

## 9.0 INJURY PREVENTION TECHNIQUES:

### PRINCIPLES OF CONDITIONING

#### 9.1 GENERAL PRINCIPLES OF CONDITIONING

It is a well known fact that athletes are less likely to be injured when they are physically fit. In addition to being less likely to be injured, well conditioned athletes can perform at a higher level of intensity for longer periods of time without becoming fatigued. This resistance to fatigue allows fit athletes to be both physically and mentally in control of themselves from the drop of the puck until the final buzzer.

The basic components of fitness are,

- Aerobic Conditioning
- Anaerobic Conditioning
- Motor Coordination and Skill
- Muscular Endurance/Strength/Power
- Joint Flexibility

This section will briefly describe these components of fitness. To learn more the systems specific to your team, please consult a professional in this field.

#### **Aerobic Conditioning**

This is the training of the athlete to utilize oxygen as an energy source at different workloads. The athlete is generally training for a longer period of time at an intensity of anywhere from 65-85% of maximum exertion. The development of this energy system is critical in the game of hockey. A large degree of Aerobic Conditioning allows the player to recover better allowing the player to perform for an entire game at maximum intensity. The development of Aerobic Conditioning is essential in the development of Anaerobic Conditioning for hockey.

#### **Anaerobic Conditioning**

This is the training of the athlete to work at a high intensity (greater than 85% of maximum exertion) for a short period of time. During this type of activity the muscles do not require oxygen to work, however, lactic acid is produced as a by-product that accumulates in the muscle. The training of this energy system is common in hockey. The key to its' success is following the proper work to rest ratios when training. Generally, an athlete will work from 0 to 120 seconds with 5 to 6 times as much rest allowed between work intervals.

## Motor Co-ordination Skill

This is the training of the athlete to perform new skills. It is important that the development of new skills follows an acceptable sequence, allowing the athlete enough time to practice these skills in a controlled situation prior to executing them in a game situation. During the growing years, motor co-ordination is influenced by periods of rapid growth causing the athlete to lose certain aspects of his/hers' motor co-ordination and skill. During these periods, it is important that time is allowed for the athletes' motor co-ordination and skill to catch up with their growth.

## Muscular Endurance/Strength/Power

Muscular endurance is the ability of a muscle or group of muscles to work for an extended period of time.

Muscular strength is the ability of a muscle or group of muscles to produce a large amount of force a few times.

Muscular power is the ability of a muscle or group of muscles to produce force in a short period of time.

The training of these fitness components is complex and dependent on the athletes' age and experience. It is important to consult a professional in this field when introducing muscular endurance/strength/power training.

## Joint Flexibility

Flexibility is defined as the range of motion (ROM) available at a joint or series of joints. The development of joint flexibility allows the body to move more freely with less energy costs. Joint flexibility is improved through stretching. There are generally two types of stretches; active and passive. An athlete can develop static flexibility however, it is more important to integrate this static flexibility into dynamic movements.

**The development of these basic components of fitness is the goal of every coach. Their development should be aimed not only at improving the athletes' performance, but also for injury prevention. Through proper conditioning an athlete will better be able to handle the stresses of the game, putting them at a lower risk for injury.**

## Off-Ice Conditioning: Considerations and Guidelines

- The development of an appropriate off-ice training program should incorporate all the major components of fitness. It is necessary to consult with an appropriate fitness professional when starting an off-ice training program.
- For 9 to 12 year olds emphasis should be on motor coordination and skill development.

- For 13 to 16 year olds emphasis should be on development of aerobic conditioning and muscular endurance.
- For 17 to 20 year olds emphasis should be on development of aerobic conditioning, anaerobic conditioning and muscular strength and power.
- All players must stretch before and after all training sessions and players must drink sufficient amounts of cold water, before, during and after sessions. It is important that all players are properly supervised during off-ice conditioning and players should never participate in any form of conditioning that aggravates an injury.
- Training and exercise should not be used as a form of punishment.
- The exercises should be discussed with the player, with the player understanding both the purpose of the exercise and the expected stress and fatigue of the exercise.
- The player should be able to stop participating in any exercise if he/she chooses to do so.

