DEVELOPING FITNESS
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There are many reasons why young hockey players should develop high levels of fitness; they will be less prone to injury; they will recover faster so they can practice their skills more often; they will be able to use their skills more effectively they will have more fun playing hockey. Of course, as they build better levels of fitness they will get more enjoyment out of other aspects of their lives.

Chapter Review

• incorporate into your team’s yearly planning the important components of fitness, endurance, strength, power, agility, balance and coordination,

• design training programs specific to the age groups that you are coaching,

• understand the importance of warm-up, cool down and stretching for games and practices.

Relationship Between Fitness Components and Age

Differences

There are many factors which contribute to “fitness” and each of these plays a more important role for different age groups. The important fitness components for hockey players are:

• Endurance
• Strength
• Power

The ABC’s are:

• Agility
• Balance
• Coordination

Endurance

Endurance permits rapid recovery between bursts, between shifts, between periods, and between games. It also helps tolerate heat and to offset the detrimental effects of travel.

Strength

Strength offers protection from impact and gives more stability on the puck and the ability to establish position in front of the net and move others off the puck in the corners.

Power

Power affords good acceleration, braking and a high velocity shot.
The ABC’s

The ABC’s are fundamental to skill development and therefore to tactics and strategies as well.

Agility

Agility is the ability to change direction quickly in a confined space. If your players’ tight turns and sudden stops are not good, they need to work on their agility.

Balance

Balance is the ability to keep the body’s centre of gravity over its supporting base so as not to fall down. If you find your players are falling down often, then they may need to work on their balance.

Coordination

Coordination is the ability to link precise movements of different parts of the body. If your players have trouble skating when trying to carry the puck, then they may need to work on their coordination.

Different components should be emphasized at the different age groups. For 9-12 year olds, the ABC’s should receive top priority. For 13-16 year olds, the ABC’s are still important because growth rate may exceed coordination, but the development of endurance is necessary to lay the foundation for building strength and power as the player progresses through this age range. For the 17-20 year olds, the further development of endurance, strength and power will enhance performance through better decision making, explosive power and ability to physically control opponents.

Developing the ABC’s (Agility, Balance and Coordination)

This should be the major focus for the 9-12 year olds and should still be used for 13-16 and 17-20 year olds. Agility, balance and coordination are three parts of fitness which are referred to as “athletic ability”. When you say somebody is a good athlete, you usually mean that person has good agility, balance and coordination.

But it is not just sports which require athletic agility. Every active game, such as tag or leap frog, requires agility, balance and coordination. Thus, by playing enjoyable games, you can improve your fitness and getting fit can be fun.
For the Coach:

Here are some fun things coaches can use to improve agility, balance and coordination both on and off the ice.

Off-ice Activities:

- Any relay race or game which forces players to change direction rapidly is a good ABC fitness builder.

- Have players run the circular agility course shown in Figure 1, adding progressively more difficult movements, such as dribbling a soccer ball with the feet, or a basketball with the hands, or juggling tennis balls. Players could be moving in the opposite direction of each other and must avoid running into each other.

- Use your imagination and come up with games which challenge the levels of coordination, balance and agility which your players already possess.

- Encourage young players to participate in all sports because the athletic ability which they develop and derive from other sports will carry over into their hockey and make them better players.

![Figure 1: A Circular Agility Course](image)

On-Ice Activities:

- Weaving drills while dribbling balls, juggling, stick handling, or controlling the puck with the feet are excellent.

- Relays which incorporate quick changes in direction, such as tight turns around pylons, and involve multiple movements of arms and legs, are also very good.
Developing Endurance and Recovery

This should be emphasized in both the 13-16 and 17-20 year old groups and, ideally, it is best to build it in the summer before the season starts. Their endurance/recovery system relies on:

- the heart and vascular system which carries oxygen in the blood,
- the muscles which must be conditioned to work hard for longer periods of time, resisting fatigue and recovering quickly.

