



Competition-Coaching Introduction L2T

Step 2:

Athletes and their sport needs



**Reference Material
for Dryland Workshop**



PARTNERS IN COACH EDUCATION

The National Coaching Certification Program is a collaborative program of the Government of Canada, provincial/territorial governments, national/provincial/territorial sport organizations, and the Coaching Association of Canada.



The programs of this organization are funded in part by Sport Canada.



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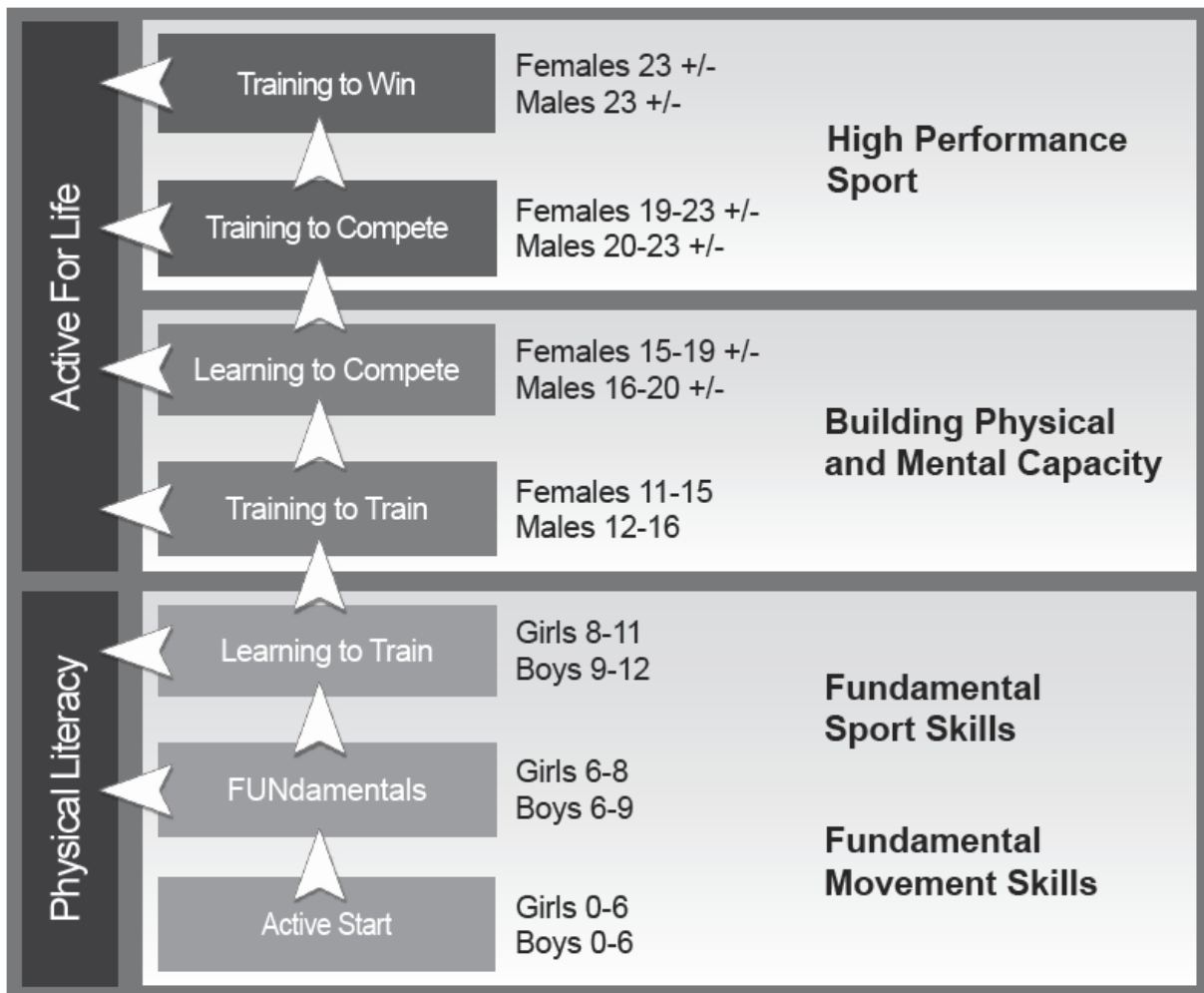
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2.1 Stages of Long Term Athlete Development (LTAD)

Cross-country skiing is a late specialization sport. During the first three stages of Canada's LTAD model, children grow and improve within the sport through programs permitting a broad exposure to activities that develop overall motor and sport skills. Following the first three stages, there is a transition to either further development and excellence in cross-country skiing or life-long participation in skiing and/or other sports at the recreational or less competitive level. For athletes who wish to pursue excellence, increasing specialization in cross-country skiing and an expanding focus on competition permit them to mature athletically and aspire to national and international podiums. Regardless of the level of excellence or sport-mastery achieved however, participation in cross-country skiing – a "sport for life" - can enhance the health, fitness and mental well-being of Canadians of all ages.

2.1.1 The LTAD Framework for Cross-Country Skiing

Figure 2.1



The first three stages encourage physical literacy and “Sport for All”:	The next four stages focus on development and competitive excellence:	The final stage encourages life-long physical activity:
1. Active Start 2. FUNdamentals 3. Learning to Train	4. Training to Train 5. Learning to Compete 6. Training to Compete 7. Training to Win	8. Active for Life

2.1.2 The LTAD Stages for Cross-Country Skiing

To promote a healthy and logical development for each athlete, the LTAD model identifies sequential stages for training and competition that respect his/her physical, mental and emotional development. This approach encourages lifelong physical activity for athletes of all levels of ability and disability. It also provides an effective route for athletes to pursue excellence up to and including the national and international levels of competition.

The following is an overview of the eight LTAD stages:

1. **Active Start** (Boys and Girls 0-6)

- ❑ This is an important period for acquiring the fundamental movement skills that lay the foundation for more complex movements, thereby preparing children for a physically active lifestyle.
- ❑ Young children should be physically active through active play, and encouraged to begin cross-country skiing at an early age.

2. **FUNdamentals** (Boys 6-9 and Girls 6-8)

- ❑ Fundamental movement skills are mastered, motor development emphasized and basic cross-country ski skills learned. For optimal sport specific acquisition, all basic ski skills, both classic and skating, should be learned before the end of this period.

3. **Learning to Train** (Boys 9-12 and Girls 8-11)

- ❑ This is an important period for motor development and ***window of optimal trainability for motor-coordination***. Children are developmentally ready to acquire the general sport skills that will be the cornerstone of their athletic development.
- ❑ Fitness becomes increasingly important.

4. **Training to Train** (Males 12-16 and Females 11-15)

- ❑ This is an important period for developing aerobic capacity, which is especially critical for cross-country skiing (a lot of skiing at low intensity!).
- ❑ Social and emotional considerations are very important. Team building, group interaction and social events should be emphasized.

