee should not advance beyond toes
- Can add trunk rotation
- 30’ x 2
Inverted hamstring
- Works on hamstrings, gluts, balance, and core strength
- While moving backwards, reach down towards the floor lift leg back keeping knee and back straight
  - 30’ x 2

Back pedal run
- Maintaining good running form
- More advanced
- Maintain a slightly flexed forward position at the hip
Inch worm
- Works on hamstrings, shoulder, and core strength
- Start in push up position with chest on ground, pike up walking feet up towards hands, keep feet flat on the ground, then walk hands out
  - 5 x

Rapid response
- Tapping feet and pumping arms quickly
- Small excursions
- 10 sec intervals

Progress rapid response with front, side, back, or diagonal foot taps
- 10 sec intervals
Add reactive running upon coaches cue

Cool-Down: Many of these exercises can also be used to cool down the athlete after exercise. A dynamic cool-down is recommended after each training session.
MODULE TWO: PLYOMETRICS

What are Plyometrics?
Plyometrics are exercises that involve pre-stretching a muscle before it is contracted. (Bending your knees pre-stretches your quadriceps prior to jumping) Energy is stored as potential energy during this pre-stretch period and is released as kinetic energy during the concentric contraction.

Goals of Plyometrics
The goal of these exercises is to allow the athlete to reach maximal strength in as short a time as possible (Allerheigen, 1994). Very basic exercises are recommended for beginners. These are achieved by jumping up onto stable objects. This minimizes the effect of gravity on the landings, thereby reducing stress on the body. The athlete is not progressed to the next step until he/she is able to perform the jumping exercise with proper alignment and control with their landing. We also only perform a few repetitions (5 reps per set) with long rest periods (1-2 minutes) and limit these exercises to 2x/week. Each athlete performs less than 45 foot contacts per session with plyometric exercises. The reason for this is that the focus should be on quality of the exercise and maintaining form, rather than the quantity of repetitions. If more than a few reps are performed, the athlete tends to lose the intensity, explosiveness, and quality of the movement and can place themselves at greater risk for injury.

What is a good plyometric jump?
The components for proper alignment involve a level pelvis, upright posture and an imaginary straight line drawn from the thigh, through the knee, down through the shin, and crossing over the second toe. If an athlete is unable to land quietly in the same position that he/she started in, then it is not considered a good jump.

Criteria for progression
Perfect alignment and the ability to land without a sound are required for each level of plyometrics before progression is allowed.

Exercise progression
(Below is a list of 5 simple steps to progress your athlete.) The athlete may progress to the next step if able to jump and land properly with the specified criteria. The athlete must be able to jump and “stick” landing (hold position for three seconds).
1. **Jump off and land on 2 legs.** Begin jumping over a piece of tape, be sure the athlete can jump and land over a short distance off of two legs with perfect form before progressing the exercises.

2. **Jump off 1 leg and land on two legs.** Perform 5 repetitions and switch legs to ensure symmetry.
3. Jump off 2 legs and land on one leg.

4. Jump off one leg and land on one leg.

5. Jumping and landing onto higher obstacles will help decrease the forces of acceleration and gravity that are placed upon the athlete’s joints, while increasing the challenge of the exercise. The athlete should jump up onto the box of step and step off (not jump off).
Once the athlete has mastered each jump for at least 2 consecutive practice sessions you can progress the challenge of the exercise. Examples may include exercises involving jumping up and down, jumping over obstacles, jumping front to back, side to side, diagonal, and rotation. Only progress your athlete if they are able to jump and land properly with the specified criteria.

Reps and sets-Sets and reps can vary greatly depending on your particular setting, but for safety reasons we recommend that your athletes do not exceed 45 repetitions in any one session. A repetition can be considered a foot contact. Plyometrics can be performed anywhere from 2-4 times in one week, but the athletes should have no more than 100 contacts per week. Be sure that your athletes rest at least one minute between repetitions and have at least one day off in between a session that consists of plyometric jumps.

Red flags-unable to land softly, poor alignment, poor posture, signs of fatigue, pain with any of the exercises, inability to achieve an identical start or end position, landing with limited or excessive knee, hip, or trunk flexion.

Program Progression: Height of jumps can be added, as well as directional changes. Additional plyometric exercises for advanced athletes are shown below. The last step in the progression is repetitive jumps without sticking the landing (considered by many to be a true plyometric jump).