Exercise which challenges these two systems is termed “aerobic”, meaning “with oxygen”. Athletes develop their circulation system by aerobic exercises which use large amounts of muscle for time period of 30-60 minutes.

Activities such as cross-country skiing, distance skating on a lake or oval, continuous skating on a rink, roller-skating, cycling (stationary or bicycling), running, swimming and skipping can be used to challenge the central component of aerobic fitness. The intensity should be at a level where players can just carry on a conversation and it should be 4-5 times per week. It is ideal to build this component of fitness during spring and summer so that your players have a good recovery system when they begin their hockey season.

Your players can build endurance fitness in their hockey muscles with activities which closely simulate hockey actions done in 2-3 minute intervals of work with 2-3 minutes of recovery and progressing from 6-10 repetitions per session. Cross-country skiing, roller-skating (single file wheels), cycling (stationary or bicycling), the slide-stride board or interval skating all mimic hockey actions and are effective.

In summary, the endurance/recovery, or aerobic system, has two important components:

- The cardiovascular system can be improved through many activities which use large muscles for 30-60 minutes continuously.
- The hockey specific muscles which build aerobic fitness with 2-3 minute work to rest ratios in activities which closely simulate hockey actions.

Developing Strength

Strength is the ability to produce force through the contraction of muscles. Should your athletes discover that opposing players can lift their sticks or easily push them off the puck, a natural conclusion might be that there is a need to develop upper body strength. As well, your players will be more stable on their skates and will be able to execute more powerful skating strides through the development of leg strength.

Building up strength in all muscles is important. But wherever possible working on the specific muscles used in hockey should be emphasized. Strength in the upper body becomes more important with increasing age because the physical jousting of body contact comes into play and strength protects joints from injuries.

Strength can be increased in two ways:

- by increasing the size of the existing muscles, and
- by using the existing muscles more effectively.
Developing Strength in 9-12 Year Olds

Adults can increase their strength by building more muscle through weight lifting. But players in the 9-12 age bracket do not have the body hormones necessary to build more muscle, and lifting weights too heavy could damage their growing bones.

Fortunately, there is another way to build strength, and that is by learning how to use existing muscles more effectively. This is the only way to increase the strength of a 9-12 year old player.

For muscles to become stronger they must work against resistance for a period of time. This resistance for 9-12 year old players should not be more than their own body weight. Working in pairs is a good way to develop strength, where partners provide resistance for each other. Light weights (that they could lift at least 25 times in succession) can be used too.

For the Coach:

There are several fun things you can do to improve your players’ strength both on and off the ice.

Off-Ice Activities:

- Push-ups, sit-ups, chin-ups, leg pushes with a partner, and stick exercises are all challenging ways to improve their strength.

On-Ice Activities:

- Partner-resisted skating drills both forward and backward automatically work on the skating muscles.
- Face-off resistance drills and stick struggles are good strength builders.

Developing Strength in 13-16 Year Olds

Since hormone production, which is necessary for increasing muscle size is on the rise or has peaked, a 13-16 year old player can build strength in both ways mentioned above.

For muscles to become stronger they must work against resistance for a period of time. However, because of the rapid growth at the 13-14 age, it is wise to keep the resistance relatively low and do a high number of repetitions; say a set of 15-20 reps at one time. Using their own body weight, slight resistance from a partner, or light free weights is ideal.

In the 15-16 age category, resistance can be added so that only 10-12 reps in one set are possible.
For the Coach:

Off-Ice Activities:

- A training circuit can be set up in a gym or outdoors. It can be fun in a challenging way, and players should choose partners of similar size and weight. Set the circuit up to alternate between upper body and lower body activities. Some players might repeat certain stations if they need extra work in specific areas.

A bicycle tire inner tube is a very handy item to use for strength and power training. It is inexpensive, portable and can be used in many ways. Free weights are also very good.

