



FIND YOUR EDGE



SKATING CANADA'S **STRATEGIC PLAN LEAD SKATING CANADA'S**

Long-Term Athlete Development Plan





Table of Contents

- 2.....Glossary of Terms
- 5.....Introduction
- 6.....Overview
- 6.....Shortcomings and Consequences
- 7.....LTAD Framework
- 8.....10 Key Factors Influencing LTAD
- 8.....The Rule of 10
- 9.....The FUNdamentals
- 9.....Specialization
- 10....Developmental Age
- 12....Trainability
- 14....Physical, Mental, Cognitive, and Emotional Development
- 14....Periodization
- 15....Calendar Planning for Competition
- 16....System Alignment and Integration
- 16....Continuous Improvement
- 17....Speed Skating Canada Stages of LTAD
- 17....FUNdamentals- Basic Movement Skills
- 19....Learning to Train
- 22....Training to Train
- 27....Learning to Compete
- 32....Training to Compete
- 36....Learning to Win
- 36....Training to Win
- 41....Implementation
- 42....Appendix 1
Physical, Mental, Cognitive, and Emotional Development
Characteristics
- 48....Appendix 2
Speed Skating LTAD Overview layout
- 49....Appendix 3
Speed Skating Canada's Current Canadian
Age Class Categories
- 52....References
- 52....Credits

Glossary of Terms

Adaptation refers to a response to a stimulus or a series of stimuli that induces functional and/or morphological changes in the organism. Naturally, the level or degree of adaptation is dependent on the genetical endowment of an individual. However, the general trends or patterns of adaptation are identified by physiological research, and guidelines are clearly delineated of the various adaptation processes, such as adaptation to muscular endurance or maximum strength.

Adolescence is a difficult period to define in terms of the time of its onset and termination. During this period, most bodily systems become adult both structurally and functionally. Structurally, adolescence begins with acceleration in the rate of growth in stature, which marks the onset of the adolescent growth spurt. The rate of statural growth reaches a peak, begins a slower or decelerative phase, and finally terminates with the attainment of adult stature. Functionally, adolescence is usually viewed in terms of sexual maturation, which begins with changes in the neuroendocrine system prior to overt physical changes and terminates with the attainment of mature reproductive function.

Ancillary Capacities refer to the knowledge and experience base of an athlete and includes warm-up and cool-down procedures, stretching, nutrition, hydration, rest, recovery, restoration, regeneration, mental preparation, and taper and peak.

The more knowledgeable athletes are about these training and performance factors, the more they can enhance their training and performance levels. When athletes reach their genetic potential and physiologically cannot improve anymore, performance can be improved by using the ancillary capacities to full advantage.

Bend refers to the curve of the tube in the blade. As skaters only race counter clockwise, both the left and right blade are bent into the corner (to the left). The skate is bent into the corner to assist in initiating the turn by increasing the surface area touching the ice. In simple terms, bending uses the same concept as the side cut in skis. It should be noted that short and long track bends vary in size (larger or smaller radius).

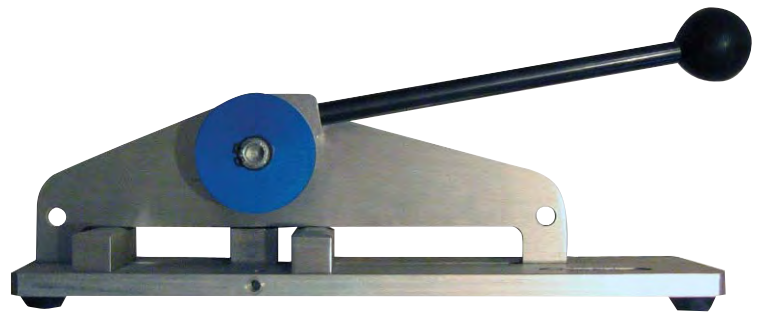


Photo Credit: Shawn Holman

Bender refers to a machine used to bend a curve into the tube of the blade. This machine is used by manually pressing the tube to produce a bend in the blade of the skate.

Childhood ordinarily spans the end of infancy- the first birthday- to the start of adolescence and is characterized by relatively steady progress in growth and maturation and rapid progress in neuromuscular or motor development. It is often divided into early childhood, which includes pre-school children aged 1 to 5 years, and late childhood, which includes elementary school-aged children, aged 6 through to the onset of adolescence.

Chronological age refers to “the number of years and days elapsed since birth.” Growth, development, and maturation operate in a time framework; that is, the child’s chronological age. Children of the same chronological age can differ by several years in their level of biological maturation. The integrated nature of growth and maturation is achieved by the interaction of genes, hormones, nutrients, and the physical and psychosocial environments in which the individual lives. This complex interaction regulates the child’s growth, neuromuscular maturation, sexual maturation, and general physical metamorphosis during the first 2 decades of life.

Windows of Trainability refers to a point in the development of a specific behavior when experience or training has an optimal effect on development. The same experience, introduced at an earlier or later time, has no effect on or retards later skill acquisition.

Development refers to “the interrelationship between growth and maturation in relation to the passage of time. The concept of development also includes the social, emotional, intellectual, and motor realms of the child.”

The terms “**growth**” and “**maturation**” are often used together and sometimes synonymously. However, each refers to the specific biological activities. Growth refers to “observable, step-by-step, measurable changes in body size such as height, weight, and percentage of body fat.” Maturation refers to “qualitative changes, both structural and functional in nature, in the organism’s progress toward maturity; for example, the change of cartilage to bone in the skeleton.”



Photo Credit: Shawn Holman

Gauge refers to an instrument used to measure both the bend and rocker of the blade. Measurements can be converted into metres to monitor and modify both the bend and rocker of the blade.

Imitations refer to the imitation of skating movements off the ice. This is used as both a mode of technical training, as well as physical training.

ISU refers to the International Skating Union which governs both Long and Short Track Speed Skating.



Photo Credit: Shawn Holman

Klap Skate refers to the blade and mechanism, which is attached to the long track boot. This equipment gets its name “Klap Skate” from the sound it makes when the blade opens and closes on the boot as the skater pushes. This opening action of the blade on a LT skater is because it is only secured by a single pivot point on the boot. This differs from ST as the blade is secured at both the front and back of the boot.

Long Track (LT) Speed Skating is done on a 400m Oval and there are several events including:

- Mass start racing is a race in a pack and usually done with younger skaters. Time is recorded, but it is head to head competition with the winner being the first skater across the line. Distances are determined by Canadian age classes. Refer to Appendix 3 on page 49.
- Olympic style racing, which is raced in pairs against the clock. Both skaters compete using both inner and outer lanes on the 400m Oval. Elite distances include
 - Sr. Men 100m, 500m, 1000m, 1500m, 5000m, 10000m
 - Sr. Women 100m, 500m, 1000m, 1500m, 3000m, 5000m
 - Jr. Men 500m, 1500m, 3000m, 5000m
 - Jr. Women 500m, 1000m, 1500m, 3000m

Marathon, which is a pack style skating over very long distances. This can be done on both 400m Ovals, as well as on outdoor lakes and canals.

Team Pursuit is the newest event where skaters compete in teams of 3 with all laps skated on the inner track of the Oval. Men complete 8 laps and women perform 6 laps with the clock determining the winner.



Photo Credit: Arno Hoogveld



Photo Credit: Scott Maw

Medicine ball is a small weighted ball used for strength training. They are significantly smaller than the Swiss ball and will vary in weight.

Off-set refers to the placement of the blade on the boot. This setting can be done with the blade moved to the left or right of the centre setting.

Peak height velocity (PHV) refers to the maximum rate of growth in stature during growth spurt. The age of maximum velocity of growth is called the age of PHV.

Peak strength velocity (PSV) refers to the maximum rate of increase in strength during growth spurt. The age of maximum increase in strength is called the age of PSV.

Peak weight velocity (PWV) refers to the maximum rate of increase in weight during the growth spurt. The maximum increase in weight is called the age of PWV.

Physical literacy refers to the mastering of fundamental motor skills and fundamental sport skills.

Post-natal growth is commonly, although sometimes arbitrarily, divided into 3 to 4 age periods, including infancy, childhood, adolescence, and puberty.

Puberty refers to the point at which an individual is sexually mature and able to reproduce.

Readiness refers to the child's level of growth, maturity, and development that enables him/her to perform tasks and meet demands through training and competition. Readiness and windows of trainability during growth and development of young athletes are also referred to as the correct time for the programming of certain stimuli to achieve optimum adaptation with regard to motor skills, muscular and/or aerobic power.

Rocker refers to the radius of the blade, which is measured in metres. This radius can be consistent or variable, which can enhance skater's gliding or turning ability. It should be noted that ST and LT rockers vary considerably.

Short Track (ST) Speed Skating is done in an arena and is raced mass start. Several skaters will race together on a 111m oval where the first person across the line wins. Short Track events at the elite level include

- Individual distances for both senior men and women 500m, 1000m, 1500m, 3000m
- Sr. Women's relay 3000m (4 person team)
- Sr. Men's relay 5000m (4 person team)
- Individual distances for both junior men and women 500m, 1000m, 1500m, 1500m super final
- Jr Women and Men's relay 2000m (3 person team)

Distances are determined by Canadian age classes. Refer to Appendix 3 on page 49.

Skeletal age refers to the maturity of the skeleton determined by the degree of ossification of the bone structure. It is a measure of age that takes into consideration how far given bones have progressed toward maturity, not in size, but with respect to shape and position to one another.



Photo Credit: Richard Guerette

Swiss Ball is a large ball that can be used for core and stability exercises. It is also referred to as a physio ball. Various sizes are available to properly fit the size of the skater.

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

Introduction

Speed Skating Canada (SSC) is pleased to present its Long Term Athlete Development (LTAD) model. This document will provide an overview or 'big picture' of the LTAD plan and framework that will guide SSC and its member's programs. This guiding model and framework will be critical to the young skaters, their parents, coaches, and administrators and will help ensure that the quantity and quality of training and competition are appropriate for their developmental age. The LTAD gives special attention to the skater's growth and development, maturation, trainability, and sport system alignment and integration. This overview document is intended to provide information regarding LTAD, as well as SSC's objectives which integrate LTAD concepts specifically to the sport of speed skating. To achieve these objectives, SSC will develop detailed manuals, which will assist in the practical implementation of the LTAD principals.

This model is based on the work of Istvan Balyi and has been embraced by SSC as well as Sport Canada. Currently, Sport Canada is working with 32 sports in developing their sport specific LTAD plan. To aid in development and education, the Canadian Sport Centres have worked with LTAD specialists to develop and publish a resource paper, Canadian Sport for Life. This SSC document has integrated the information from the Canadian Sport for Life resource paper into a speed skating specific resource.



Photo Credit: Scott Maw

Overview

Why do we need LTAD?

Speed Skating Canada has a history of excellence and is regarded among Canada's premier winter sports. To build and continue on this tradition of excellence, SSC has recognized the need to take the next step in maximizing the development of its members. Before implementation of a LTAD, it is important that we understand the shortcomings and consequences that currently plague the Canadian sport system. Below is a list of shortcomings and consequences that impede the Canadian sport system. Many of these shortcomings and consequences exist in the sport of speed skating. With the implementation and education of LTAD in the sport, we will be able to address and avoid these shortcomings.



Photo Credit: Arno Hoogveld

Shortcomings

- Developmental athletes over-compete and under-train
- Adult training and competition programs are imposed on developing athletes
- Training methods and competition programs designed for male athletes are imposed on female athletes
- Preparation is geared to the short-term outcome and winning and not on the process
- Chronological rather than developmental age is used in training and competition planning
- Coaches largely neglect the critical periods of accelerated adaptation to training
- Fundamental movement skills and sport skills are not taught properly
- The most knowledgeable coaches work at the elite level; volunteers coach at the developmental level where quality trained coaches are essential
- Parents are not educated about LTAD
- Developmental training needs of athletes with a disability are not well understood
- In most sports, the competition system interferes with athlete development
- There is no talent identification (TID) system
- There is no integration between physical education programs in the schools, recreational community programs, and elite competitive programs
- Sports specialize too early in an attempt to attract and retain participants

Consequences

- Failure to reach optimal performance levels in international competitions
- Poor movement abilities
- Lack of proper fitness
- Poor skill development
- Bad habits developed from over-competition focused on winning
- Undeveloped and unrefined skills due to under-training
- Female athlete potential not reached due to inappropriate programs
- Children not having fun as they play adult-based programs
- No systematic development of the next generation of successful international athletes
- Athletes pulled in different directions by school, club, and provincial teams because of the structure of competition programs
- Remedial programs, implemented by provincial and national team coaches, to counteract the shortcomings of athlete preparation
- Fluctuating national performance due to lack of TID and developmental pathway
- Athletes failing to reach their genetic potential and optimal performance level

Source: *Canadian Sport for Life* p. 7

LTAD Framework

Speed Skating Canada's LTAD framework is athlete centered and built upon the principals of human growth and development. This model stresses the need for an individualized approach to developing young skaters, which is guided by biological maturation and not chronological age. All young people follow the same pattern of growth from infancy through adolescence although there are significant individual differences in both the timing and magnitude of the changes that take place. This framework is based on the physical, mental, emotional, and cognitive development of children and adolescent skaters. Speed Skating Canada has developed a 5 stage approach, which is broken down and detailed into the following 7 specific categories:

<p>STAGE 1</p> <p>Fundamentals- Fundamental movement skills Age: Males 6-9 and Females 6-8 (Short & Long Track)</p>
<p>STAGE 2</p> <p>Learning to Train- Fundamental sports skills including speed skating skills Age: Males 9-12 and Females 8-11 (Short & Long Track)</p>
<p>STAGE 3</p> <p>Training to Train- Building the engine and sport specific skills Age: Males 12-16 and Females 11-15 (Short & Long Track)</p>
<p>STAGE 4.1</p> <p>Learning to Compete- Optimizing the engine and speed skating specific skills and fitness Age: Males 16-18 +/- & Females 15-17 +/- (Short & Long Track)</p> <p>STAGE 4.2</p> <p>Training to Compete- Further Optimizing the engine and speed skating specific skills and fitness Age: Males 18-21 +/- and Females 17-21 +/- (Short & Long Track)</p>
<p>STAGE 5.1</p> <p>Learning to Win-</p> <p>Maximizing the engine and speed skating specific skills and fitness Age: Males 21-23 +/- and Females 21-23 +/- (Short Track) Age: Males 21-25 +/- and Females 21-25 +/- (Long Track)</p> <p>STAGE 5.2</p> <p>Training to Win- Further Maximizing the engine and speed skating specific skills and fitness Age: Males 23 + and Females 23+ (Short Track) Age: Males 25 + and Females 25+ (Long Track)</p>

The 10 Key Factors Influencing LTAD

The following factors are the research principles and tools upon which LTAD is built.