LATERAL JUMPS
T JUMPS (numbered squares)

ZIG ZAG DOUBLE JUMPS

FORWARD/BACK (cone, line) hops
SINGLE LEG LATERAL

180 DEGREE BOTH DIRECTIONS

ZIG ZAG SINGLE LEG
MODULE THREE: AGILITY
Agility is the ability to effectively and efficiently change direction, and to coordinate a variety of tasks simultaneously. Components of agility include: dynamic flexibility, coordination, power, dynamic balance, acceleration, deceleration and stopping ability, and strength. A comprehensive agility program includes these components and movements that reflect circumstances in sports practice and competition. When basic movements are mastered and performed 100% accurate, more complex movements are integrated to simulate what is required of the athlete on the field.

Drills can include: running forward, backward, sideways; in varied patterns

**Progression:** Simple to complex
- Increase speed and intensity
- Forward/backward to lateral movements
- Running to shuffle to crossovers
- Stagger distances between direction changes
- Call out stops or changes of direction
- Catch or dribble a ball during the drill
- Time the drill

**Things to watch for:**
Drills are NOT progressed until movements are performed correctly:
- Keep center of gravity low
- Maintain power position: forward trunk flexion, knees flexed, feet shoulder width apart
- Knees should stay behind toes—avoid extreme knee flexion
- Knees should be centered—keep straight alignment between hips, knees and ankles
- Land softly with knee flexed
- Movements should be precise: watch for over stepping or mis-stepping.

**Drill #1**

Begin at star. Sprint forward 5 yards, backpedal to starting line. Repeat for 10, 15, and 20 yds.
Drill 2: Start at the star. Sprint forward toward the right until you reach the cone, backpedal to the center of the ‘V’. Repeat sprinting toward the left cone and backpedal until you reach the starting position.
**Drill 3**: Begin at the star. Sprint forward to the cone then shuffle to the left. Sprint forward to the farthest cone and shuffle right back to the midpoint. For the last leg, backpedal to the starting line.

**Drill 4**: Sprint forward to the cross line. Shuttle sideways in the direction called out to you. Switch directions shuttling when called.
Drills 6 - 12: Agility Ladder
- Forward and lateral
- Jumping and hopping
- Frequent change of direction

Examples
- Quick Foot Run: rapid foot steps in each box
- High Knee Run: emphasis marching knee motion in each box
- Hop Scotch: both feet jump in, both feet jump out
- Lateral Front Backs: step forward and back as you travel sideways
- 90° Straddle Hops: jump straddling ladder rungs while turning 90 degrees with each jump
- Zig Zag Hop: on one leg, hop diagonally across length of ladder
- Lateral Hop: hop sideways on one foot throughout each box

Drill 5: Beginning at cone #1, spring to and around cone #2. Shuttle sideways to and around cone #3. Sprint to and around cone #4. Shuttle sideways to cone #1.
Progression: Increase speed and complexity

- Begin with forward/backward movement and progress with integration of lateral movements
- Ideas
  - Forward
  - Back pedal
  - Stagger or spread cones
  - Called out stops/change of direction
  - Shuffle
  - Crossovers
  - Catch or dribble a ball
  - Timed
  - Relay between athletes

Things to Watch For

- Quality of Movement
  - Accurate, precise movement
  - Body awareness: no overstepping or mis-stepping
  - Keep center of gravity low. This will facilitate quick acceleration, deceleration, and change of direction
  - Maintain power position: forward trunk flexion, knees flexed, feet shoulder with apart
  - Knees should stay behind toes—avoid extreme knee flexion
  - Knees should be centered—keep straight alignment between hips, knees and ankles
  - Land softly with knee flexed

- Progress drills only when skill/movements are mastered!!
**MODULE FOUR: STRENGTHENING**

Guidelines for strengthening
Exercises should be done with appropriate posture and body alignment throughout.
Movements need to be controlled, smooth and through a complete range of motion.
Breathing patterns need to be correct throughout the exercises.
Repetitions are usually 10-15/set and all must be performed well.
Sets of repetitions are usually 3.
Resistance at 60% or less maximum effort level only
Relaxation between reps and sets

Specific Strengthening Exercises that can be used in this module are illustrated on the next pages. The strengthening program can be progressed with addition of free weights (low weights), use of elastic materials, machines to provide resistance.

Typical strengthening exercises include:
Curl-ups, arms crossed 1 set 10
Curl-ups, hands behind, 1 set of 10
Sit-backs, 1 set of 10
Bridging, 1 set of 10
Bridging from neutral, 1 set of 10
Bridging with knee extension, 1 set of 10
Forward lunges, 1 set of 10
Backward lunges, 1 set of 10
Toe raises, 1 set of 10
Walking on toes, 1 set of 10
Heel raises, 1 set of 10
1. Curl-Ups, Arms Crossed, 1 set of 10
Lie on your back with your knees bent, feet flat on the floor, and your arms crossed (hands on the opposite shoulder). Tighten your abdominal muscles as you lift your head and shoulders (clear inferior angle) from the floor (keep your chin tucked). Hold for 3-5 seconds, then relax. Begin with 1 set of 10 reps.