5. Learning to Compete (Males 16-20 (+/-) and Females 15-19 (+/-))

- ❑ Fitness preparation, sport and individual specific skills are developed. The development of self-awareness and independence should be emphasized.
- ❑ Training and racing should be integrated gradually and seamlessly into the overall timetable and lifestyle of the aspiring competitive athlete.

6. Training to Compete (Males 20-23 (+/-) and Females 19-23 (+/-))

- ❑ This is an important period for individualized fitness preparation. Fitness and medical monitoring is increasingly sophisticated, and sport and individual specific skills are mastered.
- ❑ Self-awareness and independence become increasingly important.
- ❑ Athletes learn to compete internationally.

7. Training to Win (Males 23 (+/-) and Females 23 (+/-))

- ❑ During this stage athletes focus on high performance and undertake multi-year preparations for major events (i.e. Olympics, World Championships).
- ❑ High performance sport specialist support is optimized, as is fitness and medical monitoring.
- ❑ All aspects of training and performance are highly individualized.
- ❑ Podium performances are the goal.

8. Active for Life (This stage can be entered at any age)

- ❑ There is a better opportunity to be “Active for Life” if physical literacy is achieved before the “Training to Train” stage.

Children who do not develop their fundamental motor skills by 12 years of age are unlikely to reach their genetic athletic potential.

2.1.3 Learning to Train (L2T) Stage of Development

This is an important period for motor development, and an optimal window of trainability for motor-coordination. At this stage, children are developmentally ready to acquire the general sport skills that will be the cornerstone of their athletic development.

Objectives

- ❑ To further develop all fundamental movement skills and general overall sports skills. Otherwise, a significant window of opportunity is lost, compromising the ability of the young athlete to reach full potential.
- ❑ All basic cross-country ski skills will be refined by the end of this stage.

Optimal Windows of Trainability

- ❑ Motor skills and coordination should be developed.
- ❑ This is a major skill learning phase.

The Goals

The goals for this stage include:

- ❑ Developing all basic sport skills (physical literacy) before the athlete enters the “Training to Train” stage.
- ❑ Introducing hopping and bounding exercises or routines, or wheeling up gradients, to aid in strength development.
- ❑ Utilizing games to develop skills, speed, power and aerobic fitness.
- ❑ Further developing strength, using exercises that incorporate the child’s own body weight as well as medicine balls and Swiss balls.
- ❑ Further developing flexibility through exercises.
- ❑ Further developing good ski technique habits through repeated practice and the use of games that reinforce the technique being taught.
- ❑ Further developing speed by using specific activities that focus on agility, quickness and change of direction.
- ❑ Structuring competition to address differences in training age and abilities.
- ❑ Narrowing the focus to three sports while encouraging participation in a variety of other sports/activities such as canoeing, cycling, swimming, etc.
- ❑ Sport-specific practice sessions three times a week during the fall and ski season; participation in other sports three times a week during the ski season and more often in the off-season.
- ❑ Building adventure-based activities into the seasonal plan.
- ❑ Introducing dryland ski techniques – ski walking, ski striding and rollerskiing.
- ❑ Emphasizing group interaction, team building and social activities.

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- ❑ Integrating mental, cognitive and emotional development.
- ❑ Introducing ancillary capacities.
- ❑ Encouraging unstructured play.

Psychological Training

- ❑ Objectives:
 - ✓ To understand the importance of practising basic mental skills.
 - ✓ To develop an awareness of how performance unfolds from a mental perspective.
- ❑ To-do list:
 - ✓ Introduce pre-race preparation.
 - ✓ Introduce tactical skills.
 - ✓ Introduce the mental skills of:
 - Constructive self-talk.
 - Imagery.
 - Confident behaviour.

The “Learning to Train” and “Training to Train” stages are the most important stages of athletic preparation.

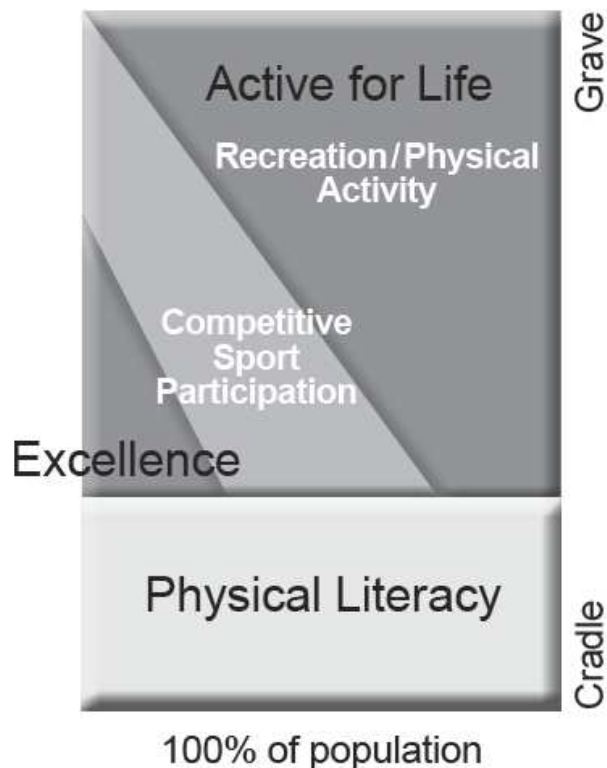
2.2 Physical Literacy

- ❑ FUNdamental movements skills plus FUNdamental sports skills = physical literacy.
- ❑ Physical literacy refers to competency in movement and sports skills.
- ❑ Physical literacy gives children the tools they need to take part in physical activity and sport, both for healthy life-long enjoyment and for sporting success.
- ❑ Physical literacy should be developed before the onset of the adolescent growth spurt.

Fundamental movements and skills that provide the base requirements for future advances in movement capacity and athletic skill should be introduced through fun and games at an early age. Without the basic movement skills, a child will have difficulty excelling in most sports. For example, to enjoy baseball, basketball, cricket, football, netball, handball, rugby and softball, the simple skill of catching must be mastered. The emphasis on “FUN” within “FUNdamentals” clearly recognizes fun as an extremely powerful motivating force for children.

FUNdamental movements and specific skills should follow and include basic universal elements such as (but not limited to) running, jumping and throwing. Furthermore, the aspect of an underlying “physical literacy” should be considered as a foundation concept that embraces the ability to execute a broad base of physical competencies.

Figure 2.2



2.2.1 Developing Physical Literacy

Physical Literacy: What Exactly Is It?

Physical literacy is the development of fundamental movement skills (section 2.2.2) and fundamental sport skills (section 2.2.3) that permit a child to move confidently and with control in a wide range of physical activity, rhythmic (dance) and sport situations. This includes the ability to “read” what is going on around them in an activity setting and react appropriately to those events.