On-Ice Activities:

- Activities can be arranged into a circuit with one minute for each partner at each station with ten second transit times between stations. Coaches can signal station changes and partner changes. In partner-resisted skating, partners change after each length.

Developing Strength in 17-20 Year Olds

Strength is important for a 17-20 year old hockey player to protect joints and internal organs from injury. Strength also enhances their hockey performance by increasing their stability which helps them to establish their position and move opponents off the puck.

Optimal hockey strength gains are achieved by loading the muscles with resistance in movements in which strength is required. The ideal amount of load is that which players can lift only ten times. This is called the 10 RM – repetition maximum in each exercise. A complete group of exercises is called a set and athletes should build from one to two to three sets gradually.

General strength programs which use free weights or resistance equipment can be effective and have some carry over into hockey performance. However, for on-ice strength, the use of partner resistance and bicycle tubes or surgical tubing can be even more effective because the load can be applied in specific hockey actions.

Guidelines

Players can develop their strength in a fitness centre, health club, or a gym. Here are some important guidelines to follow when strength training.

- It is better to start with loads which are too light than too heavy.
- When using free weights, work with a partner who can “spot” for safety.
- Alternate an upper body exercise with a lower body exercise.
- Muscles are organized in pairs around each joint. Train both groups in the pair.
- Performing ten repetitions of the load which athletes can do ten times (10 RM) gives the best improvements. Build from one to two to three sets over the first six weeks.
- When a player can do more than 12 repetitions in their third set, increase the load.
• For general strength, select exercises which build the muscles around the shoulders, chest, abdomen, elbow, wrist, hip, knee and ankle,

• For hockey specific strength, choose exercises which simulate hockey movements. Athletes can design their own using a bicycle inner tube or surgical tubing and a hockey stick shaft.

• Strength train only three times a week (on alternate days) to allow time for muscles to recover and build.

There are a wide range of partner-resisted exercises which an athlete can do, either on or off the ice, to increase strength. Partner-resisted include push-ups, sit-ups, chin-ups, leg presses, scissors, stick struggles, skating and single armed puck protections.

Developing Power

Power training and extending high power over longer durations should be introduced in the latter years of the 13-16 year olds and then further emphasized in the 17-20 year olds. High speed sprints on-ice are sufficient load for the younger groups and avoid the explosive jumps which are risky for the younger less skilled players.

Because the game is based on speed, power in the lower body is very important. High power means faster starts, more rapid acceleration and a better ability to drive to the net, to get in the open, or to close off defensive openings.

However, good upper body power is important, it results in more rapid application of force which permits players to have better opportunities to establish position, shove opponents off the puck and to shoot quickly with power.

The best way to train for speed is to use explosive actions. An effective way to do this is to rapidly stretch a muscle, then explosively contract it. This technique is called plyometrics and it is an important type of exercise to develop hockey fitness.

For instance, stretching the leg extensors occurs when an athlete lands from a jump, then follows it with an explosive jump. Note that higher jumps give more stretch but jumping from heights (e.g., benches) should be progressed to gradually and should not be used on ice because of the instability of skates.

Exercises using plyometrics should closely mimic hockey actions. Here are some on or off-ice activities which can be effective.

• laterally jumping over lines, pylons or benches using one or two legs,

• jumping crossovers across lines on-ice or into hoops on a gym floor,

• partners lock feet to back of each other’s calves in sit-up position facing one another,

• partner throws medicine ball above head to opposite number, opposite number catches it, leans back and explodes forward, throwing ball to partner,

• swing dumbbells forward and backward with arms in skating motion,

• roll soccer ball to partner who cradles it with stick and explosively shoots it back.
These exercises should be done no more than 2-3 times per week. This rapid stretching will result in some muscle soreness up to two days later.

These types of power developing activities can be organized into a circuit with alternating upper and lower body activities. Keep the time spent at each station short (10-20 seconds) to keep the quality of activity high.