Progression can be accomplished by: (1) changing hands to holding behind head /or coming to a full sit-up and controlled return.
Do 1 set of 10

2. Curl-Ups, Part 2, Hands Behind, 1 set of 10
Changing hands to behind your head is an example of progression in difficulty. Do 1 set of 10

3. Sit-Backs, 1 set of 10
Controlled descent to a starting position can be used as a progression. Maintaining control throughout is important. Do 1 set of 10
1. Bridging, 1 set of 10
Lie on your back with your knees bent, feet flat on the floor, and your arms at your sides. Do a pelvic tilt, tighten your abdominal and buttock muscles as you lift your buttocks off the floor. Be sure to keep pelvis level throughout. Hold for 3-5 seconds. Relax, returning to the starting position. Do 1 set of 10 reps. This is the basic exercise. Do 1 set of 10.

2. Bridging from Neutral, 1 set of 10
As a progression, use your abdominal muscles to find your neutral position. Then using your buttock muscles, slowly lift your hips and buttocks off the floor without bending your lower back. Hold for 3-5 seconds. Return slowly to the starting position maintaining the pelvic tilt. Again hold for 3-5 sseconds. Do 1 set of 10 reps. Do 1 set of 10.

3. Bridging with Knee Extension, 1 set of 10
Find your neutral position, then raise your buttocks slowly off the floor. While maintaining this neutral position, lift one leg off the floor then slowly straighten your knee. Hold 3-5 seconds. Keep your arms, neck and shoulders relaxed and maintain normal breathing patterns. Slowly return to the starting position. Do 1 set(s) of 10 reps. This also can be made more difficult by placing a weight on the lower leg. Do 1 set of 10.
1. Forward Lunges, 1 set of 10
Find your neutral position. Step forward and bend knees slowly to lower your trunk. Maintain alignment e.g. keeping forward knee over 2nd toe. Keep your trunk upright and pelvis in neutral. Slowly return to starting position. Keep the motion slow and controlled. Keep your breathing patterns even as well. Do 1 set of 10 steps each leg. Progression is by lunging/walking forward. Do 1 set of 10

2. Backward Lunges, 1 set of 10
Find your neutral position (shoulder, trunk, hip alignment) Step backward bending the back knee toward the floor, stabilize the upright position with your abdominal muscles. Return to the starting position keeping your trunk square and straight and the motion smooth and controlled. Do 1 set of 10 reps each leg. Progression in difficulty is by walking/lunging backward. Do 1 set of 10
1. Toe Raises, Standing, 1 set of 10
Raise up on your toes as far as possible from a standing position. Use a friend for balance minimally, if necessary. Progression can by doing on one foot. Do 1 set of 10 reps. Do 1 set of 10

2. Walking on Toes, 1 set of 10
As a progression, rise up on your toes and walk. Keep knees straight and try to stay as high on your toes as possible. Walk about 10 feet. Repeat with 10 heel raises followed by an additonal walk. Do 1 set of 10

3. Heel Raises, 1 set of 10
Standing with balls of toes on edge of a 2” x 4” board, slowly raise up onto your toes bringing the heels of your feet off the ground. Check at foot flat position (hip, knee and ankle alighnment) and continue to come to full raises. Hold this position for 3-5 seconds, then return to starting position. Do 1 set of 10 reps. Do 1 set of 10
MODULE FIVE: PROPRIOEPTION

Proprioception allows the body to maintain stability and orientation during static and dynamic activities at both the conscious and unconscious level. Mechanoreceptors are neurosensory cells that are responsible for monitoring joint position and movement. A proprioception program should stimulate these mechanoreceptors that encourage joint stabilization, balance, and postural activities at both the conscious and unconscious level.

- single leg stance on level surface
- single leg stance on soft or unstable level
- dynamic balance on wobble board
- dynamic balance with directional changes e.g. walking on balance beam

Progression of these activities include:

- eyes opened
- catch/throw ball
- kick ball
- eyes closed

Single Leg Stance (SLS)

**Description:**
athlete stands on one leg hands at hips
minimal body sway (less than 20%)
maintain for 60 seconds

**Progression:**
maintain for > 60 seconds
eyes open
vary arm position
catch/throw ball
eyes closed

**Red Flags:**
excessive body sway > 20%
excessive knee valgus
observe strategies for balance
quality of movement
Single Leg Stance
soft/unstable surface

Description:
athlete stands on one leg hands at hips
on pillow or foam ½ roller
minimal body sway (less than 20%)
maintain for 60 seconds

Progression:
maintain for > 60 seconds
eyes open
vary arm position
catch/throw ball
eyes closed