### **WARM-UP AND COOL DOWN CONSIDERATIONS AND GUIDELINES**

While the player may be in top form in terms of their physical conditioning, participation in vigorous sports like hockey requires a proper warm-up to help prepare the body for the increased demands and to help prevent injuries.

A proper warm-up provides a number of benefits to the body:

- Increased general body and tissue temperature.
- Increased blood flow throughout the cardio-respiratory system and ultimately to the working muscles.
- Increase in the body's metabolic processes.
- Decreased resistance of connective tissue thus allowing for greater movement in muscle and associated joint structures.
- Enhanced psychological preparedness of the athlete.
- Reduced chance of muscle/tendon pulls.

While the above is not an exhaustive list, the benefits are readily seen. But to be effective, a good warm-up should focus on the following:

1. To raise body temperature resulting in an increase in respiratory and heart rate.
2. It should affect as many of the large muscle groups as possible to effectively make tissues soft and flexible.
3. It should be made up of general body activities and some sport-related ones.

A warm-up activity should include, jogging or easy running. This should be of high enough intensity to produce a light sweat.

### **Off-Ice Warm-up**

Players should arrive at the arena at least 30 minutes before a game or practice to prepare themselves both mentally and physically.

Players should warm-up for approximately 10-15 minutes.

### **Range of Motion Exercises**

Initially, the player should complete a series of warm-up exercises such as jogging on the spot, jumping jacks and any other type of calisthenic exercises. These exercises should start at low intensity and gradually get more demanding. During these calisthenic type exercises the players should complete the following range of motion exercises. During these range of motion exercises the player should control the amount of swing allowing for no bouncing (momentum). The range of motion exercises should be progressed from small ROM to larger ROM.

1. Neck Flexion/Extension
2. Neck Side Flexion
3. Neck Forward Rotation
4. Shoulder Circles
5. Trunk/Pelvic Circles
6. Ankle Rolls

After completing the ROM exercises the player should continue to do a variety of calisthenic exercises such as hopping, skipping and jumping. The athlete should then complete the 7 static stretching exercises.

## 9.2 STRETCHING

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Players should perform the following seven (7) stretches to complete the off-ice warm-up. During the off-ice stretches, the stretch should be static with the athlete moving into and out of the stretch in a slow and smooth manner. Hold each stretch for 15 seconds and repeat 2-4 times. (see diagrams pages 68-71)

Stretching improves a player's flexibility. Flexibility is the ability to move freely, or more properly defined, is the range of motion (ROM) available at a joint or series of joints. Therefore, stretching is a fundamental component of any risk management and safety program. An appropriate stretching program can provide the following benefits:

- Increased Range of Motion
- Increased Strength
- Increased Movement Efficiency
- Increased Muscular Relaxation
- Improved Posture and Symmetry
- Improved Body Awareness
- Decreased Muscle Soreness

Stretching ultimately allows a player to increase their level of performance and decrease their risk of injury.

**General Instructions:**

1. Players should warm-up prior to stretching
2. Players should maintain the proper body position and alignment during each stretch.
3. Players should be alert to the feel of the stretch: the feeling should be one of gentle stretch not pain. **DO NOT OVER STRETCH.**
4. Players should maintain control of the movement during the stretch:
  - during the off-ice stretches the stretch should be static with the athlete moving into and out of the stretch in a slow and smooth manner.
  - during the on-ice stretch, the stretch should be dynamic but not “bouncy”.
  - during the range of motion exercises, control the swing: there should be little momentum with no bounce.
5. Stretches should be held for 15-20 seconds and repeated 2-4 times each.
6. Stretches should be completed before and after each practice and game.

**Things to Remember**

- The range of motion exercises and stretches should be considered the minimum requirements.
- For more stretches, consult an appropriate professional in your community.
- If a player complains of pain during any of the range of motion exercises or stretching exercises, the player should stop the exercises and seek medical advice.
- A player’s flexibility will decrease during their growth spurt. This occurs at approximately age 12 for girls and age 14 for boys.