For full physical literacy, children should learn fundamental movement skills and fundamental sport skills in each of the four basic environments:

- ❑ On the ground – as the basis for most games, sports, dance and physical activities.
- ❑ In the water – as the basis for all aquatic activities.
- ❑ On snow and ice – as the basis for all winter sliding activities.
- ❑ In the air – as the basis for gymnastics, diving and other aerial activities.

Physical literacy is developed during the first three stages of the LTAD progression, meaning the period of time from birth to the start of adolescence (section 2.1.1).

The Myth That It “Just Happens”

While it’s true that many children DO develop good physical skills on their own by trial-and-error, there are many who do not; and for those the consequences can be serious.

Children who are physically skilled often enjoy vigorous healthy play while the less skilled are left out. This creates a vicious cycle - those with the skills play, and through that play further develop fitness and skills. In contrast, those who are less skilled play less, have fewer opportunities to refine and develop their skills, and fall further and further behind their skilled peers. Eventually many of the less skilled children stop trying and withdraw from the activities that would help them become more fit and more skilled.

The Consequences of Missing Out

Children tell us that not having the skills to play is one major reason they drop out of physical activity and organized sport.

A child who misses out on developing physical literacy is at a great disadvantage. On the playground and in the park, children like to play with other children who have the same level of skill they do, and who can “keep the game going”. If a child can’t keep the game going, he/she generally won’t be asked to join in.

Missing out on fundamental movement skills also means that a child is unlikely to choose to take part in a formal sport activity that requires proficiency in that skill. This will restrict his/her choice of life-long health-promoting activities. It will also restrict opportunities for sporting excellence.

It is worth noting that the inability to perform even one fundamental movement skill can seriously restrict later opportunities for recreational or competitive activity.

2.2.2 Fundamental Movement Skills

To become physically literate, children need to master fundamental movement skills. However this mastery does not come all at once and coaches need to continually keep in mind that children are not miniature adults. To successfully learn most skills, a developing child needs to go through a series of developmental stages. The objective of a coach should therefore be to help each child move through an appropriate skill progression, rather than pushing him/her to perform the skill the way an adult would do it.

Although children mature and learn at different rates, almost all children learn their fundamental movement skills in the same sequence, and go through the same phases:

□ **When can a child learn a skill?**

As a child grows and develops (matures), the nerve cells make more connections. At the same time, the muscles of the body become stronger. When the brain is mature enough and the muscles are strong enough, a child can learn a skill. Before that point in time, trying to teach skills to a child does little good. What a child needs most during this period is many opportunities to explore all possible movements in a rich environment – which means that the child's environment needs to be both safe AND challenging.

□ **When is the child ready to learn a skill?**

At a certain point in maturation, all the hardware – the muscles and nerves – will have developed sufficiently to allow the child to perform a particular skill (the readiness factor). When the skill begins to emerge naturally, learning can be dramatically improved through practice by using a variety of different equipment and materials. Providing children with simple instructions and plenty of opportunity to practise can help them develop confidence that will stay with them throughout their lives (although it may not actually “speed up” the learning process).

□ **The optimal time to learn a skill.** For every emerging skill there is a “best” time for a child to learn. Again, providing the child with simple instructions and plenty of opportunity to practise can improve learning and pay great dividends. While the “best” time to teach a particular skill differs according to the child, there is a consistent pattern in the sequence in which they learn skills.

□ **The time for remedial work.** If the child goes too long without learning a skill, then it may become more difficult to learn. However, the sooner the child starts to overcome the learning deficit the easier it will be to catch up – and develop the skill and confidence needed to be fully active with friends and peers.

2.2.3 Fundamental Sport Skills

Running, jumping, catching, kicking, throwing and hitting something with a stick, bat or racquet of some kind, are the basic building blocks of the many sports played by the vast majority of people. A person who can perform these fundamental sport skills well can easily learn to play many sports.

Making good decisions in sport situations is another skill that is fundamental to each sport (section 2.2.4).

The difference between fundamental movement skills and fundamental sport skills can be illustrated by the following examples:

- ❑ When children learn to throw a variety of balls of different sizes with one hand or both hands, and to throw the ball at different speeds - sometimes for accuracy using a variety of different targets, and sometimes for distance - they are learning a fundamental movement skill.
- ❑ When children learn to throw a softball using a softball pitching motion, and attempt to pass the ball over home plate, they have moved from learning a “fundamental movement skill” to learning a “fundamental sport skill”.

For children to have success in sport - either as a health-related recreational activity or a competitive activity - it is important that they master fundamental movement skills before learning fundamental sport skills, and it is important that they learn fundamental sport skills before being introduced to specific techniques.

Some further examples of this are:

❑ **Kicking Skills**

- ✓ In the “fundamental movement skill” stage, children should learn the basic kicking action with each foot. They should kick a wide variety of balls and try different things – e.g. kicking as far as they can, kicking to hit a target, kicking to keep the ball on the ground, kicking the ball as high in the air as they can.
- ✓ In the “fundamental sport skill” stage (e.g. soccer), children learn to kick a soccer ball without touching the ball with their hands, how hard they have to kick the ball in order to get it to another team member and how to kick the ball with the inside of the foot to increase passing accuracy.

❑ **Catching Skills**

- ✓ In the “fundamental movement skill” stage, children learn to catch - first with both hands together in a two handed catch, and then with one hand. They will learn to catch a wide variety of balls of different sizes and weights, to catch the ball while they are standing still and when to move towards the ball. These are skills that can later be transferred to any sport they take up.
- ✓ In the “fundamental sport skill” stage (e.g. baseball), children learn to catch a baseball using a baseball glove. As their skill level improves they learn to catch the baseball when it is thrown at them, and then when it is hit with the bat.

For more information on movement skills and sport skills refer to section 4.4 of this Reference Material.

2.2.4 Other Skills

Prediction and Interception

While it is easy to understand why physical literacy needs to include the skills of running, jumping, throwing, kicking, catching, etc., along with agility, balance, coordination

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and speed, there are other skills that are less obvious. The two most important of these are prediction and interception.

Take a moment to think about what it takes to catch a softball that has been hit high into the air. As the catcher, children need to be able to:

- ❑ see the ball leave the bat, and predict where it will land;
- ❑ move to where they think the ball will land, and do so before the ball arrives (this is the ability to intercept the ball, and is a physical literacy skill that needs to be learned); and
- ❑ catch the ball!

This ability to predict and intercept is critical to many stick, bat and racquet sports where children need to predict where the ball or puck is going, and then move their bat, racquet or stick so that the moving “stick” makes solid contact with the moving “ball”.

In order to learn a complicated skill of this kind two things are required:

- ❑ sufficient maturation of the brain and vision (which usually happens between the ages of four and seven); coupled with
- ❑ many opportunities to try to catch, intercept and hit a variety of different sized and shaped objects moving in many different directions at many different speeds (i.e. a lot of practice!).

Learning these kinds of skills can also be helped significantly by good coaching, particularly with respect to body position and what children should be seeking.