Red Flags:
excessive body sway >20%
excessive knee valgus
quality of movement

Examples of soft/unstable surfaces:
Proprioception: Dynamic Balance
wobble board
(varying degrees of angles)

**Description:**
- feet planted on center of board
- begin with slow controlled movements side to side
- slow controlled movements front to back
- circular motions
- head up, edge of board should not touch the floor

**Progression:**
- both legs
  - eyes open
  - catch/throw ball
  - eyes closed
- single limb
  - eyes open
  - catch/throw ball
  - eyes closed

**Red Flags:**
- excessive body sway
- excessive knee valgus
- quality of movement
Proprioception: Dynamic Balance
Walking on Balance Beam

Description:
foot planted center on balance beam
hands on hips

Progression:
single leg stance
eyes open
eyes close
forward/backward
eyes open
catch/throw ball
kick ball
eyes closed

Red Flags:
excessive body sway
excessive knee
valgus
quality of movement
MODULE SIX: STRETCHING

FLEXIBILITY: Flexibility is necessary for the control and completion of movements through maximum allowable ranges. Stretching exercises aim to achieve full range of motion at each joint and for each muscle group, particularly two joint muscles. An effective stretching program reduces stress on ligaments, muscles and tendons and facilitates smoother movements.

Example: Hamstring Stretch

![Hamstring Stretch Image]

Courtesy of Children’s Hospital, Boston Physical Therapy Department

DAILY STRETCHES:
(see following pages for details on stretches)
Quadriceps Stretch
Hip Flexor Stretch
ITB Stretch
Hamstrings Stretch
Calf Stretch

Hold each stretch for 30 seconds, repeat 3 times on each side (15 min total for stretching daily).
**ANTERIOR HIP FLEXOR STRETCH**

Assume 1/2 kneeling position; place small rolled towel under bent knee; assume pelvic tilt; lean forward, so hip is ahead of bent knee—be sure to maintain pelvic tilt; you should feel the stretch in front of hip.

Hold stretch for a minimum of 30 seconds.
HAMSTRING STRETCH

A. **START POSITION** --- with buttocks 15 inches from the wall and legs extended against the wall, assume pelvic tilt by tightening buttock and abdominal muscles.

B. Place strap around forefoot and secure ends in each hand; Pull toes toward you, keep knee straight as you pull entire leg toward you; you should feel the stretch in the lower portion of the hamstrings and the upper portion of your calf.

Hold stretch a **MINIMUM OF 30 SECONDS**.

Perform exercise 3 to 5 times for each leg.

M. Cassella, P.T.
Children's Hospital
Boston, MA.
Longsitting Hamstring and Proximal Gastrocnemius (calf) Stretch

1. Keep back erect and place firm strap around ball of foot and grasp ends with hands

2. Now point foot against resistance of strap, hold 5 repeat 3 times

3. Pull forefoot toward you as you lean forward at your hips, keeping your back straight, be sure to keep leg in contact with floor at all times

You will feel a stretch behind your knee in both your hamstrings and proximal calf muscles

Hold each stretch for 30 seconds
Knee Injury Prevention for the Middle and High School Age Athlete
Sunday, June 4, 2006

2. POINT FOOT AGAINST RESISTANCE OF STRAP

3. FLEX FOOT FORWARD USING STRAP

1. START POSITION

1. Lie as illustrated
2. Point foot against resistance of strap, hold to count of 5, repeat 3X
3. Flex foot forward using strap, you will feel a stretch behind knee, hold 30 seconds, relax and repeat sequence 3X

M. Cassella, P.T.
Children's Hospital
QUADRICEPS STRETCH—SIDELYING POSITION

1. Lie on side with bottom leg flexed and top leg parallel to the floor, as illustrated below

2. Bend knee of top leg and pull leg back by grasping front of ankle with hand

3. Keep hip forward as you pull top leg back; be sure your thigh is behind your hip; also be sure thigh remains parallel to the floor

4. You should feel the stretch on the front of your thigh (quadriceps muscle)

5. HOLD STRETCH FOR 30 SECONDS, RELEASE AND REPEAT 3 TIMES; SWITCH SIDES AND REPEAT EXERCISE
BACK TO MODULE 1: COOL DOWN

- 5-10 minutes at the end of the sport activity
- Slowly decelerate the body from a heightened state
- Can utilize similar activities from the dynamic warm up at a lesser intensity
- Static stretching can also be included in the cool down period

SIGNS AND SYMPTOMS TO WATCH FOR

Fatigue: Loss of correct body position, inability to land quietly or control movements

Pain: ANY pain during exercise is a warning sign and the athlete should stop the exercise.

Body power position: forward trunk flexion, knees flexed, feet shoulder width apart.