Explosive power is very important but players must also be able to extend high speed skating for longer and longer periods. With high power activity, the working muscles produce lactic acid as they produce energy. This lactic acid causes rapid fatigue and decreased performance. Muscles therefore must be trained to tolerate this acid during high power work, letting the aerobic system remove it during recovery.

Training to extend power in the legs is done by increasing the duration of high speed sprints from 5-10 to 15-20 seconds, then resting for three times as long while three other waves of players go. Then repeat up to 5-6 times. The best training results are obtained on-ice, but with activities which simulate the hockey stride it can also be effective off-ice.

Using Warm-Up, Cool Down and Stretching Prior to and following Practices and Games

Warm-Up

A warm-up has both a physical and a mental component. It is important mentally to begin to focus on the objectives of the practice and/or game and to become mentally committed to giving quality and effort. The physical portion of the warm-up is designed to increase blood flow to the muscles and to elevate the temperature of the muscles. As such, a warm-up should be started slowly and increased gradually in intensity. It should use large muscle groups in movements similar to hockey. It can begin in the dressing room and be completed on the ice and should last 10-15 minutes.

Static or 3-S stretching (see Flexibility below) should precede the warm-up to relax the muscles and, therefore, to assist the blood flow and to permit full range of motion with a reduced risk of injury. On-ice warm-up can begin with slow stretching and must proceed from slow to quick activities. It should include forward and backward skating with the use of all edges in striding, crossovers, tight-turns, and stopping. It should also blend in upper body actions to prepare for shooting and impact.

The warm-up effect begins to decrease as soon as the warm-up activity ends and it is unlikely that much benefit exists after 30 minutes. Therefore, ensure that the transition between the warm-up and the game or the practice is short.

Cool Down

The cool down has both a physical and a mental component as well. It is important to mentally relax and “come down” after a game or practice. The physical relaxation can assist this “coming down” and accomplish some physiological ends of its own. It is designed to flush out and burn-off waste produces (e.g., lactic acid) which have built up in the muscles, to re-establish fluid balance, and to relax the muscles which are tight due to hard work.
The cool down should include exercises which focus on the legs, such as slow rhythmical striding on-ice and gradually decrease in intensity, or can involve slow jogging, walking, or light callisthenics off-ice. Light callisthenics may be done in the dressing room for ten minutes following the game or practice and should then be followed by static or 3-S stretching to halt muscle spasms and to enhance blood flow.

**Flexibility**

Flexibility is the ability to move through a full range of motion around a joint. It is limited by:

- the structure of the joint.
- the balance between the muscle groups on each side of the joint.

There is little that training can do to affect the bone and ligament structures around the joint. Therefore, flexibility training is focused on increasing the range of motion by permitting one muscle to move through the full range in one direction with little resistance from the opposite muscle, and vice-versa.

The muscle pairs around a joint are controlled by the nervous system with both signals to and from the muscles. When one group is contracting, the muscles on the opposite side of a joint are relaxed. When a muscle is being stretched, however, the nervous system tells it to contract to avoid injury. Therefore, at the ends of the range of motion as the opposite muscle group is further stretched, it is also being told to contract; this further limits any increase in the range of motion.

Stretched muscles can be relaxed and then have their range increased by either of two methods:

- Static stretching which takes the appropriate muscles to full stretch at the end of the range; then holding it there for 15 seconds. The player then slowly stretches further and holds it again for 15 seconds. This should be repeated three times.

- 3-S stretching which is based on proprioceptive neuromuscular facilitation (PNF). This method requires the use of a partner. The player takes the muscles to full stretch (as in static stretching) and then with a partner resisting, the player tries to contract the stretched muscles and holds the contraction for six seconds. The athlete then relaxes and the partner, with slight pressure helps to move the joint further through the range. This entire procedure is then repeated two more times.

**Note:**

Ballistic stretching (high speed or bounding) is not recommended. It can produce injury and the rapid stretch actually results in a restricted range rather than an extended one.