The Rule of 10

Scientific research has concluded that across most sports it takes a minimum of 10 years and 10,000 hours of training for a talented athlete to reach elite levels. This translates into slightly more than 3 hours of training or competition daily for 10 years. This factor is supported by *The Path to Excellence*, which provides a comprehensive view of the development of US Olympians who competed between 1984 and 1998. The results reveal that

- U.S. Olympians begin their sport participation at the average age of 12.0 for males and 11.5 for females.
- Most Olympians reported a 12-13 year period of talent development from when they were introduced to their sport to making an Olympic team.
- Olympic medalists were younger-1.3 to 3.6 years-during the first 5 stages of development than non-medalists, suggesting that medalists were receiving motor skill development and training at an earlier age. However, caution must be taken not to fall into the trap of early specialization in late specialization sports.

Through an analysis of top Canadian and international speed skating performers, we can predict an “optimal” age for talent identification, which supports the 10 year rule. Within speed skating, there are significant differences between both Long Track and Short Track Speed Skating. It is important to note that the rule of 10 allows for training and cross-over from other sports. Generally speaking, speed skating is a late specialization sport with Short Track having slightly younger indicators of talent ID than Long Track.

Findings indicate that

- Short Track Talent ID generally occurs in Stage 3, ages 12-13 years old for females and age 14 for males
- Long track Talent ID generally occurs in Stage 4. Specifically, it is stage 4.1 for the male skaters at 17 years old and Stage 4.2 for females at the age of 18 years old.



Photo Credit: Arno Hoogveld



The FUNdamentals

FUNdamental movements and skills should be introduced through fun and games. These should follow and include basic overall sport movement skills.

- FUNdamental movement skills and FUNdamental sports skills = physical literacy
- Physical literacy refers to competency in movement and sports skills
- Physical literacy should be developed before the onset of the adolescent growth spurt.

The following five components provide the foundation of movement skills required for participation in Canadian sports. They include:

The ABC's of athleticism which are:

- Agility
- Balance
- Coordination
- Speed

Athletics:

- Run
- Wheel
- Jump
- Throw
- Swimming: This is for safety reasons, as well as for balance in a buoyant environment. Basic swimming skills provide the foundation for all water-based sports. At the elite level recovery from training and injury can be enhanced by using water activities.

Skating:

Basic skating technique will provide the proper foundation and gateway to participate in many winter sports. As Canada is a winter sport nation, this becomes an important basic movement skill for all Canadians

Skiing:

Basic technique and comfort in a skiing environment will provide the foundation and gateway to participate in various skiing and snowboarding events. Again as Canada is a winter sport nation, this becomes an important basic movement skill for all Canadians.



Specialization

This factor has a significant effect on the sport of speed skating. Understanding, implementing, and promoting the importance of basic FUNdamentals in our skaters has limited some of our skaters' potential in the later stages of development. Speed Skating falls into the late specialization sport category, therefore special attention and consideration needs to be taken in our training and competitive programs for our young skaters.

It has been noted among many sports that specializing before the age of 10 in late specialization sports can contribute to:

- One-sided, sport-specific preparation
- Lack of ABC's, the basic movement and sports skills
- Overuse injuries
- Early burnout
- Early retirement from training and competition

Although speed skating has experienced much success, we have also experienced the pitfalls of early specialization by many of our young skaters. Attention to this area will greatly improve our depth in Canada, as well as promote life long participation in our sport.

4 Developmental Age

The terms "growth" and "maturation" are often used together and sometimes synonymously. However, each refers to specific biological activities. Growth refers to observable step-by-step changes in quantity and measurable changes in body size such as height, weight, and fat percentage. Maturation refers to qualitative system changes, both structural and functional, in the body's progress toward maturity such as the change of cartilage and bone in the skeleton.

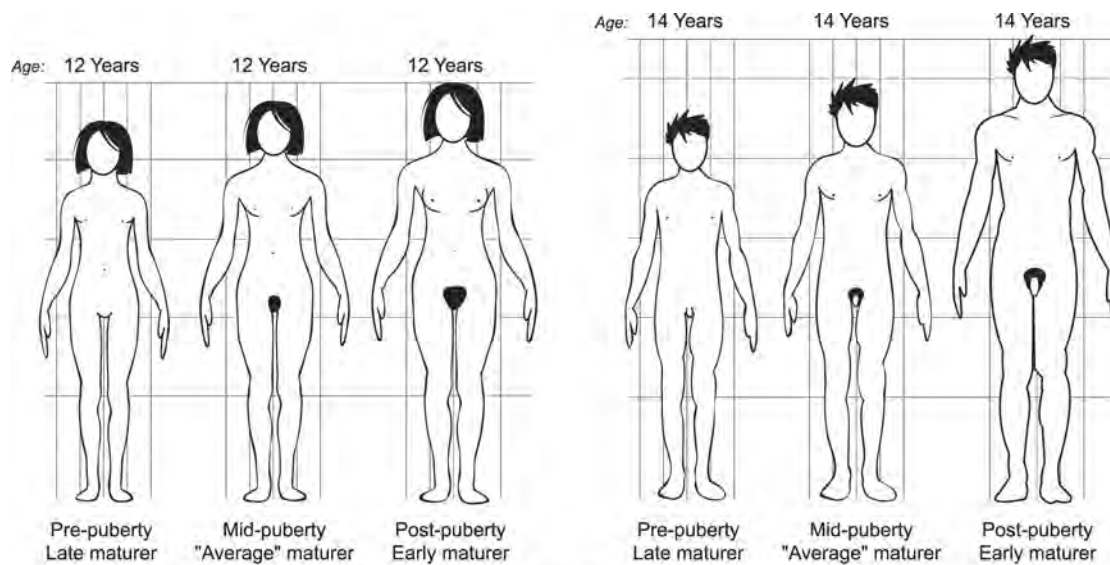
Development refers to 'the interrelationship between growth and maturation in relation to the passage of time. The concept of development also includes the social, emotional, intellectual, and motor realms of the child.

Chronological age refers to the number of years and days elapsed since birth. Children of the same chronological age can differ by several years in their level of biological maturation.

Developmental age refers to the degree of physical, mental, cognitive, and emotional maturity. Physical developmental age can be determined by skeletal maturity or bone age after which mental, cognitive, and emotional maturity is incorporated.

PHV in girls occurs at about 12 years of age. Usually the first physical sign of adolescence is breast budding, which occurs slightly after the onset of the growth spurt. Shortly thereafter, pubic hair begins to grow. Menarche, or the onset of menstruation, comes rather late in the growth spurt, occurring after PHV is achieved. The sequence of developmental events may normally occur 2 or even more years earlier or later than average.

Figure 1 – Maturation in Girls and Boys

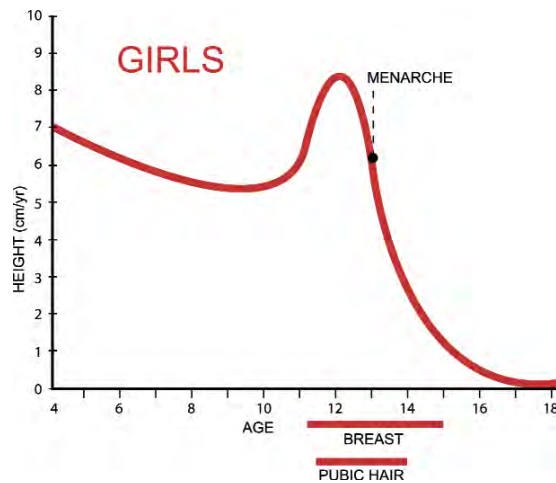


Adapted from "Growing Up" by J.M. Tanner. Scientific American 1973

Source: Canadian Sport for Life p.23

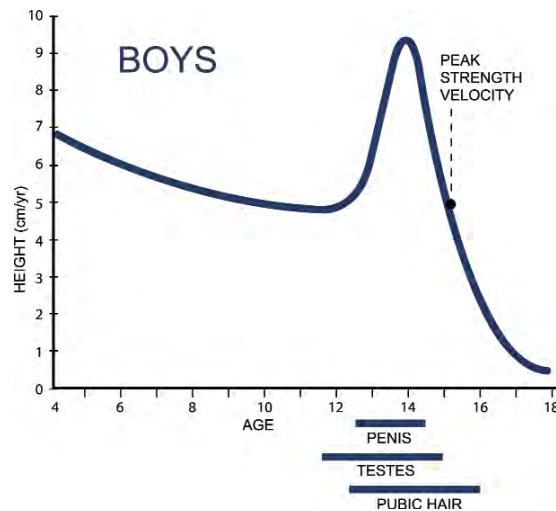
LTAD requires the identification of early, average, and late maturers in order to help design appropriate training and competition programs in relation to optimal trainability and readiness. The beginning of the growth spurt and the peak of the growth spurt are very significant in LTAD applications to training and competition design.

Figure 2—Maturity Events in Girls (Modified after Ross et al. 1977)



Source: Canadian Sport for Life p.24

Figure 3—Maturity Events in Boys (Modified after Ross et al. 1977)



Source: Canadian Sport for Life p.24

PHV in boys is more intense than in girls and on average occurs about 2 years later. Growth of the testes, pubic hair, and penis are related to the maturation process. Peak Strength Velocity (PSV) comes a year or so after PHV. Thus, there is pronounced late gain in strength characteristics of the male skater. As with girls, the developmental sequence for the male skater may occur 2 or more years earlier or later than average. Early maturing boys may have as much as a 4-year physiological advantage over their late-maturing peers. Eventually, the late maturers will catch up when they experience their growth spurt.

Currently, our system uses both chronological age (CND age class groups), as well as ability for competition (all-points format). At present, competitions, training camps, training groups and provincial teams are picked with a very heavy focus on performance. As a result, skaters of the same age, between ages 10 and 16, can be 4 to 5 years apart developmentally. Therefore, chronological age is a poor guide in dividing adolescent skaters for competition, training, and for use when picking provincial teams.

Training age refers to the age where skaters begin planned, regular, serious involvement in training. The tempo of a child's growth has significant implications for athletic training because children who mature at an early age have a major advantage during the Training to Train stage compared to average or late maturers. However, after all athletes have gone through their growth spurt, it is often later maturers who have greater potential to become top athletes provided they experience quality coaching throughout that period.

5 Trainability

The terms "adaptation" and "trainability" are often used interchangeably in coaching. However, the difference between them is significant.

Adaptation refers to changes in the body as a result of a stimulus that induces functional and/or morphological changes in the organism. The degree of adaptation is dependent on the genetic endowment of an individual. However, the general trends or patterns of adaptation are identified by physiological research, and guidelines are clearly delineated of the various adaptation processes, such as adaptation to muscular endurance or maximum strength.

Trainability refers to the faster adaptation to stimuli and the genetic endowment of skaters as they respond individually to specific stimuli and adapt to it accordingly. Trainability has been defined as the responsiveness of developing individuals to the training stimulus at different stages of growth and maturation.

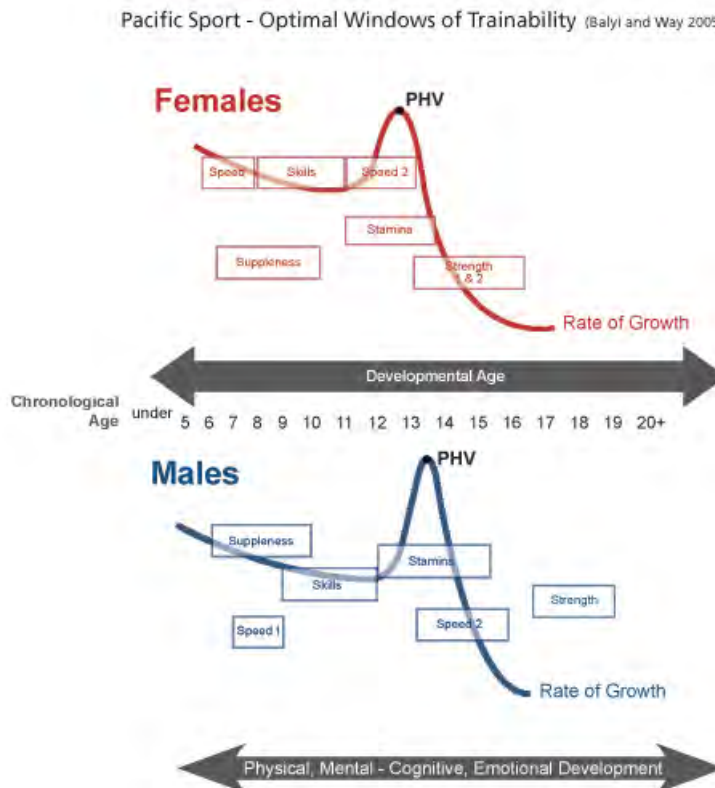
A Window of Trainability refers to the point in the development of a specific capacity when training has an optimal effect. Other factors are readiness and critical periods of trainability during growth and development of young skaters, where the stimulus must be timed to achieve optimum adaptation with regard to motor skills, muscular, and/or aerobic power. Attention to windows of trainability will be a significant factor in the continued success of Speed Skating Canada.

The Windows of Optimal Trainability for Females and Males.

Two windows, stamina and strength, are based on the moving scales of the onset of the growth spurt and PHV.

The other 3 windows, speed, skill, and suppleness, are based on chronological age.

Figure 4—Optimal Window of Trainability (Balyi and Way, 2005)



Source: Canadian Sport for Life p.27

ALL SYSTEMS ARE ALWAYS TRAINABLE!