Knee Position: Avoid valgus and/or hyperextension with stance, jumping or landing

Drills should NOT be progressed until movements are performed correctly.

Movements should be precise: watch for over stepping or mis-stepping.
SAMPLE PROGRAM

Six week preseason training program, four days per week, one hour each day:

Weeks 1 and 2 - Group A: 2 times per week

Module 1: Dynamic Warmup 10 min
- Slow jog 30’ x 2
- Walk on toes 30’ x 2
- Arm swing (chin to wallet): 10-15 sec
- Arm hugs (10 – 15 sec)
- Arm circles 10-15 sec each dir
- Straight leg kicks 30’ x 2
- Leg swings 15 sec
- Open and close gate 30’ x 2
- High knee walk 30’ x 2
- Butt Kickers 30’ x 2
- Hip IR 30’ x 2
- Hip ER 30’ x 2

Module 2: Plyometric training 15 min
- Plyometric – emphasis on controlled jumping, soft landings, no wobbling, no double jumps

Beginning low intensity 45 touches.

1. Jump off and land on 2 legs. Begin jumping over a piece of tape, be sure the athlete can jump and land over a short distance off of two legs with perfect form before progressing the exercises.
2. Jump off 1 leg and land on two legs. Perform 5 repetitions and switch legs to ensure symmetry.
3. Jump off 2 legs and land on one leg.
4. Jump off one leg and land on one leg.
5. Jumping and landing onto higher obstacles

Once athlete demonstrates good jumping form and progress as follows: shuffle hop, squat jumps, ice-skater, cone/line hop

Note: exercises start as stick and holds and progress to quick fire or hot foot

Module 3: Agility Training: 10 minutes
- Sprint 50 yards
- Sprint 30 yards backward
- Side-to-side shuffle
- Carioca both ways
- 10 yard circle both ways
- 15 yard figure-8 both ways

Module 6: Stretching: 10 minutes
2 x 30 seconds each side: Hip Flexors, quadriceps, hamstrings, iliotibial band, calf stretch

Module 1: Cool Down: 10 minutes
Sample Plyometrics for Weeks 1 and 2

SHUFFLE HOP

SQUAT JUMPS

ICE SKATER
LATERAL CONE/LINE HOP
Weeks 1 and 2: Group B: Two times per week

Module 1: Dynamic Warmup 10 min
Slow jog 30’ x 2
Walk on toes 30’ x 2
Arm swing (chin to wallet): 10-15 sec
Arm hugs (10 – 15 sec)
Arm circles 10-15 sec each dir
Straight leg kicks 30’ x 2
Leg swings 15 sec
Open and close gate 30’ x 2
High knee walk 30’ x 2
Butt Kickers 30’ x 2
Hip IR 30’ x 2
Hip ER 30’ x 2

Module 2: Strength training 20 min, 20 repetitions, 2 sets
- Dumbbell sits
- Leg curls
- Leg extensions
- Heel (calf) raises
- Chair scoots
- Straight leg hamstring lifts
- Hip adduction

Module 3: Proprioceptive Training: 10 minutes
- Single leg balance
- Single leg with kick
- Single leg on pillow
- Single leg on pillow with eyes closed

Module 6: Stretching: 15 minutes
2 x 30 seconds each side: Hip Flexors, quadriceps, hamstrings, iliobibial band, calf stretch

Module 1: Cool Down: 10 minutes
Weeks 3 and 4 - Group A: 2 times per week

Module 1: Dynamic Warmup 10 min
Slow jog 30' x 2
Walk on toes 30’ x 2
Arm swing (chin to wallet): 10-15 sec
Arm hugs (10 – 15 sec)
Arm circles 10-15 sec each dir
Straight leg kicks 30’ x 2
Leg swings 15 sec
Open and close gate 30’ x 2
High knee walk 30’ x 2
Butt Kickers 30’ x 2
Hip IR 30’ x 2
Hip ER 30’ x 2
ADD: Ankle flips 30’ x 2
Lunge walk 30’ x 2
Inverted hamstring 30’ x 2
Back pedal run 30’ x 2

Module 2: Plyometric training 15 min
Plyometric – emphasis on controlled jumping, soft landings, no wobbling, no double jumps

Medium intensity 45 touches.

Assuming athlete demonstrates good jumping form with prior plyometrics in Weeks 1 and 2, then progress as follows: plyometrics lateral jumps, T jumps, Zig Zag Double Jumps, Forward/Back hops.

