

## KNEE INJURY PREVENTION PROGRAM FOR MIDDLE AND HIGH SCHOOL AGE ATHLETES

### 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 must 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 may need to be individualized based on the athlete's response.

### DYNAMIC WARMUP: DAILY

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**

### ALTERNATE DAYS: PLYOS/AGILITY OR STRENGTHENING/PROPRIO 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.

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.



### AGILITY

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

Progression: Simple to complex

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

Things to watch for: drills are NOT progressed until movements are performed correctly:

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.

## STRENGTHENING

Improves the efficiency and effectiveness of the neuromuscular system and enhances muscle performance. The overload principle for improvement applied through the use of levers (body weight & position), free weights, and bands will be utilized. Core and extremity exercises will be included.

For example: abdominal strengthening

Partial sit-up >>>> Full sit-up

Arms forward >>>> Arms across

chest, arms behind head

Squat >>>> graduate depth until thighs are parallel to floor

## PROPRIOCEPTION

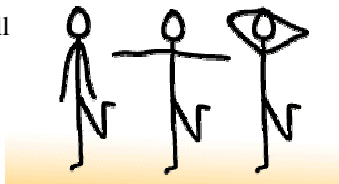
Proprioception allows the body to maintain stability and orientation during static and dynamic activities at both the conscious and unconscious level.

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



## STRETCHING: DAILY

**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.

Mickey will select example.

## COOL DOWN: DAILY

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

### FOR MORE INFO, CONTACT:

Division of Sports Medicine, Children's Hospital of Boston

Department of Physical Therapy, Children's Hospital of Boston, Boston, MA

JumpStart Physical Therapy, Natick MA

Sports and PT Associates, Boston, Chestnut Hill, Lexington and Wellesley