Rhythm

Basic rhythm skills are developed during the early years of life and, if developed well, open up later possibilities for lifelong involvement in dance, music and other artistic activities. Rhythm activities also help develop fluid movement patterns that can help children perform many fundamental movement and fundamental sport skills with greater ease and efficiency.

2.2.5 The Key to an Active, Healthy Life and Sporting Excellence

Being physically active is more important to health than just about any other part of life over which we have control. Recent research suggests that it is better for one's health to be overweight and active than to be of normal weight and inactive. For this reason alone it is critical that children

develop the knowledge, skills and attitudes that give them the very best chance of staying active throughout their lives.

When children have confidence in their ability to take part in recreational and sporting activities without fear of showing themselves up, the probability that they will join in is high; and if they enjoy the activity they will likely continue with it. Children's movement confidence develops gradually as they grow and learn, and children are constantly

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comparing their own level of ability with the ability of the children with whom they play. Physically literate children who move with skillful purpose KNOW that they move well, and this confidence encourages them to try new and different activities without fear.

Physical literacy also provides a foundation from which sporting excellence can grow.

Physical literacy is therefore the key both to developing habits of life-long physical activity for enjoyment and health, and to the development of athletes who have the strong foundation that will permit them to reach the highest levels of international sporting excellence – to become world-class athletes.

2.3 CCC Athlete Development Grid

LTAD STAGE	COACH LEVEL	FACILITIES	TECHNIQUE	PHYSIOLOGY, STRENGTH, FLEXIBILITY	MENTAL SKILLS	COMPETITION	OTHER
<p>“Learning to Train” stage of athlete development. Boys 9 – 12 Girls 8 - 11</p>	<p>NCCP Competition Coaching Introduction (CCI) – Learning to Train Minimum 58 hours training.</p>	<p>Varied terrain, including challenging technical trails. Groomed tracks for skating and classic techniques. Lit trail system. Day lodge in stadium area.</p>	<p>Window of optimal trainability for motor-coordination. Introduce dryland ski techniques – ski walking and ski striding. The focus on snow is balance, agility and rhythm. Good technique habits are developed through repeated practice. Use games that reinforce technique being taught. All basic cross-country ski skills (classic and skating) should be refined before the end of this stage. Encourage unstructured play time on snow.</p>	<p>Utilize games to develop skills, speed, power and aerobic fitness. Window of optimal trainability for flexibility. Basic dynamic and static flexibility training with an emphasis on proper technique. Develop strength using medicine balls, Swiss balls, exercises that incorporate the child’s own body weight. Include basic core strength exercises. Use ski-related hopping and bounding exercises for developing leg strength and movement skills. Include speed exercises in the practice sessions by using specific activities that focus on agility, quickness and change of direction. Aerobic fitness is increasingly important. Include general aerobic activities 3-4x/wk.</p>	<p>Develop an awareness of the importance of practising basic mental skills. Introduce pre-race preparation. Introduce tactical skills. Introduce the mental skills of constructive self-talk, imagery and confident behaviour. Introduce basic stress management. Introduce basic goal setting.</p>	<p>Racing Rocks! ✓ <i>Ski Tournaments</i> ✓ <i>Double Cross</i> ✓ <i>Team Sprints</i> Midget Championships. Club, regional (and Provincial/Territorial Cup races when held within region). 5-10 competitive experiences per season. Race distances: start with 1.0 km and progress to a maximum of 3 km. 5-10 min. max.). Sprints: 200m. Generally begin after Xmas. Introduce ancillary capacities. Competitive focus should be on personal improvement. Basic rules are learned.</p>	<p>Narrow the focus to three sports. Ensure appropriate ski equipment. Good nutrition; continued education on re-hydration Emphasize group interaction, team building and social activities. Group sessions begin Sept. 15. 1.25 to 1.5 hrs. 3x /wk during fall and ski season. Maximum 70 sessions including competitions and special activities (includes winter safety and ski care education). Ensure “adventure-based” activities are built into season plan. Make good use of snow season.</p>

Important note for all age groups re: race distances. Early season races should be at the shorter end of the range. The maximum distance should only be raced a few times towards the end of the season. When establishing a race distance or deciding which race skiers will enter, take into account: the ability and fitness of the skiers; the difficulty of terrain; the elevation (altitude) of the race site; and whether the skiers are in the first or second year of their age class. The objective is to have skiers race at high speed with good technique, rather than struggle to finish the distance.

2.4 Growth and Development Considerations

10-11 Years, Growth and Development of Athletes

General Remarks
<ul style="list-style-type: none"><input type="checkbox"/> Develops conscience, morality and values<input type="checkbox"/> May display a highly competitive attitude (wants to look like a competent performer)<input type="checkbox"/> Marked distinctions between boys and girls begin to be visible, particularly toward the end of this period<input type="checkbox"/> May want to break free from the authority of adults and may show a defiant attitude<input type="checkbox"/> Athletic background may be highly variable among athletes; participation in sport activities is usually done on a seasonal basis<input type="checkbox"/> Time devoted to general training and the acquisition of a variety of skills and motor patterns should be greater than time spent training for a specific activity, preparing for competition or being engaged in competition
Psychosocial
<ul style="list-style-type: none"><input type="checkbox"/> Is usually very interested in group activities and creates strong links with a few friends<input type="checkbox"/> Wants to enjoy a greater degree of autonomy and wants to help<input type="checkbox"/> Shows a high degree of loyalty to the group<input type="checkbox"/> Begins to be interested in individuals of the opposite sex, without showing it openly<input type="checkbox"/> Expresses his or her feelings easily (e.g. anger, sadness)<input type="checkbox"/> Boys and girls can be involved together in the same activities
Learning
<ul style="list-style-type: none"><input type="checkbox"/> Begins to show some ability to deal with abstract concepts, yet prefers concrete examples<input type="checkbox"/> Emphasis should still be on general motor development and the learning of skills in a variety of sports<input type="checkbox"/> Fine motor control improves during this period<input type="checkbox"/> It is possible to start teaching a few specialized techniques, as well as fundamental tactical principles; the rules of the games should be well understood<input type="checkbox"/> Capacity to concentrate increases (can stay focused for approximately 10 minutes at a time)