## OFF-ICE STRETCHES

### 1. Trunk/Shoulder

- Stand with feet shoulder width apart
- Bring left arm overhead reaching hand down spine
- Hold the left elbow behind the head with the right hand
- Bend the trunk straight sideways to the right
- Do not rotate the trunk
- Hold the stretch for 15 seconds and repeat 2-4 times
- Repeat the stretch for the opposite side



### 2. Thigh/Quadriceps

- Stand on your left foot holding wall with left hand for support
- Reach behind with the right hand holding the right foot
- Keep back straight and hips and shoulders square.
- Lift the right foot and ankle towards the right buttocks
- Keep the right leg in good alignment: the right shoulder, hip, knee and ankle should be aligned
- Hold the stretch for 15 seconds and repeat 2-4 times
- Repeat the stretch for the opposite leg

### 3. Thigh/Hip Flexor

- Kneel on the right knee
- The left leg is forward with the knee bent
- Place hands on the floor at each side of the left foot
- Keep your back straight and hips and shoulders square
- Stretch forward feeling the stretch in the right thigh and hip flexor
- Hold the stretch for 15 seconds and repeat 2-4 times
- Repeat the stretch for the opposite leg

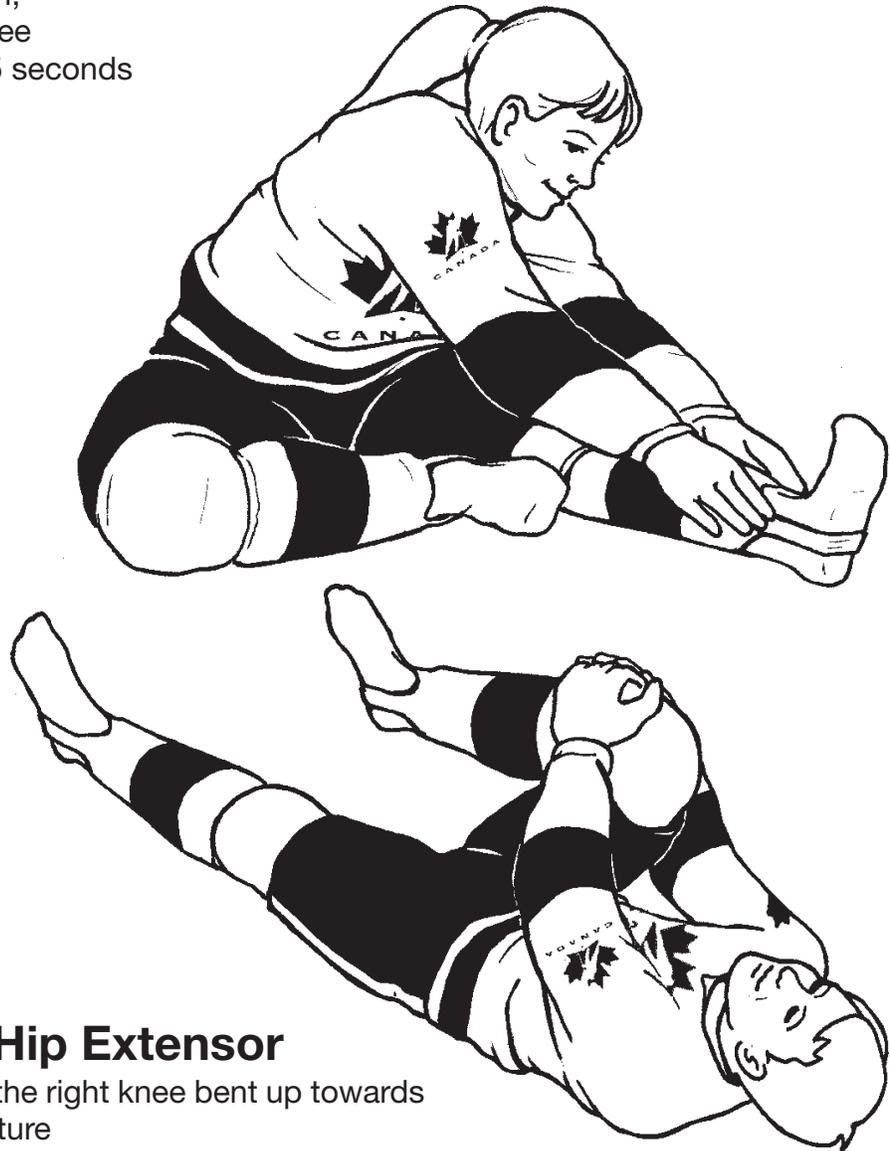


### 4. Groin

- Sit on the floor with your feet together as in the picture
- Keep your back straight
- Pull your feet in towards your groin until you cannot keep your back straight or keep your feet together
- Put your elbows on your knees and your hands on your ankles
- Press your knees towards the floor; to increase the stretch rotate forward at the hips while keeping your back straight
- Hold the stretch for 15 seconds and repeat 2-4 times