Photo Credit: Arno Hoogveld

1. Stamina (Endurance)

The optimal window of trainability occurs at the onset of PHV. Aerobic capacity training is recommended before skaters reach PHV. Aerobic power should be introduced progressively after growth rate decelerates.



Photo Credit: Scott Maw

2. Strength

The optimal window of trainability for girls is immediately after PHV or at the onset of menarche, while for boys it is 12 to 18 months after PHV.

To understand and implement the windows of trainability we will first need to identify the 5 basic S's of training and performance. (Dick, 2002)



Photo Credit: Mike Ridewood

3. Speed

For boys, the first speed training window occurs between the ages of 7 and 9 years and the second window occurs between the ages of 13 to 16. For girls, the first speed training window occurs between the ages of 6 and 8 years and the second window occurs between the ages of 11 and 13 years.



Photo Credit: Arno Hoogveld

4. Skill

The window of optimal skill training for boys takes place between the ages of 9 and 12 and between the ages of 8 and 11 for girls.



Photo Credit: Shawn Holman

5. Suppleness (Flexibility)

The optimal window of trainability for suppleness in both girls and boys occurs between age of 6 and 10 years old. Special attention should be paid to flexibility during PHV.



6

Physical, Mental, Cognitive, and Emotional Development

All training, competitive, and recovery programs should consider the mental, cognitive, and emotional development of each skater. Along with the physical, technical, and tactical development, speed skating requires a considerable amount of decision making skills. Building these skills and the capacity for decision training should be integrated into the stages of development to enhance the mental, cognitive, and emotional development of the skaters. Considerations to the skater's cognitive ability should be considered when programming, and progressing these skills.

For a complete overview of the mental, cognitive, and emotional development characteristics and their implications for the coach, refer to Appendix 1 on page 42.

7

Periodization

Simply put, periodization is time management. As a planning technique, it provides the framework for arranging the complex array of the training process into a logical and scientifically-based schedule to bring about optimal improvements in performance.

Periodization sequences the training components into weeks, days, and sessions. Periodization is situation specific depending upon priorities and the time available to bring about the required training and competition improvement. In the LTAD context, periodization connects the stage that the skater is in to the requirements of that stage.

Periodization organizes and manipulates the aspects of modality, volume, intensity, and frequency of training through long-term (multi-year) and short-term (annual) training, competition, and recovery programs to achieve peak performances when required.

Periodization, far from being a single fixed methodology, is in fact a highly flexible tool. When used appropriately in conjunction with sound methodology and ongoing monitoring and evaluation, it is an essential component in optimal sports programming and athlete development at all levels.

LTAD addresses this requirement by developing periodization models for all stages, taking into consideration the growth, maturation, and trainability principles that are unique to the primary development stages - the first 2 decades of life - yet seamlessly integrated with the subsequent stages of athletic performance and life.

LTAD is typically a 5 to 10 year procedure that optimizes physical, technical, tactical - including decision making - and mental preparation, as well as the supporting ancillary capacities. Within LTAD is quadrennial planning, which refers to the 4-year Olympic cycle for elite skaters and the annual plan, which is based upon identified periods of preparation, competition, and the transition into the next calendar plan.

Current examples of periodization models identified in the sport performance literature are designed for the sub-elite and elite senior/mature performers. There is very little information on periodization for children and adolescents. Along with this overview document, Speed Skating Canada will provide detailed examples of plans and programs which will support the LTAD model.

8

Calendar Planning for Competition

Optimal competition calendar planning at all stages is critical to skater development. During earlier stages (1-4.1), developing physical capacities take precedence over competition. Throughout the later stages (4.2-5.2) the ability to compete well becomes the focus. The following factors should be considered with regards to training to competition ratios for Calendar Planning for Competition:

- Optimal sport specific competition ratios are required for all stages of LTAD.
- Level and length of the competitive season should be aligned with the changing needs of the developmental skater progressing through LTAD.
- Over-competition and under-training at the Learning to Train and Training to Train stages result in a lack of basic skills and fitness.
- The appropriate level of competition is critical to the technical, tactical, and mental development at all stages. Specific strategies will need to be analyzed and implemented by the provinces and regions across the country, as strengths and weaknesses will vary considerably.
- The current system of competition is based on tradition. It should be planned to enhance optimal training, performance and development of the skater depending upon their LTAD stage.
- Competitions in Canada must be created and scheduled considering strategic planning and with due regard for the optimal performance of an athlete and the tapering and peaking requirements.
- While international and national calendars are usually well integrated, a systematic competition and training review needs to be undertaken, with regard to our club and provincial level skaters. Specifically, we need to look at the integration of both Long and Short Track training and competition.

THE SYSTEM OF COMPETITION MAKES OR BREAKS SKATERS!



Photo Credit: Mike Ridewood



Photo Credit: Mike Sturk



9 System Alignment and Integration

As a leader in Canadian sport, Speed Skating Canada continues to improve its system alignment and integration through its NCCP coaching certification, which is guided by LTAD.

Once all sports in Canada implement LTAD it will hopefully encourage community and school programs to adapt the same principles.

10 Continuous Improvement

The concept of continuous improvement, which permeates LTAD, is drawn from the respected Japanese industrial philosophy known as Kaizen.

Continuous improvement ensures that:

- LTAD responds and reacts to new scientific and sport-specific innovations and observations and is subject to continuous research in all its aspects.
- LTAD, as a continuously evolving vehicle for change, reflects all emerging facets of physical education, sport, and recreation to ensure systematic and logical delivery of programs to all ages.
- LTAD promotes ongoing education and sensitization of federal, provincial/territorial, and municipal governments, the mass media, sport and recreation administrators, coaches, sports scientists, parents, and educators about the interlocking relationship between physical education, school sport, community recreation, life long physical activity, and high performance sport.



Photo Credit: Teunis Versluis

Speed Skating Canada

Stages of LTAD

STAGE 1 – FUNdamentals

Basic Movement Skills

Age: Males 6–9 and Females 6–8 (Short & Long Track)

Physical Objectives

The focus of this stage is on critical skill and speed skating literacy. Speed Skating Canada's programs provide a learn to skate program, which consists of

- Speed, power, and endurance through fun and games
- Introduction to core stability through fun and games
- General overall athleticism through programs introducing the:
 - ABC's of athleticism (agility, balance, coordination, speed)
 - RJT's (run, jump, throw)
 - KGB's (kinesthesia, gliding, buoyancy, striking with implements)
 - CK's (catching, kicking with body parts)

The 5 S's of Training and Performance "Windows of Trainability"

Stamina (Endurance)

- Programs should not concentrate on energy system development specifically, but include aerobic activities through fun and games.

Strength

- Introduction to strength exercises using the skaters own body weight, as well as medicine and Swiss ball exercises. Again, implementation should be done using a game environment.

Speed

- First window of speed development for boys aged 7-9
- First window of speed development for girls aged 6-8

- Speed should be done at the end of each warm-up
- Emphasis should be on doing the speed work prior to fatigue - low volume and high intensity

Skill

- Optimal window of skill training starts for girls near the end of this stage, between ages 8-11
- Emphasis on motor development to produce skaters who have a better trainability for long-term sport specific development

Suppleness

Optimal window for flexibility for both girls and boys is at the beginning of this stage, ages 6-10.



Photo Credit: Sandi Vyse-Lloyd



Testing Objectives

This should be done in a game environment whenever possible. Due to short attention spans of young people, coaches will need to give careful consideration to their practice planning when implementing any testing games. Due to the windows of trainability testing should include both field and ice.

Field

The start of height measurements for the tracking of PHV. This should be recorded once per year and preferably on the skater's birthday.

- Weight
- Directional agility challenge (Delorme, 2002)
- Knee angle
- Sit and Reach

Ice

- Emphasis should be on general skating skills and having fun
- Obstacle courses can be used for fun and a way to observe improvements

Psychological Objectives

During this stage there are not any specific mental training skills that should be implemented. The coach should be promoting all of the mental capacities that are appropriate for young skaters in this stage, which include positive attitude, confidence and concentration.

Mental Capacities

At this stage in a skater's development, coaches should be aware of the skater's mental capacities, as well as promote the development of them. The mental capacities during this stage include

- A positive attitude to sport
- Confidence
- Concentration
- Achieve success and receive positive reinforcement

Lifestyle and Personal Objectives

Involvement in more than one sport should be promoted. The aim of these skaters is to have enjoyment in sport while learning fair play, development of a positive attitude, develop interaction skills, and the ability for teamwork.

Sport Specific Objectives

There are no arena size recommendations for this stage of development. Along with the multi-sport approach, the skater will be introduced to the simple rules and ethics of sport, as well as speed skating specific regulations. The introduction of simple rules, ethics in sport, and speed skating specific regulations in Stage 1 is supported by the data mining of both our long and short track team members. It was found through our data mining that our national teams started speed skating at an average age of 6.8 for short track and 9.4 for long track.

Equipment Objectives

- Learning proper maintenance of skates (ie drying)
- Learning to tie and fit skates
- Supplied with a properly fitted boot with a blade that is straight or a bend up to 0.5
- Properly fitting helmet, knee pads, gloves, and neck guard

Skill objectives are to introduce basic skating skills

- Forward
- Backward
- Balance
- Edge control
- Cross over both ways
- Basic speed skating position
- Stopping
- Starts
- Agility

Training and Competition Objectives

- There is no periodization in the FUNdamentals stage, however, all programs are structured and monitored.
- Training camps should emphasize the components of general athleticism and implement when ever possible (ie different sports, swimming lessons for safety reasons).
- Fun races in practice should be promoted before "organized events".
- The type of competition at this stage should be at the club level, with the recommended approximate number of competitions for this stage between 0 to 6.
- Competition strategies should consist of having fun and competition preparation and include a group warm-up and warm-down lead by the coach.
- Average sessions should be 45 minutes in duration and 1-3 sessions per week for 22-24 weeks are recommended.
- Skaters should not exceed the recommended sessions, as we are promoting athleticism in this stage, skaters should be involved in 4 different sports at this stage of their development.

STAGE 2 – Learning to Train

FUNdamental Sports Skills Including Speed Skating Skills

Age: Males 9-12 and Females 8-11 (Short & Long Track)

Physical Objectives

The focus of this stage is on critical skill and speed skating literacy. Further development of all fundamental movement skills is critical during this stage of development. If missed, a significant window of opportunity is lost which will compromise the ability of the young skater to reach their full potential. Attention to the following should be considered

- Learn to speed skate long and short track.
- Develop endurance through fun and games.
- Flexibility exercises introduced through fun and games.
- Speed through agility, quickness, and change of direction. This should be done as part of warm-ups, dryland, and ice sessions. They should also incorporate lateral, multi-directional, and random movements.
- Continued development of core stability through fun games.
- Introduce generic ankle and knee stability, as well as body alignment.
- Development of physical literacy through fun and games.
- Advanced ABC's, RJT's, and KGB's, CK's.
- PHV in girls could start as early as 9 years old.

The 5 S's of Training and Performance "Windows of Trainability"

Stamina (Endurance)

- Programs should increase with an emphasis on aerobic development. This should be done through games, relays, and unstructured play.

Strength

- Foundational athletic skills (ABC's) are the focus of strength development.
- Circuit training as a progression in strength development is encouraged. High repetitions and/or timed sets are suggested when developing programs.
- Hopping and bounding exercises can be introduced to aid in strength development.

- Continue to develop strength using exercises that incorporate the skaters own body weight as well as medicine and Swiss balls.
- Introduction to proper lifting technique should be incorporated into exercises using body weight and the two types of balls.

Speed

- Second window of trainability for girls is near the end of this stage, ages 11-13.

Skill

- It should be noted that this stage is one of the most important periods of motor development for children. This generally happens between the ages of 9 and 12.
- This is a window of accelerated adaptation to motor co-ordination.
- Optimal window of skill training continues for girls, but closes at the end of this stage, ages 8-11.
- Optimal window of skill training for boys occurs in this stage, and continues through the end of this stage, age 9-12.

Suppleness

- Optimal window for flexibility for both girls and boys continues through Stage 2.
- Special attention to flexibility for girls due to the onset of PHV.

Testing Objectives

The focus of testing in this stage is to expose the skaters to various physical field testing. All skaters are learning to test at this stage of development. When implementing testing modalities, LTAD factors should be considered. These factors include the physical, mental, and cognitive aspects of the skater's stage of development, as well as the aims of progression to properly and optimally align all stages of development.

Field

- Continued measurement of height for the tracking of PHV. Optimally this should now be recorded every 2 to 3 months, as well as on the skater's birthday.
- Weight should be taken on a monthly basis
- Directional Agility Challenge (Delorme 2002). This test should be a tool used for developing motor coordination and speed. This can be done as part of the warm-up and to assist in learning what testing is about. Results should not be emphasized.
- Knee angle
- Sit and Reach
- Leger Boucher
- Vertical Jump
- Wobble board balance. This is used primarily as training of balance, with a secondary goal of learning to test.
- Standing broad jump
- Critical speed 800m run

Ice

- Emphasis should be on general skating skills and having fun
- Obstacle courses can be used as games and a way to observe improvements. Increased difficulty should be added from Stage 1
- Introduction to specific distances (333m, 500m, 666m, 777m). Practice and competition distances can be skated and recorded, but it should not be emphasized with the skater

Psychological Objectives

During this stage there is an introduction to mental training skills which include:

- Introduction to goal setting sheets
- Emphasis on the process of setting goals, introduce the concept of goal outcomes
- Set daily and realistic goals
- Ability to imagine themselves skating
- Introduction to basic ideal performance state (IPS) exercises (ie. relaxation, activation, refocusing, and parking)

Mental Capacities

- Introduction to mental preparation
- Understanding of the role of practice
- Perseverance
- Confidence
- Concentration
- Achieve success and receive positive reinforcement

Lifestyle and Personal Objectives

- Continued involvement in multi-sports should be promoted.
- The inclusion of sport in the skater's lifestyle should start during this phase.
- Participation in complementary sports, some of which classically include cycling (road&mntn), running, and inline skating.
- Introduction to sport cultural and lifestyle habits, which include nutrition, hydration, recovery and regeneration. This should include both skater and parental education with respect these issues.
- There should be an understanding of the changes which puberty will bring.
- The skater learns discipline and structure, as well as relationship between effort and outcome.
- Teamwork and group interaction skills remain a focus of development.



