CyclingCANADACyclisme

Cycling Canada

Long-Term Athlete Development MOUNTAIN BIKE

Contents

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Canada

1 – Pathway to Success

Cycling is one of the world's great activities. Whether it is transportation, recreation, or competitive sport, BMX, Road, Mountain Bike (MTB) or Track, for able-bodied or Para-cycling athletes, cycling is participated in and loved by millions around the globe.

Cycling Canada, formerly the Canadian Cycling Association, has existed for over one hundred years to promote cycling in Canada, and to organize competitive cycling in our country. We have a proud tradition of international competitive success – including World Champions and Olympic medalists – representing the highest level of competitive excellence. While we take pride in our competitive achievements, we also have a responsibility to keep our sport strong, to honour our traditions, and to help new generations of Canadians to achieve their dreams - whether that means helping them to join the ranks of our champions or simply enjoy all the pleasures and benefits of cycling.

This document is a guide to MTB based on principles of Long-Term Athlete Development, and informed by our work on Gold Medal Profile for MTB. Along with all Canadian sport organizations, Cycling Canada has adopted the Long Term Athlete Development (LTAD) model as its framework for athlete and sport development. LTAD is based on sport science research combined with the practical experience of working with thousands of athletes and coaches to develop a comprehensive set of principles for effective athlete development. In fact LTAD is more than a model - it is a system and philosophy of sport development.

- LTAD recognizes the continuum of growth and participation in sport, from the earliest stages of developing physical literacy, through high performance, to lifelong participation.
- For competitive cyclists, LTAD means optimal training, competition and recovery programming with attention to biological development and maturation.
- LTAD is athlete-centred, coach-driven, and administration-supported.

Since athlete and participant development is at the core of the Cycling Canada's mission, LTAD is key to everything we do, whatever our role or level within the cycling system. Our obligation is to help every Canadian cyclist fulfill their aspirations and be the best they can be.

Our goal is not simply to help Canadian riders onto international podiums, but to ensure that every athlete can enjoy participation in cycling for a lifetime.

2 – The MTB Long-Term Athlete Development Model

LTAD is a model of life-long development in which the athlete passes through stages, from *Active Start* to *Active for Life*. All individuals pass through the *Active Start*, *FUNdamentals* and *Learn to Train* stages from birth through adolescence, and acquire a critical foundation of physical literacy or competence in basic movement and sport skills. These are the stages of *MTB for Fun and Skill*. From there they can progress into competition and go as far as their will and potential carry them. We call these the stages of *MTB for Performance*. Only a few reach the level of high performance in the *Train to Win* stage. The CCA *LTAD Volume 1* document outlines the stages of development for cyclists including MTB and the *Para-Cycling LTAD* supplement has specific information for athletes with a physical disability. You can also find many other resources at *www.canadiansportforlife.ca*

MTB for Fun and Skill

Young riders before puberty participating in stages of ***MTB for Fun and Skill*** are typically in the *FUNdamentals* or *Learn to Train* stages of LTAD. It is essential to understand that when working with young participants, we are not simply preparing them for our sport, but for all sports- and that by offering well-rounded development that builds physical literacy, we are also preparing them for a more active, healthy lifestyle. Young athletes of the same chronological age can vary widely in their development, ability to learn skills, and emotional readiness for competition. If we over-emphasize tactics when the athlete is not ready to learn or expose the athlete to intense competition, it can take the fun out of sport. Every young athlete deserves a program appropriate to his or her individual stage of development.

MTB for Performance

Athletes in the ***MTB for Performance*** stages, from *Train to Train* through *Train to Win*, may be any age from puberty and older. They are focused on improving competitive performance, and developing the fitness, technical and tactical skills to attain success. Ideally these athletes have built a solid foundation of technical skills in the *MTB for Fun and Skill* stages, but if they have entered sport late or crossed over from other sports, they may need accelerated development in cycling skills.