Physical
<ul style="list-style-type: none">❑ Strength and endurance gains are possible as a result of fitness training, but improvements are also directly related to growth; very little potential for increased muscle mass (hypertrophy); strength gains result primarily from increased coordination and neural factors❑ Flexibility improves, but it should also be trained❑ Reaction time is relatively slow; however good visual acuity and depth perception allow for better performance in throwing/catching exercises❑ Sweating mechanism of children is not well developed, which reduces their capacity to dissipate heat during exercise; children are at an increased risk of heat injuries; children cool off rapidly and do not tolerate cold well❑ In girls, the second half of this period marks the beginning of a major growth spurt that will last approximately 3.5 years; some girls may have their first menstruation as early as 11 years of age. In some boys, puberty will begin at the end of this period
Preferences
<ul style="list-style-type: none">❑ Enjoys games that feature some competition, team games, as well as activities that require some form of effort or that represent some sort of physical challenge
To Avoid
<ul style="list-style-type: none">❑ Activities that feature repeated impacts or where there is a risk of collision; repetitive activities (to prevent boredom and overuse injuries); activities that feature too much structure; inappropriate exposure to a cold or hot environment❑ Use of equipment that is not designed for children; repetition of all-out efforts lasting between 20 and 60 seconds; work against a high resistance; prolonged aerobic endurance efforts❑ Specialization in a sport or in a position on a team❑ Emphasizing winning and creating pressure to perform❑ Comparisons with other children❑ Unpleasant or unsatisfying competitive experiences❑ Mechanical or highly repetitive approach to the teaching of fundamental techniques

Suggestions

- Participation in several sports/activities should be encouraged
- Rules should be adapted to encourage a high degree of interaction between athletes and to increase the probability of success during the activity; modified, scaled-down equipment should be used
- Demonstrations should be highly specific, simple and aimed at the achievement of a well-defined objective; duration of activities should be relatively short, and exercises should change frequently
- Time when athletes are actively involved in activities during practices should be maximized
- Children need to be praised and complimented generously and regularly for their efforts
- Feedback should focus on one point only; choose the most important one; emphasize the development of confidence, self-esteem, peer interaction, cooperation, having fun, putting winning and losing into perspective, and giving 100% effort
- Encourage children to drink water, and ensure plenty of drinks are available when exercising in the heat

12-15 Years, Growth and Development of Athletes

General Remarks

- Period where major growth spurts occur; in each gender, large differences in physical maturation may be observed in individuals of the same chronological age; in general, girls develop earlier than boys
- During this period, there is often a large difference in maturity between boys and girls
- Acquires moral concepts, values and attitudes that make it possible to relate meaningfully to society; positive role models are important
- Opinion of friends tends to be more important than that of the coach; athletes want to look like or be perceived as competent performers
- This is a period of major change during which athletes are likely to challenge authority, be very critical, question decisions and ask for justification
- Competition becomes increasingly important to some athletes; time devoted to general training should be greater than time spent training specifically for a sport or time spent competing

Psychosocial
<ul style="list-style-type: none">❑ It is important to separate boys and girls for activities and competition❑ Emotional instability may be observed because of the rate at which physiological changes occur❑ Shows a greater desire for independence; this can be a time of rejection of parental authority and, in general, a period when there is a high degree of confrontation with adults❑ Develops close relations with individuals of both sexes; enjoys being more independent and having more responsibility; a great deal of interest in sexuality is observed toward the end of this period❑ This period is important for the development of values such as respect for others, fair play and a work ethic
Learning
<ul style="list-style-type: none">❑ Begins to think like an adult; it is important to take into account the different maturity level between boys and girls; interests and abilities differ between the genders; challenges can be very appealing❑ Needs change on a regular basis; is highly curious; capacity to concentrate increases (can stay focused for 20 minutes or more at a time); increasingly capable of abstract thinking❑ This is a good period to consolidate the development of fine motor skills, to teach more complex tactical notions, and to encourage decision making in specific situations
Physical
<p>Girls:</p> <p>The development of secondary sexual characteristics begins at approximately 11-11.5 years of age. On average, the growth spurt begins shortly after that. Maximal growth rate (or peak height velocity, PHV) is normally observed between 11.5 and 12.5 years, and menarche (first menstruation) occurs approximately one year after PHV. During this period, body fat content tends to increase progressively, and typical female body forms (hips) appear because of the effect of hormones. As a result of these changes, performance often plateaus or may even decline for a short period of time. In addition, for a period of several months following menarche, girls may have difficulty sustaining heavy training loads. Girls should be counseled that this phenomenon is normal and that their performance will continue to improve after this temporary phase.</p>

Boys:

The development of secondary sexual characteristics occurs progressively at approximately 11 years of age. On average, the growth spurt begins at age 13, and PHV is reached at age 14-15. Significant gains in muscle mass and in strength typically occur one year after PHV (i.e. approximately ages 15-16) because of higher levels of testosterone. This is a good time to initiate strength training with heavier loads if this athletic ability is important in the sport.

Boys and Girls:

- During the growth spurt, feet and hands tend to grow first, followed by the legs and arms; long bones are fragile during this time; growth is accompanied by an increase in body weight throughout the period
- As a result of the rapid growth spurts that occur during PHV, body parts can be disproportionate; this can have a direct effect on coordination and the ability to perform certain skills that had already been well mastered
- This period is well suited for the development of aerobic fitness, as well as flexibility

Preferences

- Enjoys challenges and the opportunity to accomplish individual feats
- Accomplishment of actions that are likely to be looked at or admired by peers/friends
- Activities that contribute to the development of fine skills/dexterity and that do not require too much strength, team games, situations where some form of competition exists

To Avoid

- Repetition of all-out efforts lasting between 20 and 120 seconds before or during PHV; work against high resistance; prolonged aerobic endurance efforts that involve impact on the joints (i.e. running on a hard surface such as asphalt)
- High mechanical stress (compression forces) on the long bones and the backbone, e.g. lifting heavy weights
- Programs where the number of competitions is greater than the number of practices
- Pressure to perform
- Negative competitive experiences

Suggestions

- Time when athletes are actively involved in activities during a practice should be as high as possible
- Acquisition of more complex or sport-specific techniques; explanations can be more elaborate where appropriate; a high number of repetitions during drills is possible
- Give the opportunity to make decisions and to problem-solve
- Correct execution of movements must be emphasized if strength training is performed
- Appropriate supervision of training activities is important to prevent unnecessary risks that adolescents may take
- Games emphasizing skill and dexterity
- Opportunities to meet or interact with sport role models (athletes or coaches); competitions or tournaments that involve trips; social activities among the team/training group
- When an athlete who has reached puberty experiences pain in the joints (e.g. shoulders, elbows, knees) or if he/she now seems to have difficulty completing workouts that previously posed no difficulty, training loads (amount-frequency-intensity) may have to be decreased to avoid undue stress on the athlete's body
- Depending on the maturity level, involvement in roles such as officiating or leading certain activities (e.g. leading a warm-up or cool-down)

2.5 Developmental Age (Maturation)

It is important to understand the concept of “developmental age”. This refers to the degree of physical, mental, cognitive and emotional maturity as opposed to the well-understood notion of “chronological age”.

Developmental age is highly individualistic and is an amalgam of a child or adolescent’s physical development (assessed by skeletal maturity or bone age), together with the incorporation of mental, cognitive and emotional maturity. Chronological age refers to the number of years and days elapsed since birth. Athletes of the same chronological age between 10 and 16 can differ by as much as four or five years in their developmental age.