Note: exercises start as stick and holds and progress to quick fire or hot foot

Module 3: Agility Training: 15 minutes
Sprint 50 yards
Sprint 30 yards backward
Side-to-side shuffle
Carioca both ways
10 yard circle both ways
15 yard figure-8 both ways
ADD: 100 yard sprint
5 yard circle
5 yard figure 8 both ways

Module 6: Stretching: 10 minutes
2 x 30 seconds each side: Hip Flexors, quadriceps, hamstrings, iliotibial band, calf stretch

Module 1: Cool Down: 10 minutes
Sample Plyometrics Weeks 3 and 4
LATERAL JUMPS

T JUMPS (numbered squares)
ZIG ZAG DOUBLE JUMPS

FORWARD/BACK (cone, line) hops
Knee Injury Prevention for the Middle and High School Age Athlete
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**Weeks 3 and 4 - Group B: Two times per week**

**Module 1: Dynamic Warmup 10 min**
- Slow jog 30’ x 2
- Walk on toes 30’ x 2
- Arm swing (chin to wallet): 10-15 sec
- Arm hugs (10 – 15 sec)
- Arm circles 10-15 sec each dir
- Straight leg kicks 30’ x 2
- Leg swings 15 sec
- Open and close gate 30’ x 2
- High knee walk 30’ x 2
- Butt Kickers 30’ x 2
- Hip IR 30’ x 2
- Hip ER 30’ x 2
**ADD: Ankle flips 30’ x 2**
**Lunge walk 30’ x 2**
**Inverted hamstring 30’ x 2**
**Back pedal run 30’ x 2**

**Module 2: Strength training 20 min, 20 repetitions, 2 sets**
- Dumbbell sits
- Leg curls
- Leg extensions
- Heel (calf) raises
- Chair scoots
- Straight leg hamstring lifts
- Hip adduction
  **ADD: Lunges, step-ups, abdominals, hamstring push-ups**

**Module 3: Proprioceptive Training: 10 minutes**
- Single leg balance
- Single leg with kick
- Single leg on pillow
- Single leg on pillow with eyes closed
  **ADD: Wobble board single leg, play catch on wobble board, theraband perturbations**

**Module 6: Stretching: 15 minutes**
- 2 x 30 seconds each side: Hip Flexors, quadriceps, hamstrings, iliotibial band, calf stretch

**Module 1: Cool Down: 10 minutes**
Module 1: Dynamic Warmup 10 min
Slow jog 30’ x 2
Walk on toes 30’ x 2
Arm swing (chin to wallet): 10-15 sec
Arm hugs (10 – 15 sec)
Arm circles 10-15 sec each dir
Straight leg kicks 30’ x 2
Leg swings 15 sec
Open and close gate 30’ x 2
High knee walk 30’ x 2
Butt Kickers 30’ x 2
Hip IR 30’ x 2
Hip ER 30’ x 2
Ankle flips 30’ x 2
Lunge walk 30’ x 2
Inverted hamstring 30’ x 2
Back pedal run 30’ x 2
ADD: Inch worm 5x
Rapid response 10 sec intervals
   Progress to coach cues for changes

Module 2: Plyometric training 15 min
Plyometric – emphasis on controlled jumping, soft landings, no wobbling, no double jumps
High intensity 45 touches.
Assuming athlete demonstrates good jumping form with prior plyometrics in Weeks 1 and 2,
then progress as follows: single leg lateral, 180 degree, zig zag single leg, cones/line hop with reaction to directive
Note: exercises start as stick and holds and progress to quick fire or hot foot

Module 3: Agility Training: 15 minutes
Sprint 50 yards
Sprint 30 yards backward
Side-to-side shuffle
Carioca both ways
10 yard circle both ways
15 yard figure-8 both ways
100 yard sprint
5 yard circle
5 yard figure 8 both ways
ADD: Star hop, square drill (fun, shuffle, backpedal, carioca), suicides line drill, 100 yard sprint – cut different direction every 10 yards

Module 6: Stretching: 10 minutes
2 x 30 seconds each side: Hip Flexors, quadriceps, hamstrings, iliotibial band, calf stretch

Module 1: Cool Down: 10 minutes
Sample Plyometrics for Weeks 5 and 6

SINGLE LEG LATERAL

180 DEGREE BOTH DIRECTIONS

ZIG ZAG SINGLE LEG

 Cone/Line Hop with Reaction to Directive
Weeks 5 and 6 - Group B: Two times per week

Module 1: Dynamic Warmup 10 min
- Slow jog 30’ x 2
- Walk on toes 30’ x 2
- Arm swing (chin to wallet): 10-15 sec
- Arm hugs (10 – 15 sec)
- Arm circles 10-15 sec each dir
- Straight leg kicks 30’ x 2
- Leg swings 15 sec
- Open and close gate 30’ x 2
- High knee walk 30’ x 2
- Butt Kickers 30’ x 2
- Hip IR 30’ x 2
- Hip ER 30’ x 2
- Ankle flips 30’ x 2
- Lunge walk 30’ x 2
- Inverted hamstring 30’ x 2
- Back pedal run 30’ x 2