MTB for Performance involves a higher level of commitment to the sport. The path becomes more challenging as the athlete progresses; success in international competition comes from deliberate practice, appropriate training and competition. The LTAD model offers a progressive, periodized pathway that uses competition as a tool to achieve developmental goals, and integrates optimal nutrition, rest and recovery, and sport science as a basis for holistic athlete development. The objective is to maximize development by building skill and training capacity while minimizing overtraining and risk of injury.

Ultimately everyone, whether they have simply learned the basics of MTB or completed a competitive career, can enjoy the sport at the Active for Life/Competitive for Life stage. Active life-long participation is one of the greatest benefits of our sport.

Cycling MTB LTAD

ACTIVE FOR LIFE/ COMPETITIVE FOR LIFE
enter at any age
from any stage after
growth spurt

PERFORMANCE

FUN & SKILL

Canadian Sport for Life

SUCCESS: **Be World Champion!**
TRAIN TO WIN: Perform on demand
8 - 10+ years in cycling

STRATEGY: **Be the smartest!**
TRAIN TO COMPETE: Build cmpetition skills
5 - 7+ years in cycling

SPEED: **Build the engine!**
TRAIN TO TRAIN : Build the engine
3 - 6 years in cycling

SKILL: **Be a skill champion!**
LEARN TO TRAIN: Build winning MTB skills
age: 9 (F) or 10 (M) to growth spurt
1 - 5 years in cycling

START: **Love to ride!**
FUNDAMENTALS: Basic sport skills
age: 6 to 8 (F) or 9 (M)

READY: **Learn to ride!**
ACTIVE START: Basic movement skills
age: 0 to 6

3 – Growth and Development

Long-term Athlete Development (LTAD) is a pathway for optimal training, competition and recovery throughout an athlete's career, but particularly in relation to the important growth and development years of young people.

LTAD stages are based on "sport years" which is the time spent developing in sport. Most athletes require from 7 to 10 or more years in sport to reach peak performance. After puberty, the prior sport experience of the athlete, combined with his/her individual stage of physical, mental and emotional development, is much more important than chronological age in determining what the athlete is ready for. However, while the overlap between "sport years" in each stage may suggest that athletes can progress through more than one stage per year *it is strongly recommended the athlete not be pushed through more than one stage per year, no matter how "exceptional" they seem to be.*

It is also very important to take advantage of sensitive periods of adaptation as the child grows and develops. The mind and body are most able to develop in specific ways at specific times. Skills, for example, are learned quickly from about age 8 to 12. Physical strength, power and endurance can be developed after the growth spurt, also called "Peak Height Velocity" (PHV). *See the glossary for definitions.*

Many athletes come to MTB after puberty, sometimes transferring from other sports. Even if the sensitive periods of adaptation were "missed", *all performance factors are always trainable*. An expert coach will assess the key performance factors for each athlete, and design a training program to accelerate certain aspects of development as needed. The "At a Glance" chart on page 25 lists the performance factors for a MTB athlete and shows the main emphasis of each stage. Each stage is a foundation for the next, and competitive success can only be built on a strong foundation.