The beginning of the growth spurt and the peak of the growth spurt are very significant considerations in the application of LTAD to training and competition program design. For the most part, they are also relatively easy-to-obtain indications of the general developmental process that can be used to observe and monitor growth. As a result, LTAD requires the identification of early, average and late maturing individuals in order to help design appropriate training and competition programs in relation to the optimal trainability and readiness of an athlete.

Our sport system frequently selects athletes in the 10 to 16 age range to training camps, provincial teams and other programs offering educational and skill development advantages based on performance. Since early maturers typically have a significant biological advantage over their competitors, this selection process may create obstacles for late maturing athletes who, provided they experience quality coaching throughout that period, often have the potential to become the top athletes. It is therefore essential that administrators/programmers and coaches take developmental age-related considerations into account when designing their programs.

Figures 2.3 and 2.4 (below) show the rate of change in height in boys and girls through the key growth period.

Figure 2.3

Rate of Change in Height & Peak Velocity (PHV)
(Adapted from Tanner, 1978 & Kahn, 1999)

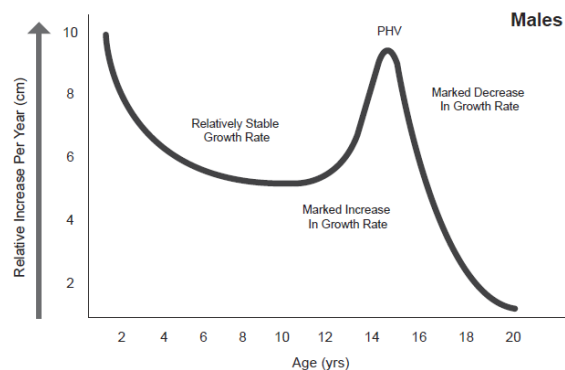
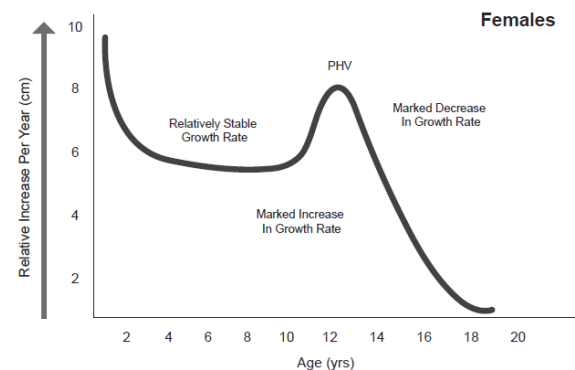


Figure 2.4

Rate of Change in Height & Peak Velocity (PHV)
(Adapted from Tanner, 1978 & Kahn, 1999)



2.5.1 Early Versus Late Developers

Adolescence is the period between childhood and becoming an adult. While both the start and end of this period are difficult to define, it is usually obvious when a youth is going through the many physical, psychological, social and sporting changes that accompany it.

Not all children enter adolescence at the same age, and it takes different children different lengths of time to complete the process. In general, children who enter adolescence early pass through it faster than those who start later, and whether they start early or late partially depends on their body shape. Stockier, more muscular children usually enter adolescence earlier than their peers who are thinner and leaner.

The whole process starts at approximately age 10 - 11 for girls, and approximately two years later for boys. It usually takes three to four years to complete. This means that for girls aged 12, some will have almost completed the physical changes of puberty, while others have barely started. For boys the greatest range of development is found in 14 year olds.

Few sports recognize and make provisions for the difficulties faced by early and late developers, or understand that those difficulties are different for boys and girls. Because of this, in many Canadian sports there are disadvantages to being either an early or a late developer.

One advantage late developers have is that they have a longer period of time between learning fundamental movement skills and the onset of adolescence.

This "Learning to Train" stage is a time when the human body is perfectly designed for the acquisition and refinement of sport skills, and the longer a child is in this stage, the better developed their skills can become.

The challenge in sport for late and early developers is explained as follows:

- **Males.** In reality, male late developers are often at a great disadvantage. This is especially true in sports where age group competitions are held. As their peers go through puberty, late developing males find themselves much smaller, less muscular and physically weaker. Training and competing against bigger, stronger and faster opponents is not always fun, particularly in contact sports, and late developers therefore tend to drop out, despite the fact that in the long run they have greater potential for success. There are also disadvantages to being an early developer. Early in adolescence, early developers (who go through a relatively rapid but short adolescence) are bigger, stronger and faster than their peers and this often translates into sporting success. However, as late developing competitors go through their longer, more sustained, growth spurt, they eventually catch up with and surpass the early developers. With their late developing peers now bigger, faster, stronger and more skilled than them, the early developers tend to drop out of their sport. This usually occurs towards the end of adolescence.
- **Females.** For females the situation is less clear, but appears to be reversed. Changes to their body along with social pressures to discontinue sport involvement can cause early developers to drop out early in their teen years, while late developing females who had success with their prepubescent bodies when their competitors developed before them face the same difficulty when older.

2.5.2 Measuring Growth

Coaches and parents can use stature measurements (height) before, during and after maturation as a guide for tracking the development age of children. Tracking allows coaches to address the critical or sensitive periods of physical development (endurance, strength, speed and flexibility) and skill development.

The age of an athlete can be examined from seven different perspectives:

1. Chronological age
2. Biological age
3. Developmental age
4. Sport-specific training age
5. Relative age
6. Skeletal age
7. Training age

How to Measure Growth Spurt

- ❑ Stand straight against a wall; no shoe; heels touching the wall.
- ❑ Measure from floor to top of head.
- ❑ Measurements should be taken at the same time of day (AM or PM).
- ❑ **Phase 1: Age 0 to 6**
 - ✓ Very rapid growth.
 - ✓ Measure standing height and weight on birthday.
- ❑ **Phase 2: Age 6 to the Onset of Growth Spurt**
 - ✓ Steady growth until the onset of growth spurt.
 - ✓ Measure standing height and weight every three months.
 - ✓ If measurement takes place outside of home, replace birthday with an annual starting point of measurements.
- ❑ **Phase 3: From the Onset of Growth Spurt to Peak of Growth Spurt**
 - ✓ Rapid growth until peak is reached.
 - ✓ Measure standing height, sitting height and arm span every three months.
- ❑ **Phase 4: Peak of Growth Spurt to Slow Deceleration**
 - ✓ Rapid deceleration.
 - ✓ Measure standing height, sitting heights and arm span every three months.
- ❑ **Phase 5: From Slow Deceleration to Cessation**
 - ✓ Slow deceleration of growth until cessation of growth.
 - ✓ Measure standing height every three months.
- ❑ **Phase 6: Cessation**
 - ✓ Cessation of growth.
 - ✓ Measure height and weight on birthday.