Photo Credit: Richard Guerette

Sport Specific Objectives

The recommended arena size for this stage should be National Hockey League (NHL) or Olympic sized. During this stage, an emphasis starts to develop with regards to Short and Long Track Speed Skating skills. A continuation and progression should continue with regards to the education of simple rules and ethics in sport. This will allow for increased understanding of the simple rules and ethics in speed skating, as well as ensure the basics are covered for skaters entering the system. This reinforcement of simple rules is supported by the average age of 6.8-9.4, which covers the trend in starting ages of both our Long and Short Track team members.

Equipment Objectives

- The introduction to sharpening and the purchase of sharpening equipment should be encouraged.
- An off-set adjustment should start with the blade centered on the boot. Progression of an off-set adjustment should consider the following:
 - Assessment of ankle strength (straight line of force).
 - Timing of push and ability to glide on edges (consider hip, knee, and shoulder alignment).
- Skater should have proper training equipment such as
 - Running shoes
 - Cycling shorts
 - Warm-ups
- Skaters should be dressed appropriately for environmental factors.
- Bend recommendations include 0.5-1.0 ST and 0.5 for LT
- Coaches and clubs should have access to bending equipment (bender and gauge).
- Introduction to bending by the athletes can take place near the end of this stage. This will assist in the progression of skater's equipment skills in the following stages.
- Skaters should be introduced to both Short and Long Track speed skating. The introduction to the Klap skate can be done in this stage with the determining factor being availability and funds. Age does not play a factor.
- Appropriate skates and blades for a developmental skater. Due to the accelerated window of motor coordination, it is important that properly fitted boots (comfort & performance) are available. As well as boots, a properly sized and maintained blade is critical for this stage of development.

- Skill objectives are to refine skating skills with an emphasis on specific speed skating skills.
- Skaters should be working toward achieving a "gold level" in the SSC Cutting Edge program.
- Emphasis should be on developing correct timing in the execution of the skating push.
- Continued reinforcement of the basic skills from Stage 1.
- Introduce off-ice speed skating skill development (imitations) during training sessions beginning with implementation in group warm-ups.
- Introduction to relay technique and patterns should be introduced. Both traditional and modified relays can be done to develop general skating skills.

Training and Competition Objectives

- The introduction of single periodization for the Learning to Train stage.
- Competition recommendations for this stage include 4 to 8 per year, which includes both Long and Short Track. Competition events should include both club and provincial level.
- It should be noted that fun races during practice time should be incorporated into the program. As a result, traveling for competition will be reduced, therefore increasing available time for training, skill development, additional activities, and fewer missed school days.
- Competition strategies should be on skating technique, while introducing the skaters to race plans.
- The coach should continue to lead group warm-ups and warm downs with a progression of leadership of these activities to the skaters. These activities should still be done in a group setting.
- Average sessions should be 60 minutes in duration and 4 sessions per week for 22-29 weeks. It is recommended that skaters participate in 3 on-ice sessions along with 3 other organized activities. Participation in these activities should follow the seasonal sports schedule.
- Recommended training to competition ratio is 70% training to 30% competition.
- At competitions, emphasis should be on personal bests not on ranking.



STAGE 3 – Training to Train

Building the Engine & Sport Specific Skills

Age: Males 12-16 and Females 11-15 (Short & Long Track)

Physical Objectives

The focus of this stage is on physical development or “building the engine”, and on consolidating sport specific skills. It should be noted that both the aerobic and strength trainability are dependent on the maturation levels of the skater. For this reason, the timing of training emphasis differs depending on whether skaters are early, average, or late maturers. Attention to the following should be considered:

- Continue to develop speed through agility, quickness, and change of direction. This should be done as part of warm-ups, dryland, and ice sessions, which incorporate lateral, multi-directional, and random movements.
- Ankle, knee, and core stability based on diagnostics.
- Continue to develop body alignment and teach/challenge motor coordination.
- Participation in complementary sports with similar energy systems and movement patterns should be encouraged (ie inline skating).
- Growth spurt for girls can start as early as age 10.
- PHV for girls occurs at the average age of 12.
- PHV for boys occurs at the average age of 14.
- Growth spurt for boys could start as early as age 12.
- During rapid growth spurts, skaters may go through an uncoordinated and awkward period. Coaches and skaters should be aware and discuss this as it is a common occurrence that could affect adolescent skaters.
- Early maturing boys could have as much as a 4 year physiological advantage over late maturers.

The 5 S’s of Training and Performance “Windows of Trainability”

Stamina (Endurance)

- Aerobic training continues to be trained but should be a priority after the onset of PHV.
- Aerobic power should be introduced progressively after growth rate decelerates.

Strength

- Timing of strength development differs in males and females due to PHV.
- Optimal window of trainability for girls is immediately after PHV or at the onset of menarche.
- Optimal window of trainability for boys is 12 to 18 months after PHV, this is also referred to the period of Peak Strength Velocity (PSV).
- The progressions of fundamentals are focused on the teaching of lifting technique, with an emphasis on foundational athletic skills.
- Introduction to strength training with light implements.
- Exercises include barbell lifting to develop technique. This can be done with a broomstick and light dumbbells.
- Loading parameters should focus on technique, which starts with low reps and low weight, and then progress to higher reps with low weight. The amount of reps and weight are dictated by the ability of the skater to maintain proper technique.

Speed

- Second window of trainability for girls continues into the beginning of this stage, ages 11-13.
- Second window of trainability for boys starts near the beginning of this stage, ages 13-16.

Skill

- Optimal window of skill training for boys (9-12 years old) ends near the beginning of this stage.

Suppleness

- Special attention to flexibility for boys and girls during and through PHV. This emphasis on flexibility will promote proper care and development during the rapid growth of bones, tendons, ligaments, and muscles.

Testing Objectives

There is an increased focus on physical testing throughout the skater's windows of trainability. Although the skaters are developing the physical capabilities needed to monitor testing for performance purposes, this stage generally remains a focus of testing education. This education should emphasize an approach of increased responsibility to prepare and execute the tests properly. The responsibilities of the skater include their integration of the personal, lifestyle, and mental aspects (ie. motivation, IPS) to their approach of testing, as well as training.

The importance of this approach will greatly increase the validity of the tests performed now, but more importantly in the stages to come when testing becomes a critical component of enhancing performance. Testing should be used as part of training, which will ensure that the skater's focus remains on their training throughout this critical stage of development. A common pitfall during this stage is for coaches, skaters, and parents to rush the focus of testing and competition during this stage. The skaters' developmental level needs to be evaluated on an individual basis to ensure the tests are appropriate. Introducing a test too early could put a skater at risk for injury.

Field

- Continued measurements of height for the tracking of PHV. Optimally this should now be recorded every 2 to 3 months, as well as on the skater's birthday.
- PVH measurements should be increased to every month when acceleration in height is noticed.
- Weight should be taken on a monthly basis
- Directional Agility Challenge (Delorme 2002). This test should be a tool used for developing motor coordination and speed. At this stage the skaters are now becoming comfortable with the test, which should allow them to increase their knowledge of testing/ preparation.
- Knee angle.
- Sit and Reach.
- Leger Boucher.
- Vertical Jump (used if jump pad is not available).
- Wobble board balance. This continues to be more of a training exercise than classic testing method. Emphasis should be on on-ice testing for balance.
- Standing broad jump.
- 5 jump bounding. Caution with this test should be taken with regards to the skaters growth spurt. Emphasis should be on jumping technique to prevent injury.

- Medicine ball overhead throw (backward throw).
- Critical speed 800m run.
- Critical speed 1500m run.
- Critical speed 3000m run.
- Introduction to AM/morning heart rate (HR) for monitoring training and recovery. Optimally a HR monitor should be used, but the skater can use their finger and a watch to count the beats per minute if a HR monitor is not available.

Lab tests (tests requiring equipment)

- Introduction to the jump pad test. This is a progression from vertical jump to a more scientific approach to power testing. Education increases with the quality of information gathered from the test, as well as the increase in responsibility in the approach the test.
- Introduction to the 30" Wingate test. This will also aid in the progression to a more advanced testing method. As cycling tests are among the most used methods of testing for skaters, it is an excellent opportunity to learn and be exposed to this testing modality.
- Computrainer testing if the skater/coach has access.

Ice

- With an increase in physical trainability comes the increase in specificity on the ice. Emphasis still remains on the education of testing, which includes the introduction of more specific tests. From this stage on, testing protocols should include the following

Long Track Tests include

- Tempo distance (400m, 800m, 3000m, team pursuit)
- Specific distance (500m 1000m, 1500m, 3000m, 5000m)
- Location
- Split breakdown
- Indication of practice or competition
- Weather/ice conditions



Photo Credit: Arno Hoogveld

Short Track Tests include

- 777m Pursuit
- 1 & 2 lap flying
- Standing start 1 lap
- Specific distance (500m, 1000m, 1500m)
- Jr. relay 2000m (3 per team)
- Men and Women 3000m relay

Psychological Objectives

During this stage there is a progression to specific mental training skills. Along with the development of skills, coaches and athletes need to be aware of the motor learning issues that accompany the growth spurt. Mental profiling can begin in this stage, as well as development of appropriate attitudes towards competition. The skater should focus on being the best they can be, and start to understand and believe in the process.

Mental Training Skills

- Continue to set process and outcome goals, which should be written down with an increase in detail.
- Visualization exercises – the skater should be able to imagine themselves skating and visualize technical corrections.
- Understanding of Ideal Performance State (IPS).
- Apply basic exercises such as relaxation, activation, refocusing, and parking.

Mental Capacities

- Goal setting both short and medium term
- Practice visualizing improved technique and self confidence
- Relaxation (deep breathing)
- Patience and control
- Concentration
- Continue positive reinforcement

Lifestyle and Personal Objectives

- Understanding and application of basic rest and recovery strategies.
- Nutrition and hydration for sport and recovery.
- Record of training and performance (diary/log).
- Time management. This develops with increase of training and competition, along with the holistic approach to school, family etc. A balanced lifestyle is very important to monitor by both coaches and parents.
- Introduction to planning and periodization. This will assist in the skater's responsibility for training expectations, recovery, and time management.
- Develop sport cultural and lifestyle habits, which include nutrition, hydration, recovery and regeneration and tapering and peaking. This should include both skater and parental education.
- Introduce individual management/career planning.
- Due to the talent identification in short track men and women, skaters will have to make some decisions regarding priority towards either ST or LT. Data mining of elite performers in Short Track show an indication that talent ID occurs during this stage. Approximate ages are 12-13 years old for the girls and 14 years old for the boys. It should be noted that athletes should continue skating both disciplines, but the ratio may vary.
- An understanding of interpersonal skills and learning to work in a team environment.
- Positive communication.
- Awareness of PHV and windows of trainability.



Photo Credit: Arno Hoogveld

Sport Specific Objectives

For safety reasons the recommended arena size for this stage is Olympic. During this stage, the skaters will refine their specific speed skating skills for both Long and Short Track. A continuation and progression should continue with regards to rules and ethics in sport.

Equipment Objectives

- At this stage skaters should be sharpening their own blades and be responsible for basic maintenance of their equipment.
- Individual off-set should be introduced in this stage. Skaters should have an understanding of off-set and the concepts behind it. During this stage, athletes should become more responsible for this adjustment in their equipment.
- Introduction to bending, as well as the ability to measure bend and rocker by the skater. A progression from coach to athlete should start with regards to responsibility. Individual set-ups should be introduced with the coach's supervision.
- Continued upkeep on training equipment. The addition of a heart rate monitor, road bike (primary bike), mountain bike (secondary bike), inline skates, and running and weight room shoes should be a priority during this stage. This will greatly assist in increased training, monitoring and injury prevention during the windows of trainability.



Photo Credit: David Reith

- Skaters should have access or purchased both Long and Short Track equipment. This will ensure quality cross-training, as the athletes are still in a development stage of the sport. Many skaters may still discover that they have an aptitude towards the discipline which they have not "specialized" in. It is critical not to close this window of opportunity for a switch in disciplines, as this is a common mistake during this stage of development. There are far too many examples of coaches and/or parents who encourage their kids to specialize too early on either ST or LT. Many make their decision based on physical size, which should not be a determining factor. The following illustration shows two very different developmental ages; both skaters are 14 years old yet should both be encouraged to continue their development in both LT and ST.

- As skaters start to gravitate to one discipline, they should purchase the appropriate higher quality boot and blade.
- Correct decisions should be made with regard to appropriate clothing for both training and racing. Performance and environmental factors should be considered when making these decisions.

Skill objectives are to refine core techniques

These objectives should be practiced in a competitive environment, which occur in both practice and competition. Priority should be given to providing this in a practice environment, so that the LTAD principals of Training to Train will be accomplished. Competition skills that would be incorporated into practice and competition would include

- Passing
- Track patterns
- Pacing
- Changing lanes
- Decision making skills
- Olympic style racing towards second half of this stage
- Introduction to video analysis
- Ensure off-ice training is part of a well-structured program
- Advanced strategies and tactics in relays (coverage, exchanges, pacing)



Photo Credit: Shawn Holman

Training and Competition Objectives

During competitions, skaters compete to win and do their best, but the major focus of training should be on learning the basics as opposed to competing.

- Skaters should be exposed to and learn to cope with the physical and mental challenges of competition.
- Single periodization is recommended for this stage of development.
- Data mining of elite performers in short track show an indication that talent ID occurs during this stage. Approximate ages are 12-13 years old for the girls and 14 years old for the boys.
- Recommended numbers of competitions are 8 to 12 per year. This includes both long and short track and should be monitored closely as over-competing and under training are common mistakes during this stage of development. To assist in this, it is recommended that races be organized during practice to cut down on traveling, which results in lost training time.
- Competition events for long and short track include; club, provincial, CDN age class, North American, ISU Jr. Worlds, and Canada Winter Games.
- Skaters who have reached the age of 14 before July 1, but have not reached the age of 19 before July 1 preceding the Championships can compete at the ISU Junior World Championships.