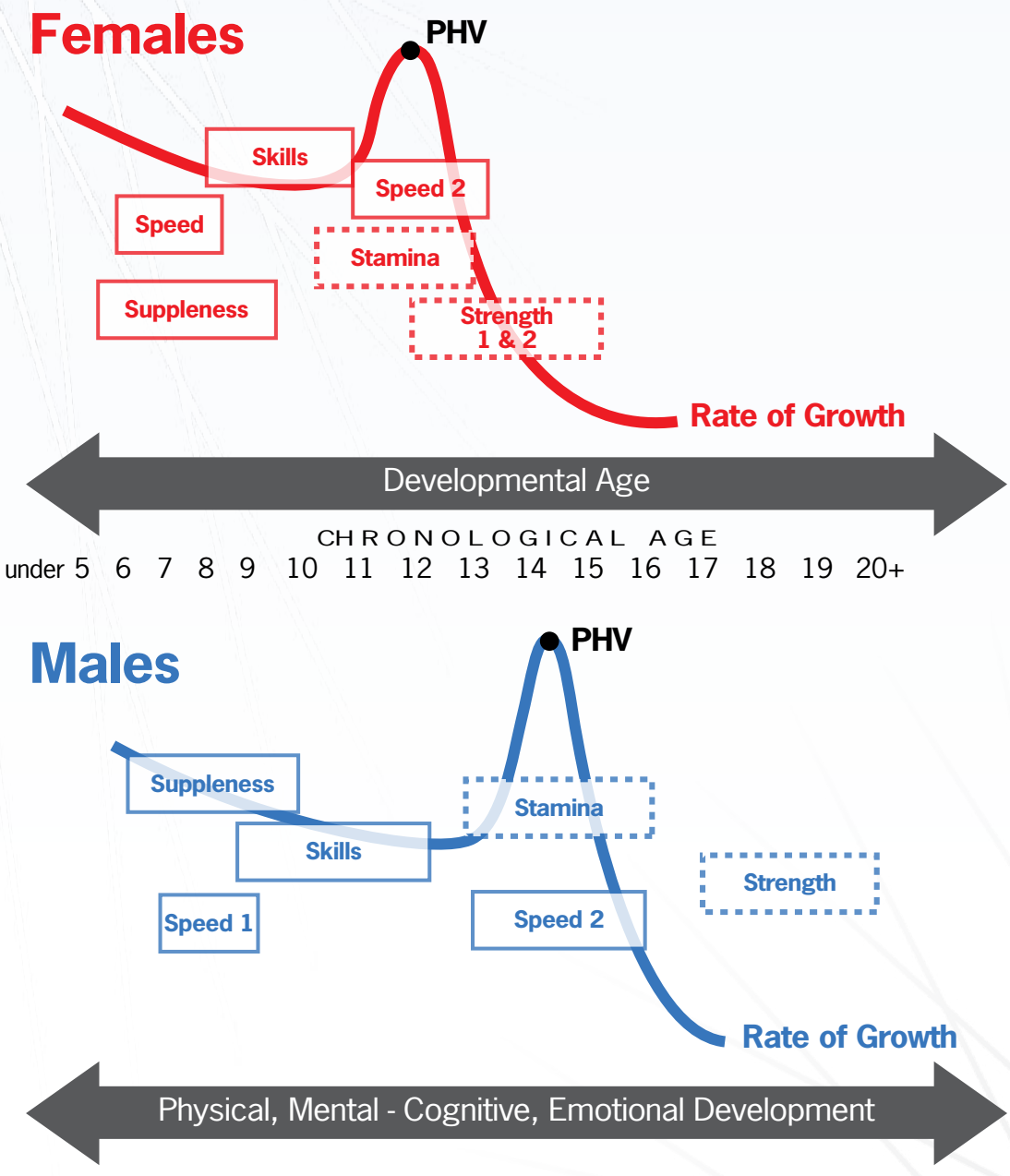

Diagram: Enhanced Periods of Adaptation in Relation to Rate of Growth (courtesy Canadian Sport for Life)

4 – MTB Stage by Stage

The following pages detail long-term athlete development for MTB, stage by stage. For each stage the main focus, three key objectives, and detailed information on how to develop a prime objective are provided. Each stage is a foundation for the next, and if key elements of a stage are not well developed or missed altogether, the athlete's progress in the next stage may be compromised. Not only is it important to maximize development in each stage, it is essential to continually monitor development and catch up on under-developed areas. The summary chart on page 25 shows key performance factors to emphasize and monitor in each LTAD stage.

ACTIVE FOR LIFE
enter at any age after growth spurt

SUCCESS: *Be World Champion!*
TRAIN TO WIN: Perform on demand
8 - 10+ years in cycling

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START: *Love to ride!*
FUNDAMENTALS: Basic sport skills
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READY: *Learn to ride!*
ACTIVE START: Basic movement skills
age: 0 to 6

READY: *Learn to ride!*
LTAD: Active Start - Age 0-6

"Almost every kid learns to ride a bike. Whether they keep riding and become interested in cycling as a sport, depends on how much fun they have on the bike, and the opportunities they are given."