In training for flexibility, it is important for players to note the following:

- Stretching should focus on those joints which require full range of motion in hockey specific actions (like shoulder).
- The feeling should be one of stretch not pain.
- It can be done in the dressing room prior to on-ice sessions to conserve valuable ice time.
• It should precede and follow practices, games, and dry-land training sessions.
• Stretching should be the first stage of warm-up and the last stage of the cool down and can be done as an end in itself.

SUMMARY

General Rules for Fitness Training in 9-12 Year Old Players

• Do something for fitness (on-ice or off-ice) at least three or four times a week.
• Never use resistance more than the athletes own body weight.
• If using light weights, make sure players can do 20-25 repetitions one after another. If they can’t, the weights are too heavy.
• For off-ice activities, ensure athletes wear shoes with good cushion soles to absorb the shock of running and jumping.
• Do not run these athletes more than three to four miles at one time. That is a sensible aerobic limit for 9-12 year olds.
• Do not run this age group long distances on hard surfaces, such as paved roads or concrete.
• Arrange for off-ice activities in a cool environment to avoid overheating.
• Athletes should drink lots of water during all on and off-ice fitness training sessions. This helps to prevent dehydration, which happens when the body runs low on water. Dehydration can curb top performance and may cause players to feel ill.
• Choose fitness activities which are fun. That way participants will do them longer and get more fitness benefits.

General Rules for Fitness Training in 13-16 Year Old Players

• Arrange for these athletes’ fitness (on-ice or off-ice) at least three or four times a week.
• Start and finish every training session by stretching, using slow movements and holding at the end of the range of motion for 20 seconds.
• For off-ice activities, wear shoes with good cushion soles to absorb the shock of running and jumping.
• Do not run these athletes more than five miles at one time.
• Do not run them long distances on hard surfaces, such as paved roads or concrete.
Plan off-ice activities in a cool environment to avoid overheating.

- To prevent dehydration, drink lots of water (100 ml of cool to cold water every 10-15 minutes) during all on and off-ice fitness training sessions. Dehydration occurs when the body runs low on water, curbing top performance and may cause illness.

- Set goals, establish rewards and think positively. In other words, encourage your athletes to be fit.

**General Rules for Fitness Training for 17-20 Year Old Hockey Players**

- Train for fitness four times per week.
- Precede and follow each session with static slow stretching.
- During off-ice activity, wear well-cushioned and good fitting shoes to absorb the shock of running and jumping.
- Avoid running on concrete surfaces.
- Avoid prolonged exercise in the heat of day during the summer.
- Drink at least one litre of cold water prior to training and one litre during training for each hour of heavy exercise.
- The development of the endurance/recovery system provides excellent support for all aspects of training and for performance too.
APPENDIX 1

Before and After Hockey

Approximately 10 Minutes

1. 30 seconds each leg
2. 15 seconds each leg
3. 20 seconds each leg
4. 20 seconds each leg
5. 30 seconds each leg
6. 30 seconds
7. 30 seconds
8. 30 seconds
9. 15 seconds each leg
10. 20 seconds each arm
11. 16 seconds each side
12. 20 seconds each leg
13. 20 seconds
APPENDIX 2

After Running

Approximately 9 Minutes

1. 40 seconds each leg
2. 15 seconds each leg
3. 30 seconds
4. 30 seconds
5. 30 seconds
6. 15 times each direction
7. 30 seconds each leg
8. 30 seconds each leg
9. 40 seconds
10. 5 times 5 seconds
11. 60 seconds
12. 25 seconds each side
APPENDIX 3

Before and After Weight Training

Approximately 10 Minutes

1. 15 seconds each arm
2. 20 seconds
3. 20 seconds

4. 25 seconds each leg
5. 15 seconds each leg
6. 30 seconds
7. 30 seconds

8. 30 seconds
9. 20 seconds
10. 15 seconds each leg