- Skaters who have reached the age of 14 on June 30, but have not reached the age of 19 on June 30 of that year can compete at the Canada Winter Games.
- Competition strategies include technique and fun through utilizing different race plans.
- Competition preparation includes an individualized warm up and warm-down.
- Recovery techniques, equipment routines, and nutrition strategies should also be implemented.
- Average sessions should be 60-90 minutes in duration and 5 sessions per week. Training becomes a year round activity with a recommended 3 to 5 sessions on-ice and 2 dryland sessions at the beginning of this stage. This is increased to 4 on-ice and 2 off-ice sessions in the middle of the stage. At the end of this stage the skater should have progressed to 5 on-ice and 2 dryland. It is recommended that the skaters follow a seasonal sports schedule.
- Skaters maturing earlier can increase their dryland training to take advantage of windows of trainability.
- Recommended training to competition ratio is 60% training: 40% competition.



Photo Credit: Richard Guerette

THE LEARNING TO TRAIN AND TRAINING TO TRAIN STAGES ARE THE MOST IMPORTANT STAGES OF ATHLETIC PREPARATION. DURING THESE STAGES, WE MAKE OR BREAK A SKATER!

STAGE 4.1 – Learning to Compete

Optimizing the Engine, Speed Skating Specific Skills & Fitness

Age: Males 16-18 +/- & Females 15-17 +/- (Short & Long Track)

Physical Objectives

The focus of this stage is on continued physical development "Optimizing the Engine", and on competitive development. Although the focus of competition is implemented in this stage, the physical development remains an important focus. It should be noted that all objectives of the "Training to Train" stage must be achieved before the objectives of "Learning to Compete" can begin. Attention to the following should be considered:

- Strength, aerobic, speed, and skill development continue with diagnostics. This will identify the skater's strengths and weakness, which will allow for the appropriate plan to meet individual skater's needs.
- Identification of individual needs for program development in relation to windows of trainability and individual maturation.
- Fitness and recovery programs should be tailored to the individual skater.
- Continue to develop speed through agility, quickness, and change of direction. This should be done as part of warm-ups, dryland, and ice sessions. Programming should also include lateral, multi-directional, and random movements.
- Ankle, knee, and core stability based off of diagnostics.
- Continue to develop body alignment and teach/challenge motor coordination.
- Teach skaters, who are now proficient in basic and speed skating specific skills, to perform those skills under a variety of competitive conditions during training.
- PHV in girls could start as late as 15 years old.



Photo Credit: Arno Hoogveld

The 5 S's of Training and Performance "Windows of Trainability"

Stamina (Endurance)

- Aerobic power can continue to be increased. Emphasis on this will continue to increase as it is a major contributor in performance.
- Aerobic training is still a focus, especially for base building for each season. During the season aerobic training becomes a mode of recovery, as well as maintenance of the skater's aerobic base.

Strength

- For the appropriate plan to meet individual skater's needs.
- Timing of strength development differs in males and females due to PHV.
- Optimal window of trainability for girls is immediately after PHV or at the onset of menarche.
- Optimal window of trainability for boys is 12 to 18 months after PHV, this is also referred to the period Peak Strength Velocity (PSV).
- Progressions of fundamentals are to develop lifting technique, with an emphasis on strength exercises using dumbbells. The introduction to heavy implements can be done in this stage, but it is dependent on the skater maintaining proper technique.
- Loading parameters include; barbell lifting technique with light to moderate loads. Intensity should remain above 6RM (repetition max). Body weight can be used for explosive exercises in conjunction with strength training programs.

Speed

- Second window of trainability for boys ends near the beginning of this stage, ages 13-16.

Skill

- Development is very sport specific and is focused on strategies and tactics for racing.
- Technique is always a focus along with basic sport specific skills.

Suppleness

- Special attention to flexibility for boys and girls during and through PHV. This emphasis on flexibility will promote proper care and development during the rapid growth of bones, tendons, ligaments, and muscles.
- Individual flexibility routines are refined for practice, competition, and recovery.

Testing Objectives

There continues to be an emphasis on the education of testing, as well as the increased responsibility to prepare and execute the tests properly. This includes the integration of the personal, lifestyle, and mental aspects (ie. motivation, IPS) of sport to perform. There is an increased emphasis on monitoring through more sophisticated testing modalities (lab testing). The importance of this progression is because of the increase in the volume and intensity of the skaters' training. Careful consideration needs to be taken with regards to the amount of testing and the preparation for the testing. As there are still windows of trainability to capitalize on, coaches should ensure that a priority remains on the training versus optimal preparation for testing and competition. An individualized approach to training programs, as well as identification of the individual strengths and weaknesses of the skater need to become a priority for the coach.



Photo Credit: Arno Hoogveld

Field

- AM/morning heart rate (HR) for monitoring training and recovery. Optimally a HR monitor should be used, but the skater can use their finger and a watch to count the beats per minute. Priority to the purchase of a HR monitor should be addressed in this stage.
- For skaters that have not reached their PHV, continued measurements of height for the tracking of PHV are needed. For these skaters this should continue to be recorded every 2 to 3 months, as well as on the skater's birthday.
- PHV measurements should be increased to every month when acceleration in height is noticed.
- Weight should be taken on a monthly basis
- Leger Boucher (used as a workout if lab testing for V02Max is available).
- Vertical Jump (if jump pad is not available).
- Medicine ball overhead throw (backward throw).
- Wobble board balance. This continues to be more of a training exercise than classic testing. Emphasis should be on on-ice testing of balance.
- Standing broad jump.
- 5 jump bounding. Caution to this test with regards to the growth spurt. Emphasis should be on jumping technique to prevent injury.
- Critical speed 800m run.
- Critical speed 1500m run.
- Critical speed 3000m run.

Lab tests (tests requiring equipment)

- Jump pad testing. This should be done if the skater/coach has access to the equipment. If not accessible, vertical jump testing should be continued.
- Jump pad testing with weight should be added for skaters that are physically ready.
- 30" Wingate test.
- Computrainer testing if the skater/coach has access to the equipment.
- V02 Max testing in the lab if the skater/coach has access to the lab and equipment.
- Anthropometric measurements. Introduction to this if access is available to the skater/coach. Caution: this test should only be done if the coach has access to a physiologist to interpret the results.

Ice

With an increase in physical trainability comes the increase in specificity on the ice. The focus shifts more towards competition, but the importance of training can not be forgotten. Testing should be done as training intervals, which means athletes should not have the opportunity to fully rest in preparation for testing, as this will take away from the continued focus of training. The testing protocols include

Long Track tests include

- Tempo distance (400m, 800m, 3000m, team pursuit)
- Specific distance (100m, 500m 1000m, 1500m, 3000m, 5000m)
- Location
- Split breakdown
- Indication of practice or competition
- Weather/ice conditions

Short Track tests include

- 777m Pursuit
- 1 & 2 lap flying
- Standing start 1 lap
- Specific distance (500m, 1000m, 1500m, 3000m)
- Jr. relay 2000m (3 per team)
- Men and Women 3000m relay
- Introduction to the men's 5000m relay

Psychological Objectives

During this stage there is a progression to specific mental training skills. Along with the development of skills and the focus on learning to compete, coaches and skaters need to be aware that some skaters could still experience the motor learning issues that accompany a growth spurt. Continued mental profiling of the skater and individualized plans need to be developed. Social psychology and team dynamics should be promoted in this stage of development.



Photo Credit: Arno Hoogveld



Mental Training Skills

- Regular monitoring, evaluating, and adjusting of goals (short and long term).
- Continue to set both process and outcome goals.
- Imagery of themselves executing technical and tactical moves.
- Introduce individual refocusing skills for practice and competition.
- Introduce positive self-talk and verbal cues with the skater and coach working together.
- Consistently apply activation and relaxation (IPS) exercises in practice.
- Introduce and apply more advanced IPS skills in a competition environment.
- Introduce progressive muscle relaxation.
- Continue to develop and introduce individualized approaches to relaxation, activation, and parking.

Mental Capacities

- Goal setting both short and long term.
- Focus and self-talk/verbal cues. This will help with distraction control and negative thoughts.
- Performance routine and pre-competitive preparation plans.
- Anxiety control and relaxation.
- Personal responsibility and involvement in decision making.

Lifestyle and Personal Objectives

- Continued personal development.
- Integration of sport, career and life goals.
- Individual management/career planning.
- Economic and independence issues. These issues will arise with the balance and choice of school, relocation, and sport demands. Money to support and balance all issues becomes a determining factor during this stage and with the progression into the next stages.
- Sport school option can assist in balancing sport and school.
- Optimize sport cultural and lifestyle habits, which include nutrition, hydration, recovery and regeneration, and tapering and peaking. This should include both skater and parental education.
- Refine self monitoring and rest and recovery strategies (diary/log).

- Injury prevention and recovery.
- Education in the preparation for different environments (cold, heat, altitude).
- Due to the talent identification in long track males, skaters will have to make some decisions regarding priority towards either ST or LT. Data mining of elite performers in long track show an indication that talent ID occurs during this stage. Approximate age for talent ID in long track males is 17 years old. It should be noted that athletes should continue skating both disciplines, but the ratio may vary.

Sport Specific Objectives

For safety reasons the recommended arena size for this stage is Olympic. During this stage, the skaters will refine their specific speed skating skills for both long and short track. A continuation and progression should continue with regards to rules and ethics in sport. Specific rules and interpretations will be introduced and integrated with regard to specific competition strategies and tactics.

Equipment Objectives

- Introduce higher level of equipment preparation and maintenance (ie rocker, bend, and sharpening).
- Skaters must have access to and should look to acquire a personal gauge and bender.
- Priority of acquiring and maintaining proper training equipment; HR monitor, bikes, inline skates, shoes (running and weight room).
- Continue to develop bending, rockering and off-set skills. Individual set-ups should be used. Responsibility for these skills should move entirely from the coach to the skater by the end of this stage.
- Skaters should own both short and long track equipment, which are in good condition. This is regardless of specialization as cross-training is still a critical component of development.
- Maintenance of all equipment (on and off-ice) is critical to ensure quality of training and competition.
- Start to develop emergency equipment (spare blades, Klap mechanism etc.)

Skill objectives are to refine competition and technical skills. These should be stressed in a competitive environment in either practice or competition. This includes the refinement of competition skills such as

- Refine timing of passing
- Track patterns
- Refine pacing
- Changing lanes
- Decision making skills
- Olympic style racing
- Use of video analysis (skater self analysis)
- Ensure off-ice training is part of a well structured program
- Continue development of advanced strategies and tactics in relays (coverage, exchanges and pacing)
- Modeling in training and competition
- Event specific technical and tactical preparation
- Application to specific technical and tactical skills under competition conditions
- Refine team pursuit and relay skills

Training and Competition Objectives

The goals of this stage are to optimize fitness preparation while doing so in a competitive environment. Performance starts to become a factor, but the skater must still focus on the process and implementation of skills under a competitive setting.

- Skaters are proficient at performing basic sport specific skills and now need to perform those skills under a variety of competitive conditions, both in training and competition.
- All aspects of training and competition are progressively individualized.
- Double periodization is recommended for this stage of development, along with multiple peaks for competitions.
- Competition recommendations for this stage include 15 to 19 per year, which includes both long and short track.
- Competition events for long and short track include; club, provincial, CDN age class, North American, ISU Jr. Worlds, Canada Winter Games, Canadian Trials, World Championships, World Cups, and Oval Finale.
- ISU Junior World Championships are open to a skater who has reached the age of 14 before July 1, but has not reached the age of 19 before July 1 preceding the Championships.
- Canada Winter Games are open to a skater who has reached the age of 14 on June 30, but has not reached the age of 19 on June 30 of that year.

- Competition strategies include; applying appropriate pace to specific distances, developing different race strategies and tactics with the coach, adjusting to changes in the race and adjust strategy, and an introduction to various competition points systems.
- Competition preparation includes an individualized warm up and warm-down. Refine recovery techniques, equipment routines, and nutrition strategies.
- Average sessions should be 90-120 minutes in duration. Training is a year-round activity with a recommended 6 sessions on-ice and 3 dryland sessions per week.
- Recommended training to competition ratio is 40% training: 60% competition.
- Emphasis in practice should be on providing a competitive environment. The 60% recommended ratio accounts for practice races and race simulation in training.



Photo Credit: Richard Guerette



STAGE 4.2 - Training to Compete

Further Optimizing the Engine, Speed Skating Specific Skills & Fitness

Age: Males 18-21 +/- & Females 17-21 +/- (Short & Long Track)

Physical Objectives

The focus of this stage is on continued physical development by further "Optimizing the Engine," but the focus shifts to the competitive development. At this stage, all systems are fully trainable and there are no growth and development considerations or limitations. This stage is critical in the consolidation and implementation of the physical, mental, and sport specific skills from the "Training to Compete" stage. Attention to and the mastery of all objectives will be critical as skaters move into the "Learning to Win" and "Training to Win" stages.

- Focus on diagnosing individual strengths and weaknesses for specific distances and programs should be developed accordingly.
- Fitness and recovery programs should be tailored to the individual skater.
- Continue to develop speed through agility, quickness, and change of direction. This should be done as part of warm-ups, dryland, and ice sessions. Included in these sessions there should be lateral, multi-directional, and random movements.
- Ankle, knee, and core stability based off of diagnostics.
- Continue to develop body alignment and teach/challenge motor coordination.
- Teach skaters, who are now proficient in basic and speed skating specific skills, to further perform these skills under a variety of competitive conditions during training.
- Introduction to physical preparation to peak. By the end of this stage, when skaters are transitioning to the "Learn to Win" stage, they should be adept at tapering and peaking to be able to achieve a major peak as required.

The 5 S's of Training and Performance "Windows of Trainability"

Stamina (Endurance)

- Aerobic power can continue to be increased. Emphasis on aerobic power will continue to increase in importance, as it is a major contributor in performance.