The three main objectives for the *Active Start* stage:

1. FUNDAMENTAL MOVEMENT SKILLS

30-60 minutes of physical activity every day: FUN activities. Play lots of sports and games that develop physical literacy. Play catching and throwing games, team sports, and technical sports (i.e. swimming) that will create the foundation for later success. Develop the love for cycling at a young age, and never lose it!

2. LEARN TO RIDE

Learn the most basic cycling skills: balance, steering, braking. Ride on varied surfaces in different environments: paved, grass and dirt. Use flat pedals only (no clips) and a bike the child can easily control. Try push bikes, or ride on a local BMX track. Allow lots of room for exploration and risk-taking in a safe environment.

3. LEAD BY EXAMPLE

Promote physical activity and healthy eating as a family activity. Role modeling is very important. Provide short-duration, rapidly changing activities with lots of breaks. Let the child's attention span and interest dictate the activity. Support the child to participate in many kinds of activity including many kinds of sport.

START: *Love to ride!*
LTAD: FUNdamentals - Age 6 to 8(F)/9(M)

"Every minute a kid spends on a bike is a good minute. They don't need to race, they need to have fun and be challenged learning skills out on the trail. When they start to race each other, they learn even more."

The three main objectives for the *FUNdamentals* stage:

1. PHYSICAL LITERACY

Physical literacy is the foundation of sport enjoyment and success. Participate in multiple sports to develop basic movement skills including locomotor, object control, balance and agility, on land, in water and air, and on snow and ice. Develop basic sport skills and learn simple cycling concepts. Build speed, power and endurance through FUN and games

2. BASIC CYCLING SKILLS

Learn basic cycling skills such as straight line riding, braking, climbing and descending, cornering, lifts and drops. Use fun and games, challenge new skill levels: how high can you bunnyhop? Try simple trials courses, and ride on varied terrain / surfaces. Build in some BMX pump track skills. Develop some mechanical ability- learn how to make sure the bike functions well and the cycling position is appropriate.

3. TRY A RACE

Participate in fun local races or challenge other riders to perform new skills. Play bicycle tag or see who can get to the top of the hill fastest. Develop the love of physical effort, being outdoors, and riding trails. In this stage competition is about skills, challenge and fun, not winning championships. Learn basic MTB race concepts such as starts and maintaining speed through fun competitive activities.

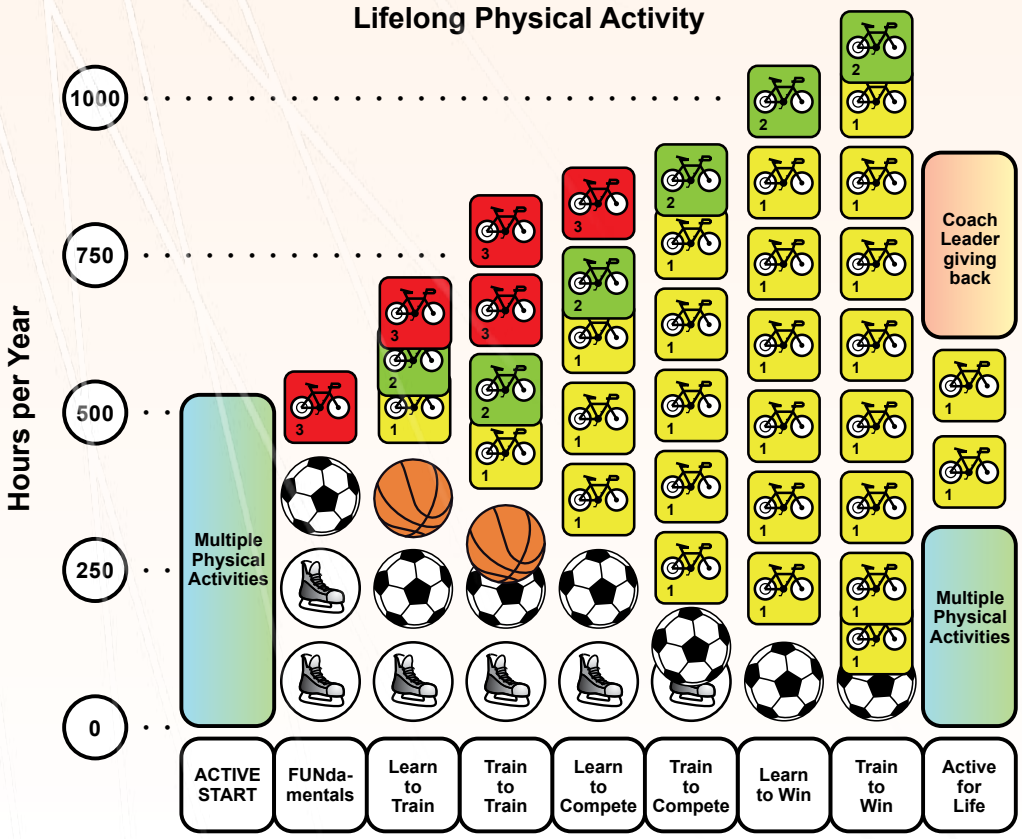
FUNdamentals: Young riders age 6 to 8 (F)/9(M)