ADD: Inch worm 5x

Rapid response 10 sec intervals
- Progress to coach cues for changes

Module 2: Strength training 20 min, 10-12 repetitions, resistance changes accordingly)
- Dumbbell sits
- Leg curls
- Leg extensions
- Heel (calf) raises
- Chair scoots
- Straight leg hamstring lifts
- Hip adduction
- Lunges
- Step-ups
- Abdominals
- Hamstring push-ups

Module 3: Proprioceptive Training: 10 minutes
- Single leg balance
- Single leg with kick
- Single leg on pillow
- Single leg on pillow with eyes closed

ADD: Wobble board single leg, play catch on wobble board, theraband perturbations

Module 6: Stretching: 15 minutes
2 x 30 seconds each side: Hip Flexors, quadriceps, hamstrings, iliotibial band, calf stretch

Module 1: Cool Down: 10 minutes
The Santa Monica Orthopaedic and Sports Medicine Research Foundation
The PEP Program: Prevent injury and Enhance Performance

This prevention program consists of a warm-up, stretching, strengthening, plyometrics, and sport specific agilities to address potential deficits in the strength and coordination of the stabilizing muscles around the knee joint. It is important to use proper technique during all of the exercises. The coaches and trainers need to emphasize correct posture, straight up and down jumps without excessive side-to-side movement, and reinforce soft landings. This program should be completed 3 times a week.

The field should be set up 10 minutes prior to the warm-up. This will allow for a smooth transition between the activities. A sample field set-up has been included in your packet.

This program should take approximately 15 – 20 minutes to complete. Along side 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.

1. **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.

   A. **Jog line to line** (cone to cone): Elapsed Time: 0 - .5 minute
      
      *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

   B. **Shuttle Run** (side to side) Elapsed Time: .5 to 1 minute
      
      *Purpose:* engage hip muscles (inner and outer thigh). This exercise will promote increased speed. Discourage inward caving of the knee joint.
      
      *Instruction:* Start is 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.

   C. **Backward Running** Elapsed Time: 1 – 1.5 minutes
      
      *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.
2. Stretching: It is important to incorporate a short warm-up prior to stretching. Never stretch a “cold muscle”. By doing the exercises outlined here, you can improve and maintain your range of motion, reduce stiffness in your joints, reduce post-exercise soreness, reduce the risk of injury and improve your overall mobility and performance.

- Do a large muscle warm-up such as brisk walking for five to 10 minutes before stretching.
- Don't bounce or jerk when you stretch. Gently stretch to a point of tension and hold.
- Hold the stretch for 30 seconds. Concentrate on lengthening the muscles when you're stretching.
- Breathe normally. Don't hold your breath.

A. Calf stretch (30 seconds x 2 reps) Elapsed Time: 1.5 to 2.5 minutes
   **Purpose:** stretch the calf muscle of the lower leg
   **Instruction:** 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.

B. Quadricep stretch (30 seconds x 2 reps) Elapsed Time: 2.5 to 3.5 minutes
   **Purpose:** stretch the quadriceps muscle of the front of the thigh
   **Instruction:** 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. Don’t allow knee to wing out to the side and do not bend at the waist. Hold for 30 seconds. Switch sides and repeat.

C. Figure Four Hamstring stretch (30 sec x 2 reps) Elapsed Time: 3.5 – 4.5 min
   **Purpose:** To stretch the hamstring muscles of the back of the thigh.
   **Instruction:** 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.

D. Inner Thigh Stretch (20 sec x 3 reps) Elapsed Time: 4.5 – 5.5 min
   **Purpose:** Elongate the muscles of the inner thigh (adductor group)
   **Instruction:** 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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E. Hip Flexor Stretch – (30 sec x 2 reps) Elapsed Time: 5.5- 6.5 min

Purpose: Elongate the hip flexors of the front of the thigh.
Instruction: 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.

3. Strengthening: This portion 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.

A. Walking Lunges (3 sets x 10 reps) Elapsed Time: 6.5 – 7.5 min

Purpose: Strengthen the thigh (quadriceps) muscle.
Instruction: 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 your keep your front knee over your ankle. Control the motion and try to avoid you front knee from caving inward. If you can’t see your toes on your leading leg, you are doing the exercise incorrectly.

B. Russian Hamstring (3 sets x 10 reps) Elapsed Time: 7.5 –8.5 min

Purpose: Strengthen hamstrings muscles
Instruction: Kneel on the ground with hands at your side. Have a partner hold firmly at your ankles. With a straight back, lead 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. 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.