2.6 Trainability

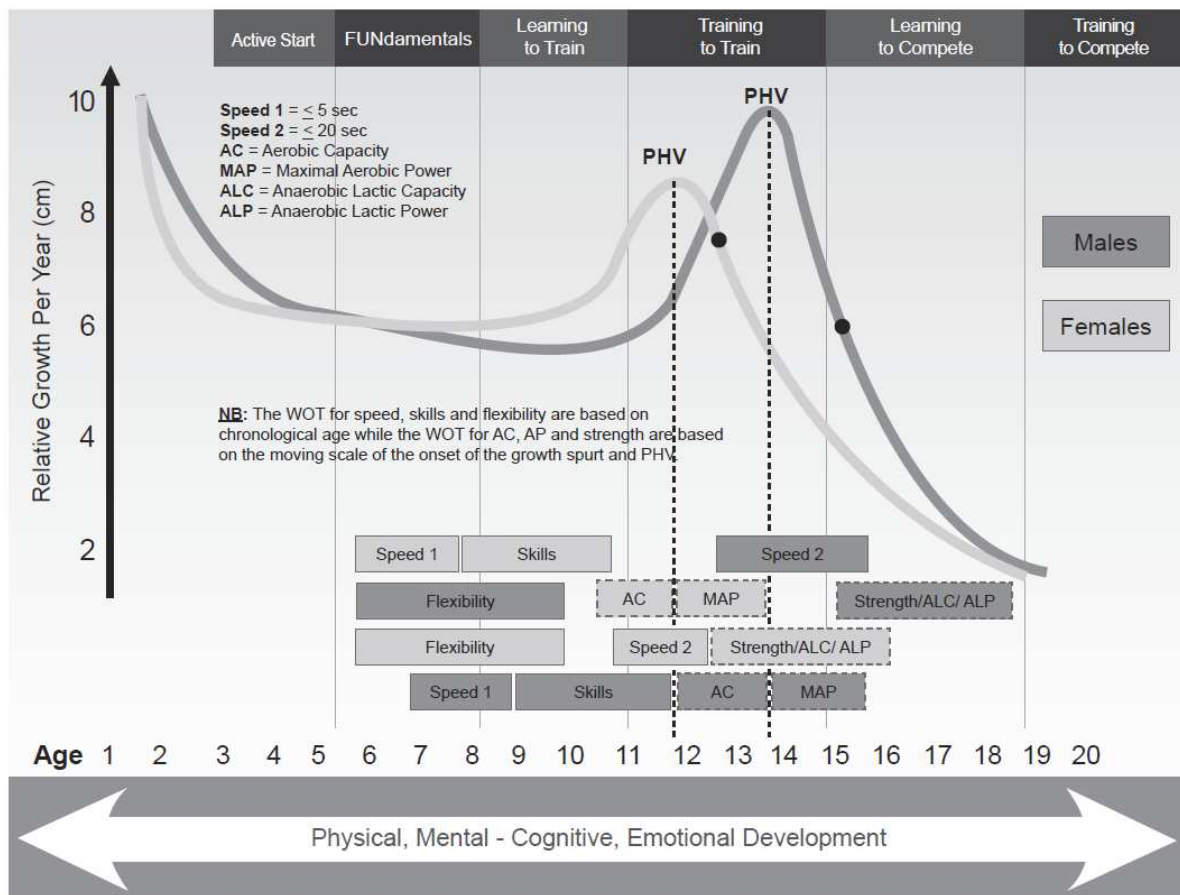
Trainability refers to the genetic endowment of athletes as they respond individually to specific training stimuli and adapt to it. Malina and Bouchard (1991) define trainability as “the responsiveness of developing individuals at different stages of growth and maturation to the training stimulus.”

The terms “adaptation” and “trainability” are often used interchangeably in coaching. However, the difference between them is significant. Adaptation refers to a change or changes in the body as a result of a stimulus that induces functional and/or morphological changes in the organism.

2.6.1 Windows of Optimal Trainability

Accordingly, periods of sensitivity to particular emphases of training, the so-called “windows of trainability” in the table below, are dependent on the maturation levels of the athlete. For this reason, the timing of training emphasis differs depending on whether athletes are early, average or late maturers. For example, the first of two windows of accelerated adaptation to strength training for females occurs immediately after Peak Height Velocity (PHV) and the second begins with the onset of menarche. For males, there is one window and it begins 12 to 18 months after PHV.

Figure 2.5: Pacific Sport Windows of Optimal Trainability (adapted from Balyi and Way, 2005)



2.6.2 Five Basic S's of Training and Performance

- ❑ **Stamina (Endurance).** The window of optimal trainability occurs at the onset of the growth spurt. Aerobic capacity training is recommended before children reach PHV. Aerobic power should be introduced progressively after the growth rate decelerates.
- ❑ **Strength.** The window for trainability for girls is immediately after PHV or at the onset of the menarche (first menstruation), while for boys it is 12 to 18 months after PHV.
- ❑ **Speed.** For boys, the first speed training window occurs between seven and nine years of age and the second window occurs between 13 and 16 years of age. For girls, the first speed training window occurs between six and eight years of age and the second window occurs between 11 and 13 years of age.
- ❑ **Skill.** The window for optimal skill training begins at nine years of age for boys and eight years of age for girls. This window ends at the onset of the growth spurt.
- ❑ **Suppleness (Flexibility).** The window of optimal trainability for suppleness in both boys and girls occurs between six and 10 years of age. Special attention should be paid to flexibility during PHV.

Refer to section 4 of this Reference Material for more information.

2.7 Mental, Cognitive and Emotional Development Characteristics

A major objective of your program - and one that reflects Canadian values - should be a holistic approach to athlete development. In addition to physical, technical and tactical development - including decision-making skills - the mental, cognitive and emotional development of athletes needs to be addressed. This includes an emphasis on ethics, fair play and character building. All programming should be designed to consider the athletes' cognitive ability to address these concepts throughout the various stages. In addition, coaches, parents and sport administrators need to understand that when programming for children and adolescents in the short-term, the longer term ramifications need to be taken into account so as to act in the participants' best interests.

Characteristics for the FUNdamentals and L2T Stages of Development

❑ Basic Characteristics

- ✓ The attention span gradually increases.
- ✓ Children are enthusiastic and often impatient.
- ✓ Children have very limited reasoning ability.
- ✓ Children enjoy the repetition of activities and improve through experience.
- ✓ Children establish their preferred learning style.
- ✓ Imagination is blossoming.
- ✓ Language skills may be limited but are improving.
- ✓ Children like to be the centre of attention.
- ✓ Children are developing their self concept.
- ✓ Children feel secure with a routine and structure to training.
- ✓ Children feel secure when coaching is consistent.

❑ General Impact on Performance

- ✓ Children cannot listen or stay still for long periods.
- ✓ Children want to move and not listen.
- ✓ Children love to be led.
- ✓ Skill learning must be directed; children do not learn correctly just by trial and error.
- ✓ Learning is through verbal, visual or manual means. Most children are doers!
- ✓ Creativity should be encouraged.
- ✓ Children can't make corrections to their performance unless they understand what is being asked of them.
- ✓ Children tend to evaluate their performance as a whole and in terms that may be black and white. (I was brilliant, or, I was useless.)
- ✓ Introduce change sensitively and gradually.
- ✓ Children like things to be fair.