## 5. Hamstring/Lower Back

- Sit on the floor with the left leg extended and the right leg bent inward as in the picture
- Keep the back straight and hips and shoulders square
- Keep the left leg in neutral rotation and aligned with the left shoulder
- Reach forward with your hands keeping the back straight. Think of bringing your chest towards the thigh, not the head to the knee
- Hold the stretch for 15 seconds and repeat 2-4 times
- Repeat the stretch for the opposite leg



## 6. Low Back/Hip Extensor

- Lie on your back with the right knee bent up towards the chest as in the picture
- Hold the right knee with both hands. If a player complains of pain holding the knee as illustrated, instruct them to hold the leg/thigh under the knee
- Keep the right knee in alignment with the right shoulder
- Pull the right knee towards the chest
- Hold the stretch for 15 seconds and repeat 2-4 times
- Repeat the stretch for the opposite leg

## 7. Gluteal/Hip/Low Back

- Lie on your back with the right hip and knee bent and the foot over the left leg as in the picture
- Place the right hand flat on the floor with the shoulder at 90 degrees as in the picture
- Turn the head to the left
- Hold onto the right knee with the left hand and pull the knee towards the floor
- Allow the body to rotate until the shoulder is about to lift off the ground
- Keep the shoulders and right hand in contact with the ground
- Hold the stretch for 15 seconds and repeat 2-4 times
- Repeat the stretch for the opposite leg



After completing the stretching exercises the athlete should finish the off-ice warm-up with a series of motor coordination/skill calistenic exercises such as agility, coordination and balance calistenic exercises.

## **On-Ice Stretching: Guidelines and Considerations**

### **Warm-up**

Once players are on the ice, they should skate lightly, gradually increasing their speed. The player should get a feel for the ice by doing some basic skating skills:

1. forward/backward skating in a straight line as well as turning corners to the right and left.
2. skating in circles to the right and left
3. doing cross-overs to the right and left
4. doing some slow stops and starts to the right and left.

## Range of Motion Exercises

During these basic skating exercises the player should complete a series of on-ice range of motion exercises:

1. Shoulder Flexion
  - Holding the stick with both hands in front of their body, the player lifts their arms over the head as far as possible without arching their back.
2. Shoulder Extension
  - Holding the stick with both hands behind the back, the player lifts their arms behind the back as high as possible without arching the back.
3. Trunk Rotation
  - Holding the stick at shoulder height with both hands, the player rotates the trunk to one side, returns to the middle and stops, then rotates to the opposite side. **DO NOT** rotate from side to side without stopping in the middle.

## Stretching Exercises

As well the player should complete the following dynamic stretch while completing the basic skating exercises

1. Adductor/Hip Flexor
  - Following the completion of these basic skating exercises, ROM exercises and dynamic stretches, the player should do some acceleration, aggressive stops and starts and some technical skills.

## ON-ICE STRETCHING

### 1. Groin/Thigh

- While gliding, as in illustration, the left leg is forward with knee bent over the skate
- Keep back straight with hips and shoulders square
- Keep right leg straight with inside of skate gliding on the ice
- Press forward and down, bending the left knee, stretching the right groin and thigh
- Stretch should be dynamic but not “bouncy”
- Hold stretch for 10-15 seconds and repeat 2-4 times
- Repeat stretch for opposite leg



### Cool-Down Guidelines and Considerations

Most players give the cool down the least attention. The benefits of a proper cool down have already been mentioned. It is important that the player be given time to cool down by doing some light skating, light jogging or cycling after a game. It is also very important that the player complete the 7 basic static stretches after a game.