- Aerobic training is still a focus especially for base building for each season. During the season, aerobic training becomes a mode of recovery, as well as maintenance of their aerobic base.
- All energy systems are fully trainable and should be individualized and integrated into the program.

Strength

- Progressions of fundamentals are to the mastery of lifting technique, with an emphasis on basic strength training methods. This is done by using all types of strength training exercises.
- Loading parameters include; the introduction to advanced lifting techniques (ie Olympic lifting technique). The use of advanced lifting strategies and weighted explosive exercises should be used.

Speed

- An individual approach to building speed is taken.
- Specificity is very important in its development and implementation.

Skill

- Development is very sport specific and is focused on strategies and tactics for racing.
- Technique is always a focus along with basic sport specific skills.

Suppleness

- Individual flexibility routines are refined for practice, competition, and recovery.
- Remedial programs may be needed on an individual basis for injury prevention.

Testing Objectives

Testing becomes a critical component in monitoring adaptation to training and competition. The types of tests become more specific and sophisticated in this stage. Depending on the skaters path at this stage, it will dictate the testing methods used. Regardless of the skaters path, be it high performance (HP) or development (DEV), all skaters should be involved in some form of testing and monitoring. This is because training volumes and intensities can be very similar between HP and DEV, therefore monitoring their progress and recovery are equally important. This will ensure that skaters can move back and forth from HP to DEV, supporting the late developers or late entries into the sport.

Alternative development tests will be indicated by DEV, which will give an option should a skater and/or coach not have access to the lab or testing apparatus.

Field

- AM/morning heart rate (HR) for monitoring training and recovery. All skaters should own a HR monitor.
- Weight should be taken on a monthly basis
- Leger Boucher for DEV skaters. HP skaters should be encouraged to do it as a workout.
- Vertical Jump for DEV skaters.
- Medicine ball overhead throw (backward throw).
- 5 Jump bounding for DEV HP skaters should be encouraged to do it as a workout.
- Critical speed 800m run for DEV skaters
- Critical speed 1500m run for DEV skaters
- Critical speed 3000m run for DEV skaters

Lab tests (tests requiring equipment)

- Jump pad testing.
- Jump pad testing with weight.
- 30" Wingate test.
- Computrainer testing.
- V02Max testing in the lab.
- Anthropometric measurements. Introduction to this if access is available to the skater and coach. Caution: this test should only be done if the coach has access to a physiologist to interpret the results.

Ice

- Tests become very specific on the ice and should simulate a competitive environment.

Long Track tests include

- Tempo distance (400m, 800m, 3000m, team pursuit).
- Specific distance (100m, 500m 1000m, 1500m, 3000m. Introduction to 5000m and 10000m).

Location

- Split breakdown.
- Indication of practice or competition.
- Weather/ice conditions.

Short Track tests include

- 777m Pursuit.
- 1 & 2 lap flying.
- Standing start 1 lap.
- Specific distance (500m, 1000m, 1500m, 3000m).
- Jr. relay 2000m (3 per team).
- Women 3000m relay.
- Men's 5000m relay.

Psychological Objectives

The importance and role that psychology plays on performance increases as the focus on performance outcomes are a priority. Attention and progression of skills during this stage are very important as the skater enters the "Learning to Win" and "Training to Win" stages.

Mental Training Skills

- Regular monitoring, evaluating, and adjusting of goals (short and long term).
- Continue to set both process and outcome goals.
- Imagery of themselves combining both technical and tactical moves.
- Individual refocusing skills for practice and competition.
- Positive self-talk and verbal cues. The skater will take on more responsibility in developing and individualizing these skills.
- Implement advanced IPS skills in a competition setting.
- Apply progressive muscle relaxation.
- Continue to develop and introduce individualized approaches to relaxation, activation, and parking.
- Introduction to media relations training and distraction management.



Photo Credit: Jerry Search

Mental Capacities

- Goal setting both short and long term.
- Focus and self-talk/verbal cues. This will help with distraction control and negative thoughts
- Imagery of competition and different challenges that will be faced, visualize strategies to be implemented.
- Performance routines and pre-competition preparation plans refined.
- Anxiety control and relaxation.
- Personal responsibility and involvement in decision making.

Lifestyle and Personal Objectives

- Individualization of ancillary supports.
- Continued personal development.
- Integration of sport, career and life goals.
- Individual management/career planning.
- Economic and independence issues. These issues will arise with the balance and choice of school, relocation, and sport demands. Money to support and balance all issues becomes a determining factor during this stage and with the progression into the next stages.
- Sport school option can assist in balancing sport and school.
- Optimize sport cultural and lifestyle habits, which include nutrition, hydration, recovery and regeneration, and tapering and peaking. This should include both skater and parental education.
- Refine self monitoring and rest and recovery strategies (diary/log).
- Injury prevention and recovery.
- Education in the preparation for different environments (cold, heat altitude).

- Due to the talent identification in long track females, skaters will have to make some decisions regarding priority towards either ST or LT. Data mining of elite performers in long track show an indication that talent ID occurs during this stage. Approximate age for talent ID in long track women is 18 years old. It should be noted that athletes should continue skating both disciplines, but the ratio may vary.
- Awareness of pathway (HP or DEV). If DEV, resetting of goals will need to be addressed and priority should be given to effective planning of education. Remaining active for life through speed skating will be promoted while continuing as a skater. In addition, participation in other aspects of the sport should be encouraged including official, coaching, and administration.

Sport Specific Objectives

For safety reasons the recommended arena size for this stage is Olympic. During this stage, the skaters will refine their specific speed skating skills for both long and short track. A progression should continue with regards to rules and ethics in sport. Specific rules and interpretations will be introduced and integrated with particular competition strategies and tactics. Skaters will start to specialize in either long or short track while using the other as a mode of cross-training.



Photo Credit: Teunis Versluis

Equipment Objectives

- Advanced level of equipment preparation and maintenance (ie rocker, bend, and sharpening).
- Skaters should have a personal gauge and bender.
- Continue to develop individual set-ups for equipment.
- Equipment should be the sole responsibility of the skater.
- Skaters should own both short and long track equipment, which are in good condition. This is regardless of specialization as cross-training is still a critical component of development.
- Maintenance of all equipment (on and off-ice) is critical to ensure quality of training and competition.
- Skaters should have back-up equipment and coaches should introduce a testing schedule to ensure equipment is ready at all times.

Skill objectives are to refine competition and technical skills

- These should be stressed in a competitive environment in either practice or competition. This includes optimizing of competition skills such as
 - Timing of passing.
 - Track patterns.
 - Refine pacing.
 - Changing lanes.
 - Decision making skills.
 - Olympic-style racing.
 - Use of video analysis (skater self analysis).
 - Ensure off-ice training is part of a well structured program.
 - Continue development of advanced strategies and tactics in relays (coverage, exchanges and pacing).
 - Modeling in training and competition.
 - Event specific technical and tactical preparation.
 - Long track event specialization begins.
 - Optimize specific technical and tactical skills under competition conditions
 - Optimize team pursuit and relay skills.
 - Disciplines become specific ST and LT.

Training and Competition Objectives

The goals of this stage are to optimize fitness preparation while doing so in a competitive environment. Performance becomes the primary factor with the transition to the "Learning to Win" stage.

- Skaters are proficient at performing sport specific skills and continue to perform those skills under a variety of

competitive conditions, both in training and competition.

- All aspects of training and competition are progressively individualized.
- Double periodization is recommended for this stage of development, along with multiple peaks for competitions.
- Competition recommendations for this stage include 13 to 17 per year, which is event specific.
- Competition events for long and short track include; club, provincial, CDN age class, North American, ISU Jr. Worlds, Canada Winter Games, Canadian Trials, World Championships FISU Games, World Cups and Oval Finale.
- ISU Junior World Championships are open to skaters [who have reached the age of 14 before July 1, but have not reached the age of 19 before July 1 preceding the Championships.
- Canada Winter Games are open to skaters who have reached the age of 14 on June 30, but have not reached the age of 19 on June 30 of that year.
- Competition strategies include applying appropriate pace to specific distances. The skater will develop the race strategy on their own and review it with the coach. Skaters need to evaluate their competitor's weaknesses and know their own strengths to apply different strategies.
- Competition preparation includes an individualized [warm-up and warm-down. Advanced recovery techniques, equipment routines, and nutrition strategies are implemented.
- Average sessions should be 120 minutes in duration. Training is a year round activity with 9 to 12 training sessions per week.
- Recommended training to competition ratio is 40% training: 60% competition.
- Emphasis in practice should be on providing a competitive environment in training. The 60% recommended ratio accounts for practice races and race simulation in training.



Photo Credit: Shawn Holman

STAGE 5.1 – Learning to Win

Maximizing the Engine and Speed Skating Specific Skills & Fitness

Age: Males 21-23 +/- & Females 21-23 +/- (Short Track)

Age: Males 21-25 +/- & Females 21-25 +/- (Long Track)

STAGE 5.2 – Training to Win

Further Maximizing the Engine, Speed Skating Specific Skills & Fitness

Age: Males 23 + & Females 23 + (Short Track)

Age: Males 25 + & Females 25 + (Long Track)

Physical Objectives

The focus of these stages is on performance development - "Maximizing the Engine". All of the skaters physical, technical, tactical (including decision making skills), mental, and personal and lifestyle capacities are fully established. The focus of training has shifted from "Learning to Win" to podium performances. There will be a division between high performance and development/recreation skaters at this stage of development. Although there are these two streams, all skaters are training to win.

- Maintenance or improvement of physical capacities.
- Frequent prophylactic breaks.
- Continue to develop speed through agility, quickness, and change of direction. This should be done as part of warm-ups, dryland, and ice sessions. Skaters should continue to be challenged on the speed and accuracy of their movements whether it be lateral, multi-directional, or random
- Ankle, knee, and core stability based off of diagnostics.
- Continue to develop body alignment and teach/challenge motor coordination.
- Physical preparation tailored to peak for major competitions.



Photo Credit: Arno Hoogveld

The 5 S's of Training and Performance "Windows of Trainability"

Stamina (Endurance)

- Aerobic power should continue to be increased. Emphasis on aerobic power will continue to increase in importance, as it is a major contributor in performance.
- Aerobic training is still a focus especially for base building for each season. During the season, aerobic training becomes a mode of recovery, as well as maintenance of the skater's aerobic base.
- All energy systems are fully trainable and should be individualized and integrated into the program.

Strength

- Progressions of fundamentals include the implementation of advanced strength training methods.
- Loading parameters include; the execution of advanced lifting techniques (ie Olympic-style lifting technique). The use of advanced lifting strategies and weighted explosive exercises are implemented.

Speed

- An individual approach to building speed is taken. Specificity is very important in its development and implementation.

Skill

- Development is very sport specific and is focused on strategies and tactics for racing.
- Specificity should be a focus at all times.
- Technique is always a focus along with basic sport specific skills.

Suppleness

- Individual flexibility routines are refined for practice, competition, and recovery.
- Remedial programs may be needed on an individual basis for injury prevention.



Photo Credit: Annie Dubé



Testing Objectives

Testing continues to be a critical component in monitoring adaptation to training and competition. In the “Learning to Win” and “Training to Win” stages, testing is a critical component in identifying training factors which can separate a top 8 finish from a podium performance. The types of tests become very specific and sophisticated during these stages. Depending on the skater’s path at this stage, it will dictate which testing methods are used. Regardless of the skater’s path, whether it be high performance (HP) or development (DEV), all skaters should be involved in some form of testing. Training volumes and intensities can be very similar between HP and DEV, therefore monitoring both groups progress and recovery are equally important. This will ensure a pathway is in place to support the late entries into the sport.

Alternative development tests will be indicated by DEV, which will give an option should a skater and/or coach not have access to the lab or testing apparatus.

Field

- AM/morning heart rate (HR) for monitoring training and recovery. All skaters should own a HR monitor.
- Weight should be taken on a monthly basis
- Leger Boucher for DEV skaters. HP skaters should be encouraged to do it as a workout.
- Vertical Jump for DEV skaters
- Medicine ball overhead throw (backward throw)
- 5 Jump bounding for DEV HP skaters should be encouraged to do it as a workout
- Critical speed 800m run for DEV skaters
- Critical speed 1500m run for DEV skaters
- Critical speed 3000m run for DEV skaters

Lab tests (tests requiring equipment)

- Jump pad testing
- Jump pad testing with weight
- 30” Wingate test
- Computrainer testing
- V02Max testing in the lab
- Anthropometric measurements. Introduction to this if access is available to the skater/coach. Caution: this test should only be done if the coach has access to a physiologist to interpret the results.
- Critical power testing: CP1, CP2, CP3, CP12

Ice

- All tests are very specific to the distances and are analyzed for every detail to produce podium performances.

Long track tests include

- Tempo distance (400m, 800m, 3000m, team pursuit)
- Specific distance (100m, 500m 1000m, 1500m, 3000m, 5000m, and 10000m)
- Location
- Split breakdown
- Indication of practice or competition

Short track tests include

- 777m Pursuit
- 1 & 2 lap flying
- Standing start 1 lap
- Specific distance (500m, 1000m, 1500m, 3000m)
- Women 3000mn relay
- Men’s 5000m relay

Psychological Objectives

The importance and role that psychology plays on performance is critical for producing performances at these stages. Sports psychologists are deployed to assist in maximizing these skills with the skaters and coaches.

Mental Training Skills

- Regular monitoring, evaluating, and adjusting of goals (short and long term).
- Individualize and implement visualization techniques to practice and competition.
- Individual refocusing strategies in place in 5.1, with a progression to the consistent implementation of strategies in 5.2.
- Media relations training and distraction management.
- Refine IPS with the ability to target activation levels during training and competitions in 5.1. A progression to control and target IPS activation levels during training and competitions in 5.2.
- Continue to set both process and outcome goals.