C. Single Toe Raises (30 reps x 2 reps) Elapsed Time: 8.5 – 9.5 min

Purpose: This exercise strengthens the calf muscle and increases balance.
Instruction: 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.
4. **Plyometrics** – These 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.

**A. Lateral Hops over Cone** (20 reps) Elapsed Time: 9.5 – 10 min  
*Purpose:* Increase power/strength emphasizing neuromuscular control  
*Instruction:* Stand with a 6” cone to your left. Hop to the left over the cone softly landing on the balls of your feet land bending at the knee. Repeat this exercise hopping to the right.

**B. Forward/Backward Hops over cone** (20 reps) Elapsed Time: 10 – 10.5 min  
*Purpose:* Increase power/strength emphasizing neuromuscular control  
*Instruction:* 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.

**C. Single Leg hops over cone** (20 reps) Elapsed Time: 10.5 – 11 min  
*Purpose:* Increase power/strength emphasizing neuromuscular control.  
*Instruction:* 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.

**D. Vertical Jumps with headers** (20 reps) Elapsed Time: 11 – 11.5 min  
*Purpose:* Increase height of vertical jump.  
*Instruction:* 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.

**E. Scissors Jump** (20 reps) Elapsed Time: 11.5 – 12 min  
*Purpose:* Increase power and strength of vertical jump.  
*Instruction:* 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.
5. Agilities

A. Shuttle run with forward/backward running Elapsed Time 12 – 13 min
   Purpose: Increase dynamic stability of the ankle/knee/hip complex
   Instruction: Starting at the first cone, sprint forward to the second cone, run
   backward to the third cone, sprint forward to the fourth cone (etc…).

B. Diagonal runs (3 passes) Elapsed Time 13 – 14 min
   Purpose: To encourage proper technique/stabilization of the outside planted foot to
deter the position from occurring.
   Instruction: 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.

C. Bounding run (44 yds) Elapsed Time 14 – 15 min
   Purpose: To increase hip flexion strength/increase power/speed
   Instruction: 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.

6. Alternative Exercises – Warm Down and Cool Down
We all know how imperative a cool down is. Please don’t skip it. It allows the muscles
that have been working hard throughout the training session to elongate and deters the
onset of muscle soreness. Please emphasize the importance of adequate fluid intake
(optimally water). Athletes should have a water bottle by their side during the cool down.
The cool down should take approximately 10 minutes. It should begin with a slow jog to
allow the heart rate to come down before stretching. This should be followed by some
light strength training exercises. We are recommending two strengthening exercises (see
below). Finally, stretch the hamstrings, calves, inner thigh, quadriceps, and low back (all
of these are explained in the protocol). In addition to those basic stretches, we are offering
some additional stretches to target 3 muscle groups that are often forgotten.

A. Bridging with Alternating Hip Flexion (30 reps)
   Purpose: Strengthen outer hip muscles (Hip abductors, flexors) and buttocks
   Instruction: 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. As you get stronger, you will place your feet on top of a ball
and repeat the exercise.
B. **Abdominal Crunches** (30 reps x 2 reps)

*Purpose:* Strengthen the abdominals (rectus abdominus, obliques)

*Instruction:* Lie on the ground with your 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.

C. **Single and Double Knee to Chest** (supine) (30 sec x 2 reps)

*Purpose:* Elongate the low back muscles

*Instruction:* 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.

D. **Figure Four Piriformis stretch**- supine (30 sec x 2 reps)

*Purpose:* Elongate the rotators of the hip.

*Instruction:* 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 low back pain with this stretch, slowly lower your legs down and let your coach/trainer know.

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

*Purpose:* Elongate the inner thigh muscles (adductors).

*Instruction:* 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.

If you have any questions or concerns regarding this program, please contact Holly Silvers, MPT at (310) 315-0292 ext. 1283 or via email: HollySilversPT@aol.com.
FOR MORE INFO, CONTACT:

Division of Sports Medicine, Children’s Hospital of Boston, (617) 355-3501, www.kidssportsmed.org

Department of Physical and Occupational Therapy, Children’s Hospital of Boston, Boston, MA, (617) 355-7212


NOPCO (National Orthotics and Prosthetics Company), Boston, Burlington, Avon (617) 355-6887


Information on ACL Injury Prevention Programs available on the Internet:

Sports Metrics: The pioneering work in this area by Tim Hewett, ATC and Frank Noyes, MD. Videos and instructions on this program for collegiate athletes can be purchased through their website www.sportsmetrics.net

The Santa Monica PEP program: Work in soccer players spearheaded by Bert Mandelbaum, MD., and Holly Silvers, MPT. Website provides a detailed ACL injury prevention program that can be accomplished in 15 minutes 3 times per week during the season, replacing the traditional warm-up period. More information available on the website: www.aclprevent.com.