❑ Implications for the Coach

- ✓ Provide short and precise instructions. Devise strategies to ensure children are listening. Children learn well by imitating and practising correctly-modeled

movements.

- ✓ Do not bombard children with technical information. Give only sufficient detail for the activity to be undertaken. Keep the fun.
- ✓ Direct the training and give it a tight focus with activities that are fun and well planned.
- ✓ Introduce imaginative ways of achieving performance goals.
- ✓ Provide correct demonstrations of the basic sport skills. Personal demonstrations must be accurate.
- ✓ Use a variety of learning styles to suit individual needs.
- ✓ Allow the children to play and experiment. Use their ideas to create exciting sessions. Structure activities to encourage individuality and creativity. Sport provides an excellent vehicle for expression.
- ✓ Use terminology that can be easily understood. Gradually introduce technical terminology.
- ✓ Develop this characteristic. Plan activities that guarantee success.
- ✓ Always move from simple to more complex when teaching a skill movement.
- ✓ Allow children to show their skills.
- ✓ Provide positive reinforcement to build self-esteem. Children are likely to perform the actions again if they are successful and feel good about it. Build on success.
- ✓ Structure activities that are progressive in nature while maintaining continuity.
- ✓ Set and maintain high levels of expectancy, but be consistent with each child. Do not let mood swings or personal situations change coaching behaviours.

2.8 Developing Self-Reliant Athletes

Self-reliance is an essential skill for all cross-country skiers. Children should begin to take personal responsibility appropriate for their age, social and psychological development from the time they take their first steps on skis. Following are some ways in which you, as a coach, might encourage the development of good self-management skills in young skiers during the first three stages of the LTAD progression.

Active Start

- ❑ Teach and encourage good ski care habits - such as not leaving poles on the ground, not walking in the parking lot with skis on, wiping the snow off skis after skiing and putting away skis after each ski session.
- ❑ Teach and encourage good trail etiquette as outlined in your ICC Reference Material (section 6) - such as passing to the right when meeting another skier head on, and not taking pets on the trail.
- ❑ Teach basic winter safety skills as outlined in your ICC Reference Material (section 6) - such as never ski alone, and what to do if you become lost.
- ❑ Teach basic skills for keeping warm as outlined in your ICC Reference Material (section 3) - such as keeping a toque on, and wearing mitts, not gloves.

FUNdamentals

- ❑ Encourage athletes to prepare their own skis and teach them how to do it as explained in your CC Reference Material (section 5, Practice Plans L1-3, L2-3, L3-12 and L4-13). For example teach them to clean the base of a ski, and to apply grip wax.
- ❑ Teach and encourage good trail safety practices as outlined in the ICC Reference Material (section 6) – such as knowing which trails they are allowed to ski on, and carrying a map and staying on recognized trails when skiing in unfamiliar areas.
- ❑ Teach about and encourage the use of appropriate clothing for skiing as outlined in the ICC Reference Material (section 3).
- ❑ Teach and encourage winter safety skills as outlined in your CC Reference Material (section 5, Practice Plan 3-13) - such as how to avoid frostbite and hypothermia, how to recognize the symptoms and what steps they should take if this happens to them or a team mate. This would include teaching practice sessions L4-30 (Backwoods Adventure) and L3-35 (Orienteering Poker Ski).
- ❑ Encourage punctuality.
- ❑ Encourage athletes to pack their own ski clothing/equipment when leaving for or departing from the ski area.
- ❑ Introduce important nutrition and rehydration principles for cross-country skiing.
- ❑ Introduce athlete involvement in decision-making.
- ❑ Encourage leadership experiences (planning activities, being a role model).
- ❑ Establish expectations with respect to athlete assistance in setting up and taking down the “practice area”.

- ❑ Teach your athletes a stage-appropriate routine to follow at competitions, and to focus on appropriate objectives, as explained in your CC Reference Material (section 8). For example teach them:
 - ✓ how to evaluate their performance against their own goals for the event (e.g. did they ski a difficult turn without falling, etc.) rather than comparing themselves against other competitors;
 - ✓ an appropriate warm-up procedure (e.g. to become familiar with their course before the race); and
 - ✓ an appropriate warm-down procedure.
- ❑ Encourage contributing to some reflection on the practice sessions.

Learning to Train

- ❑ Encourage athletes to prepare their own skis and teach them how to do it as explained in your CCI-L2T (On-Snow) Reference Material (section 2). For example, teach them how to clean the base of a ski for glide waxing and how to apply glide waxes. This would include coaching your athletes to successfully complete Track Attack Target #11 (Ski Preparation).
- ❑ Teach and encourage good safety practices for dryland activities as outlined in the CCI-L2T (Dryland) Reference Material (section 8) - such as wearing a helmet when biking or roller skiing, and how much fluid they require (and when to take it) when they are exercising. This would include coaching your athletes to successfully complete Track Attack Target #12 (Roller Skiing).
- ❑ Teach and encourage winter safety skills as outlined in your CCI-L2T (Dryland) Reference Material (section 8) – such as wearing eyewear with UV protection, how to prepare for a competition in cold weather, and how to ski the backcountry safely (including avalanche awareness). This would include coaching your athletes to successfully complete Track Attack Targets #7 (Backcountry Adventure) and #9 (Ski Orienteering).
- ❑ Encourage punctuality.
- ❑ Encourage good nutritional and rehydration habits.
- ❑ Encourage athlete involvement in decision-making and leadership experiences (e.g. planning practice session/activities, preparing and cleaning up the practice area, being a role model).
- ❑ Teach your athletes the basic competition rules for the different types of events they will compete in during this stage of development.
- ❑ Teach your athletes how to prepare for and manage a competitive experience as explained in your CCI-L2T (ON-Snow) Reference Material (section 7) - such as developing a plan for race day, how to determine what to eat for breakfast on race day and how to determine what replacement fluids to use (and when to use them) following a race. This would include coaching your athletes to successfully complete Track Attack Targets #4 (Ski Tournament), #5 (Midget Championships), #6 (Provincial/Territorial Championships), #13 (Team Sprints) and #14 (Xtreme X-Country).

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- ❑ Encourage self-analysis of ski situations, and contributing to reflections on practice sessions, camps, trips to competitions and other team activities.
- ❑ Encourage your athletes to adopt an athletic lifestyle specific to cross-country skiing. This would include coaching your athletes to successfully complete Track Attack Targets #8 (Snow Camp) and #15 (Off-season Camp).
- ❑ Encourage appropriate involvement in club activities (cleaning the daylodge, brushing the trails in the off-season, etc.), appreciation for what others are doing to make their sport experience possible, and loyalty to their club and program.

Encourage the education of the athlete. DO NOT do everything for them.

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