Mental Capacities

- Well developed and refined individual mental training skills.
- Refocusing plans/coping strategies.
- Will to win with consistent drive, concentration, and focus.
- Independent decision making and is capable of teamwork and taking advice.
- Advanced Anxiety control and relaxation
- Lifestyle and Personal Objectives
- Increase knowledge of ancillary supports.
- Maximizing of self monitoring and rest and recovery strategies (diary/log).
- Integrated support and network structure.
- Frequent breaks.
- Career and sport planning sustained.
- Optimize in 5.1 and maximize in 5.2 the sport cultural and lifestyle habits, which include nutrition, hydration, recovery and regeneration, as well as tapering and peaking.
- Individualized management and career planning.
- Full integration of sport, career, and life goals.
- Stage 5.2 will introduce the skater to re-setting goals for transition from HP athlete to life after sport.

Sport Specific Objectives

For safety reasons the recommended arena size for this stage is Olympic. During this stage, the skaters have specialized and are focused on performance. Advancement of all skills is always a focus, but the continued mastery of acquired skills and attributes need to be revised from time to time to keep all components refined and at their maximal capacity.

Equipment Objectives

- Athlete and coaches are competent in all aspects of equipment preparation and maintenance, but the responsibility is up to the athlete.
- Have back-up equipment ready and tested to use at all times.

Skill objectives are to maximize competition and technical skills

These should be stressed in a competitive environment in both practice and competition. This includes the maximizing of competition skills such as

- Timing of passing
- Track patterns
- Refine pacing
- Changing lanes
- Decision making skills
- Olympic style racing
- Use of video analysis (skater self analysis)
- Continue development of advanced strategies and tactics in relays (coverage, exchanges, pacing)
- Modeling in training and competition
- Event specific technical and tactical preparation
- Maximize specific technical and tactical skills under competition conditions
- Maximize team pursuit and relay skills



Photo Credit: Arno Hoogveld

Training and Competition Objectives

The goals of these stages are to maximize fitness preparation while doing so in a competitive environment. Performance becomes the primary factor with the focus from “Learning to Win” to “Training to Win”

- All aspects of training and competition are individualized.
- Double periodization is recommended for this stage of development, along with multiple peaks for competitions.
- Competition recommendations for this stage include 11 to 15, which are event specific.
- Focus on achieving podium performances.
- Competition events include

Short Track

- CND Trials, World Cups, World Championships, FISU Games, Olympic Games.

Long Track

- Time Trials, CAN AM’s, Oval Finale, Continental Championships, World Cups, World Sprint Championships, World Single Distance Championships, World All Round Championships, Olympic Games.
- Competition strategies include applying appropriate pace to specific distances, along with analyzing and then exploiting competitor’s weaknesses.
- Competition preparation includes an individualized warm-up and warm-down. Advanced recovery techniques, equipment routines, and nutrition strategies are implemented.
- Average sessions should be 120 minutes in duration. Training is a year round activity with 9 to 12 training sessions per week.
- Recommended training to competition ratio is 25% training: 75% competition.
- Emphasis in practice should be on providing a competitive environment in training. The 75% recommended ratio accounts for practice races and race simulation in training.



Photo Credit: Arno Hoogveld

Implementation

Shared Vision

Speed Skating Canada is excited to share in a vision and in an ongoing implementation of LTAD with its long-standing and new members. With a collective approach and philosophy to LTAD goals and principals, we will provide your children/skaters with the optimal environment for unlimited opportunities in Canadian sport.

Speed Skating Canada's LTAD Process

1. Meeting with consultant Istvan Balyi and Speed Skating Canada members. This included coaches of various levels from across the country, as well as sport specific support staff and board members.
2. Development of an LTAD matrix. The first step was to identify and break down the principals of LTAD into topic areas. The second step was to identify and align specific speed skating objectives with LTAD principals.
3. Data mining to further quantify decisions and recommendations with the integration of LTAD principals within speed skating. This was the integration of the scientific principals LTAD into an LTAD specific to the sport of speed skating.
4. Development of a Speed Skating LTAD overview document, which captured and expanded on the integration and progression of LTAD concepts within the specific sport. It should be noted this is an overview document and more detailed support materials will follow.
5. Speed Skating Canada branch presentations to communicate and answer members questions regarding Speed Skating Canada's sport specific LTAD plan.
6. Development of detailed resource materials for Speed Skating Canada's LTAD Stages 1,2,3, 4.1, and 4.2

Commitment and Support to Speed Skating Canada Members

To ensure optimal programs for your children/skaters, we will consider all of the supporting documents and materials as "living." By using this approach, we all share in the continued improvement of our LTAD plan to ensure the best possible support to all of Speed Skating Canada's present and future members.

Ongoing Considerations

- Review and develop coaching materials based on LTAD factors and responding to the evolution of Speed Skating in Canada, as well as around the world.
- Evaluation and alignment of National Coaching Certification Program (NCCP) coaching materials with LTAD principals.
- Monitor and educate our skaters, coaches, parents, and board members with regards to LTAD implementation.
- Continually look for improvements in communication, information sharing, and data collection, which will guarantee LTAD factors continue to guide, direct, and improve our programs.
- Evaluate existing competition structures, formats, and schedules to ensure goals and decisions are aligned with the LTAD plan and specifically with regards to the skaters' stage of development.
- A review of the Canadian age classifications to better align growth and maturation throughout the competitive season. Recommendations will be to use the skaters age the day before the start of a competition.

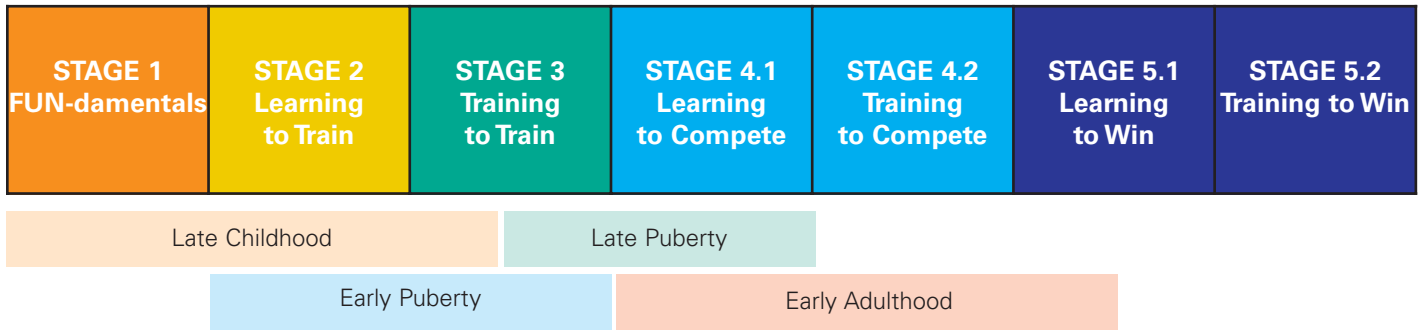
The Next Step

This overview document provides the introduction to a framework which will guide all members through Speed Skating Canada's LTAD plan. This document was created after much research, discussion and feedback. It expresses a shared vision and a vehicle for change. Once we have communicated this plan and its principles to all members, we need the next steps to occur; acceptance, support and implementation. For the LTAD plan to be a success, all members must work together for the benefit of all our skaters.

Speed Skating Canada's LTAD is part of a federal government national initiative called "Canadian Sport for Life." We look forward to your commitment to this plan, creating the optimal environment for unlimited opportunities for your children to develop as speed skaters, and also as lifelong sport participants.

Appendix 1

Physical, Mental, Cognitive and Emotional Development Characteristics



Late Childhood—Physical Development

Basic characteristics	General Impact on Performance	Implications for the coach
Heart size is increasing in relation to the rest of the body.	Endurance capacity is more than adequate to meet the demands of most activities.	Understand that a child has the capacity to keep going.
Anaerobic system is not developed.	There is a limited ability to work anaerobically.	Plan short duration anaerobic activities. The ability to hold breath must be practiced and built up gradually.
A child's metabolism is less economical than adults.	Children use more oxygen whether it's expressed in absolute values or prorated for body weight.	Do not expect younger children to keep up with older children.
Large muscle groups are more developed than smaller ones.	The child is skillful in movement requiring the use of the large groups.	Emphasize the development of general motor skills involving the large muscle groups. Then gradually introduce more precise, co-ordinated movements requiring the interaction of smaller muscle groups.
Motor patterns become more refined and the balance mechanism in the inner ear gradually matures.	Great improvements in agility, balance, co-ordination, and flexibility occurs towards the end of the stage.	Emphasize co-ordination and kinaesthetics sense when doing activities. Balance in the water using buoyancy aids in one way to develop these abilities.
Children have a shorter tolerance time for exercise extreme temperatures.	Children may show symptoms of overheating or hypothermia more quickly.	To acclimatize children will take longer so longer warm-up may be required. Watch closely for signs of distress caused by extremes of temperature.
Children subjectively feel able to be active in the heat before physiological adaptation has occurred.		Postpone or restrict exercise in heat or humidity and ensure that plenty of fluids are ingested. Thirst is not a good indication of fluid need.
Strength develops by the improvement in the neural pathways.	There is apparent improvement in strength not brought about by the neuron-muscular adaptations of muscle fibres.	Plan coordination activities.

Late Childhood—Mental and Cognitive Development

Basic characteristics	General Impact on Performance	Implications for the coach
The attention span gradually increases.	Children cannot listen or stay still for long periods.	Provide short and precise instructions. Devise strategies to ensure children are listening. Children learn well by imitating and practicing correctly modeled movements.
Children are enthusiastic and often impatient.	Children want to move and not listen.	Do not bombard children with technical information. Give only sufficient detail for the activity to be undertaken. Keep the fun.
Children have very limited reasoning ability.	Children love to be led.	Direct the training and give it a tight focus with activities that are fun and well planned. Introduce imaginative ways of achieving performance goals.
Children enjoy the repetition of activities and improve through experience.	Skill learning must be directed; children do not learn correctly just by trial and error.	Provide correct demonstrations of the basic sport skills. Personal demonstrations must be accurate.
Imagination is blossoming.	Creativity should be encouraged.	Allow the children to play and experiment. Use their ideas to create exciting sessions. Structure to encourage individuality and creativity. Sport provides an excellent vehicle for expression.
Language skills may be limited but are improving.	Children can't make corrections to their performance unless they understand what is being asked of them.	Use terminology that can be easily understood. Gradually introduce technical terminology. Children love long words.

Late Childhood—Emotional Development

Basic characteristics	General Impact on Performance	Implications for the coach
Children like to be the centre of attention.		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.
Children are developing their self concept.	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.)	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.
Children feel secure with a routine and structure to training.	Introduce change sensitively and gradually	Build a structure that is progressive but maintains continuity.
Children feel secure when coaching is constant.	Children like things to be fair.	Set and maintain high levels of expectancy, but be consistent with each child. Do not let mood swings or personal situations change coaching behaviors.



Early Puberty – Physical Development

Basic characteristics	General Impact on Performance	Implications for the coach
Significant proportional change occur in bone, muscle, and fat tissue.	Athletes may temporarily lose some of their kinaesthetic awareness, their ability to “know where they are.”	Because athletes will need to constantly change their positions, monitor carefully to ensure appropriate adaptations are being made.
Different parts of the body grow at different rates. Arm and leg length increases before the trunk.	Athletes may appear gangly and lose control of their extremities.	Make athletes aware of the effect of their changing body shape. Skills already refined may need to be re-learned.
Decreases in flexibility result directly from growth.	Movements may become restricted.	Emphasize slow stretching exercises.
Increases in growth and decreases in flexibility make adolescents prone to injury from acute impact.	Injury can result from exercise of an acute nature such as force elongation of muscles during kicking and jumping or from overuse.	Vary land based activities to avoid overuse.
Girls begin their growth spurt between 10 and 14 years and grow at very different rates.	Athletes are very different sizes at the same age.	Be aware that age-related groupings may not be appropriate.
There is a significant increase in the production of red blood cells.	The oxygen transportation system is improved.	Introduce structured aerobic training to make the most of these changes. Only short duration anaerobic training is recommended.
The central nervous system is almost fully developed.	Agility, balance, and co-ordination are fully trainable.	Use this period for maximum improvement in skill development.
Abstract thinking becomes firmly established.	Adolescence should be part of decision making processes and be more responsible for their decisions.	Base decision making for strategies on skill level.
A new form of egocentric thought develops.	The result may be strong fear of failure.	Plan for success. Introduce coping strategies, including mental imagery.
Young people are eager to perfect their skills.	Structure successful skill learning based on individual needs.	Provide positive reinforcement. Build on success. Be aware that athletes develop at very different rates and although early developers make early progress, include all athletes. Be aware that late developers may have greater potential.

Early Puberty—Emotional Development

Basic characteristics	General Impact on Performance	Implications for the Coach
Physical, mental, and emotional maturity may not develop at the same time.	Athletes who look mature may not act it. Confusion or anxiety may arise.	Develop communications skills and understanding.
Tensions may arise between adults and adolescents.	Adolescents need help to cope with their physical and emotional changes.	Endure two-way communication channels are always open. Allow athletes input to their decision making.
Hormonal activity increases.	Athletes may experience mood swings and behavior may change.	Communicate and accept changes, but don't let hormonal changes be an excuse for negative behaviour.
Social interaction between males and females becomes important.	Athletes want to form friendships and it is important to allow time for them to develop positive relationships.	Try to organize social events that allow social interaction.



Late Puberty—Physical Development

Basic characteristics	General Impact on Performance	Implications for the coach
Post-menarche height begins to stabilize. Increase in height is about 5%. Stabilization of muscular system also occurs.	Muscles have grown to mature size, but increases in muscular strength continue into the 20"s.	Maximize strength training to bring about overall improvements . Optimize neuromuscular training.
Skeletal maturation continues.	Connective tissue is strengthening.	Continue progressive overloading in training.
By 17, girls have generally reached adult proportions.	Girls proportionately gain more weight during this period.	Optimize aerobic training. Be aware of how to deal with weight gains. Teach athletes how to compete in varied circumstances.
Rate of improvements in motor ability declines.	Rate of improvements in skill developments declines.	Be aware that the rate of improvement in motor ability will be slower, but improvements will still be made.

Late Puberty—Mental and Cognitive Development

Basic characteristics	General Impact on Performance	Implications for the coach
Generally by 16, the brain has reached adult size, but continues to develop neurologically.	Athletes can understand the technical requirements of their sport.	Make sure athletes understand why they are doing certain things.
Critical thinking becomes more established.	Athletes can make decisions about their training pathway.	Allow athletes input and reduce amount of feedback and make athletes think for themselves. Develop awareness of performance by increasing kinaesthetic knowledge.
There should be complete understanding and acceptance of the need for rules, regulations, and structure.	Rules are seen in simplistic terms and must be clear and well defined.	Always be seen to be fair because adolescents have strong sense of fairness in making decisions. Make athletes part of the decision –making process.

Late Puberty—Emotional Development

Basic characteristics	General Impact on Performance	Implications for the coach
Major decisions about examinations, universities, and employment work have to be made.	There are "pulls" on time and energy.	Build in prophylactic breaks. Be aware of external pressures. Seek professional guidance to ensure the correct career and educational pathway.
Peer group pressure leads to conflicting loyalties.	An athlete may give up sport because of peer pressure and the need to be seen as one of the gang.	Be sensitive in goal setting to ensure that common goals are established and met.
Self-actualization and self-expression are important.		Treat athletes as adults. Share goals and work co-operatively towards them. Maintain a coach-led structure.
Interactions with friends of both sexes continue to be a strong priority.		Allow time to establish independent social interaction.

Early Adulthood – Physical Development

Basic characteristics	General Impact on Performance	Implications for the coach
Physiologically, the body reaches maturity during this stage.	All physiological systems are fully trainable.	Ensure that physical training programs employ the most advanced techniques and sport science information to facilitate maximum adaptation and minimize injuries.
		Ensure that all muscle groups and body alignments are well-balanced, complemented with optimum flexibility ranges.
		Use state-of-the-art testing and monitoring programs.
		Carefully monitor overtraining and overstress.
Final skeletal maturation in females occurs at about 19-20 years and in males about 3 years later.		Organize regular medical monitoring. Schedule additional blood tests for females in case of anemia.

Early Adulthood – Mental and Cognitive Development

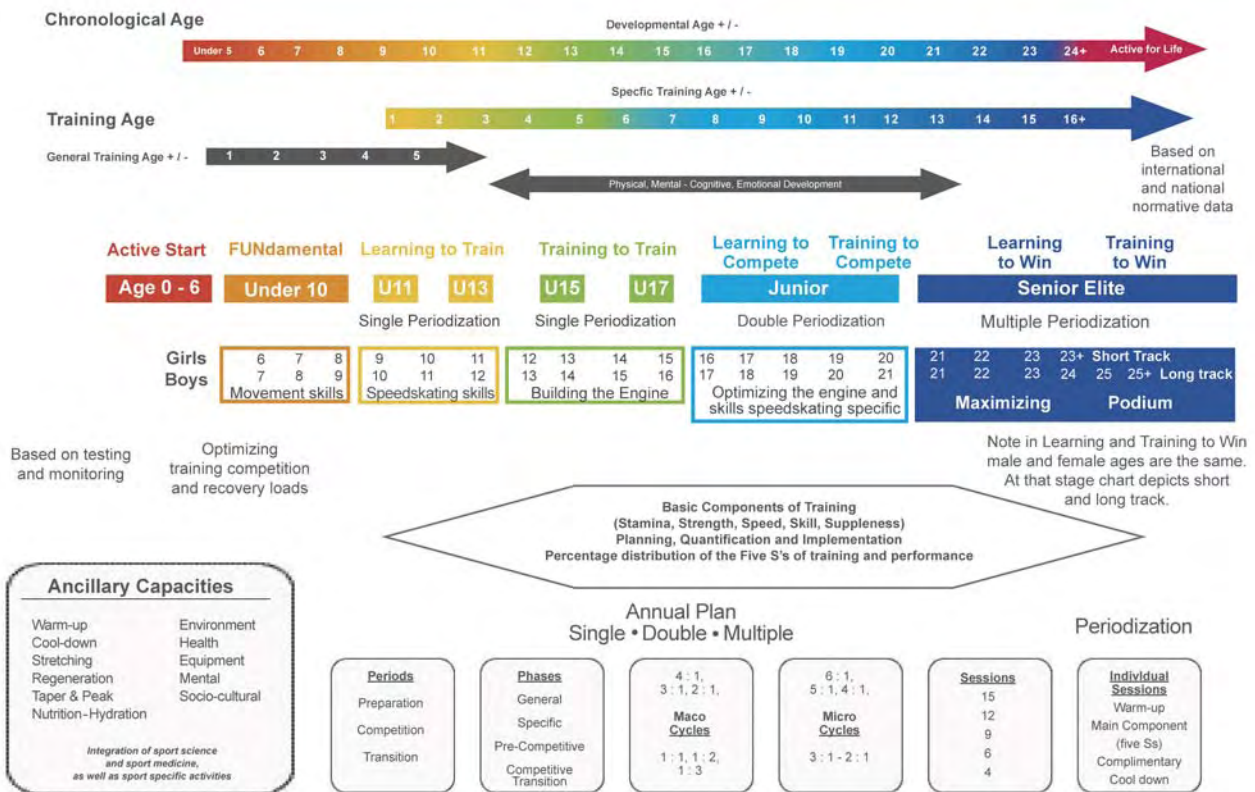
Basic characteristics	General Impact on Performance	Implications for the coach
Neurologically, the brain matures about 19-20 years of age.	Athletes are capable of self-analyzing and correcting and refining skills. Athletes can analyze and conceptualize all facets of their sport.	Establish winning as the major objective.
	Well-developed information processing skills improve the athlete's ability to visualize verbal instructions.	Implement principles of adult learning.
There is a complete understanding and acceptance of the need for rules, regulations, and structure.	The young adult must perceive the rules and structure as being clearly defined and fair.	Involve athletes in decision making and planning team or group activities.

Early Adulthood – Emotional Development

Basic characteristics	General Impact on Performance	Implications for the coach
There is a need to be self-directed and independent.	Athletes are ready to assume responsibility and accept the consequences of their actions.	Emphasize goal setting to give definite direction and purpose to the athlete's overall program.
Self-actualization and self-expression are important.		Treat athletes as adults and with respect. Remember that the coach's direction and structure remain important.
Major decisions on career, education, and lifestyle are priority at some point in this stage.	Major changes in interests, hobbies, and physical activities occur.	Make professional guidance available, considering off-season and educational pursuits.
Interactions with the opposite sex continue to be a strong priority with lasting relationships developing.		Provide athletes with ample opportunities for independent social interaction.

Appendix 2

Long-Term Athlete Development Plan - Speed Skating (Way, Holmik and Balyi 2005)



Appendix 3

Speed Skating Canada's Current Canadian Age Class Categories

	Stage 1	Stage 2	Stage 3	Stage 4		Stage 5	
	FUNDamentals LATE CHILDHOOD	Learning to Train LATE CHILDHOOD EARLY PUBERTY	Training to train LATE PUBERTY EARLY PUBERTY	Learning to Compete LATE PUBERTY EARLY ADULTHOOD	Training to Compete ADULTHOOD EARLY ADULTHOOD	Learning to Win ADULTHOOD	Training to Win ADULTHOOD
DEVELOPMENT PHASES	Fundamental movement skills	Fundamental sports skills including speedskating skills	"Building the Engine" & sport specific skills	"Optimizing the engine" & speedskating specific skills and fitness	"Optimizing the engine" & speedskating specific skills and fitness	"Maximizing the engine" & speedskating specific skills and fitness	"Maximizing the engine" & speedskating specific skills and fitness
AGE ST	Male 6-9; Female 6-8	Male 9-12; Female 8-11	Male 12-16; Female 11-15	Male 16-18 ; Female 15-17+/-	Male 18-21; Female 17-21 +/-	Male 21-23; Female 21-23 +/-	23+/-
AGE LT	Male 6-9; Female 6-8	Male 9-12; Female 8-11	Male 12-16; Female 11-15	Male 16-18 ; Female 15-17+/-	Male 18-21; Female 17-21 +/-	Male 21-25; Female 21-25 +/-	25+/-
AGE FOR COMPETITION	age on date of competition	age on date of competition	age on date of competition	as per ISU age groups			
CND age class category Women	Pee Wee 6-7yrs old	Midget 10-11 yrs old		Intermediate 16-17 yrs old			
	Bantam 8-9 yrs old		Juvenile 12-13 yrs old	Junior 14-15 yrs old		Senior 18+	
			Junior 14-15 yrs old				
			ISU Jr. 14-19yrs old				
CND age class category Men	Pee Wee 6-7 yrs old	Midget 10-11 yrs old		Intermediate 16-17 yrs old			
	Bantam 8-9 yrs old		Juvenile 12-13 yrs old	Senior 18+			
			Juvenile 12-13 yrs old				
			Junior 14-15 yrs old	ISU Jr. 14-19yrs old			

CND Age Class Category	Age	Distances
Midget	10-11 yrs old	300m
		500m
		800m
		1000m
Midget & Juvenile Boys & Girls Combined		Open 3000m
Juvenile	12-13 yrs old	300m
		500m
		1000m
		1500m
Junior	14-15 yrs old	500m
		1000m
		1500m
		3000m
Jr, Inter, and Sr Boys & Girls Combined		5000m
Intermediate	16-17 yrs old	500m
		1000m
		1500m
		3000m
Senior	18 +	500m
		1000m
		1500m
		3000m

CND Age Class Category	Age	Distances
Pee-Wee	6-7 yrs old	111m
		222m
		333m
		500m
Bantam	8-9 yrs old	222m
		333m
		500m
Midget	10-11 yrs old	333m
		666m
		500m
		666m
Juvenile	12-13 yrs old	777m
		500m
		666m
Junior	14-15 yrs old	777m
		1000m
		500m
		1000m
Intermediate	16-17 yrs old	1500m
		500m
		1000m
		1500m
Senior	18 +	3000m
		500m
		1000m
		1500m

Please Note:
 These are recommended guidelines for distances skated by these age groups
 SSC LTAD principals regarding competition structure should be considered



Notes

Notes





Credits

Cover Page Photo: Arno Hoogveld, Anne Judin, and Richard Guerette.

Special thanks to the following photographers and contributors:

Arno Hoogveld,	BC Speed Skating
Annie Dubé	Jerry Search
Richard Guerette	Shawn Holman
Scott Maw	David Reith
Mike Ridewood	Jerry Search
Mike Struk	Olympic Oval
Roch Pilon	Sandi Vyse-Lloyd
Teunis Versluis	www.viewcalgary.com
Federation de Patinage de Vitesse du Quebec	

Special thanks to the coaches for their assistance in the data mining and review of the information in this publication.

Additional thanks to the great athletes, current and past whose photos are included in this publication:

Oliver Delaney	Hugo Joly
David Corbeil	Marc-Antoine Tutt-Guerette
Simon Fortin	Mikael Bilodeau
Owen Roberts	Kristina Groves
Mike Ireland	Martin Turcotte
Marcin Goszczynski	Philippe Hardy
Mark Nielsen	Kristian Lay
Alec Janssens	Steve Buzinski
Sarah Jesty	Rosie Tempest
Dylan White	Brock Miron
Nick Szostakiwskyj	Cindy Klassen
Alanna Kraus	Sarah Smith
Arne Dankers	Christine Nesbitt,
Shannon Rempel	Clara Hughes
Krisy Myers	Danielle Wotherspoon
Kalyna Roberge	Anouk Leblanc-Boucher
Amanda Overland	Melanie Gagnon
Cory Rasmussen	Steven Elm
Jessica Nath	Sylvie Lloyd
Leia Hoot	Chelsea Reith
Denny Morrison	Jonathan Guilmette
Beth Whitmee	Francois Louis-Tremblay
Steve Robillard	Eric Bedard
Mathieu Turcotte	Charles Hamelin
Gavin Coyne	Josh Ajohn
Staci Dawidowski	Benjamin Tam
Eric Tempest	Sasha Fathoulin
Jeremy Wotherspoon	Jean-Michel Lachance
Fraser Stinson	Joshua Ajohn

Additional Credit

Shawn Holman, LTAD Project Coordinator
Emery Holmik, M. Ed., High Performance Director, Speed Skating Canada
Dawn Currie, Sport Development Director, Speed Skating Canada
Anne Judin, Editor
Gillian Bishop, Graphic Designer
Istvan Balyi, M.A., Pacific Sport Canadian Sport Centre, Vancouver
Charles Cardinal, M.Sc., Canadian Sport Centre, Montreal
Colin Higgs, Ph.D., Memorial University of Newfoundland
Steve Norris, Ph.D., Canadian Sport Centre, Calgary
Richard Way, MBA, Pacific Sport Canadian Sport Centre, Vancouver
Mathew Jordan, M.Sc University of Calgary
Bill Wotherspoon, B. Ed. (PE) and SSC Coaching Development Committee
John Monroe, Saskatchewan Provincial Coach
David Shields, Esquimalt Speed Skating Club Coach
Neal Marshall, Speed Skating National Team Coach

References

Balyi, I. and Way, R. "Long-Term Planning of Athlete Development. The Training To Train Phase." B.C. Coach, 1995.
Canadian Sport for Life Long Term Athlete Development Resource Paper. Canadian Sport Centres, 2005.pp.2-10
Dick, F.W. "Sports Training Principles" 4th Ed. A & C Black, London, 2002.
Delorme, Alain, 2002.
Malina, R.M. and Bouchard, C. Growth, Maturation, and Physical Activity. Champaign, Ill.: Human Kinetics, 1991.
Ross, W.D. and Marfell-Jones, M.J. Kinanthropometry. In: Physiological Testing of the Elite Athlete. Eds. MacDougall, J.D. Wenger, H.A., and Green, H.J. Movement publications, Ithaca, N.Y., 1982. pp. 75-104
Tanner, J.M. "Growing Up." Scientific America, 1973, 9.

Canada

We acknowledge the financial support of the Government of Canada through Sport Canada, a branch of the Department of Canadian Heritage.

We acknowledge the critical information, images, figures and format supplied by the Canadian Sport for Life Long-Term Athlete Development Resource Paper.

Provincial Speed Skating Branches





Speed Skating Canada's Long Term Athlete Development is a training, competition and recovery framework for skaters in all stages of the sport.