The *FUNdamentals* stage is about developing Physical Literacy. Participation in multiple sport activities helps build competence and confidence in basic movement and sport skills- the foundation for future success. In this stage young riders are introduced to the sport of cycling with a major emphasis on acquiring and developing cycling skills in fun, challenging environments. Youth aged 6 to 10 can quickly learn and develop basic technical skills but are usually not ready for long rides or intense organized competition. Participants are typically most interested in being with friends and learning and showing off new skills. Most of all, they love to ride!

PHYSICAL LITERACY

Individuals are physically literate when they demonstrate competence and confidence in fundamental movement skills and fundamental sport skills, combined with the ability to read their environment and make appropriate decisions (i.e. “game sense”). Physical literacy allows individuals to enjoy a variety of sports and physical activities, and is the foundation of high performance. Activity in the Active Start, FUNdamentals and Learn to Train stage should provide the widest possible range of experiences to develop all categories of movement skills- agility balance and coordination, object-control skills (e.g. kicking, catching, throwing) and locomotor skills (e.g. running, jumping, riding a bike) in the four basic environments- on land, in the air, in water and on ice and snow.

To develop physical literacy individuals should participate in multiple activities and sports. Parents, teachers and instructors should ensure young participants get enough activity- about an hour per day- as well as the right kinds of activity: diverse, skill building and not too highly competitive. The diagram below shows how an individual can participate in multiple sports and multiple cycling disciplines, eventually specializing in one discipline in the performance stages.



mechanic’s corner

Early introduction to how a bike works is important for young cyclists. The most important aspect at this stage is to have a bike that fits properly. Having the right frame and wheel size is vital for early introduction in skill learning and development. Too often kids ride bikes that are too small because they’ve outgrown them, or too big because it’s assumed the kid will grow up to the right size. With a proper position on the bike, the young rider will be able to learn faster in a safer environment. Remember the body mass to bike weight ratio: a 50-lb. child with a 25-lb. bike needs all the help he or she can get! At this stage, kids are very intrigued by how a bike actually works, by the shifting and braking mechanism. It is a great time to educate them on proper bike maintenance!

SKILL: *Be a skill champion*
LTAD: Learn to Train

"The time I spend learning skills really pays off on the World Cup circuit. Maintaining speed on drops and rocky sections saves energy and time!"

The three main objectives for the *Learn to Train* stage:

1. SKILLS DEVELOPMENT

Continue to develop new skills in progressively challenging situations (e.g weight transfer, pumping and absorbing terrain, manuals, jumping, braking, high speed flat and bermed corners, standing, balancing, wheel lifts, etc.). Incorporate skills in fun race-like settings. Continue to explore risks and limits in safe environments.

2. PHYSICAL DEVELOPMENT

Seasonal cycling program; continue to build athletic skill by participating in multiple other sports and cycling disciplines. Fun skill-focused rides, let fitness build naturally. Learn to love physical effort. Develop leg speed 100+ rpm. By end of stage, ride 3 to 5 times per week in season, 60 minutes or more per session.

3. BASIC RACE SKILLS

Develop some basic race skills and knowledge in your sessions: maintaining speed in technical terrain, riding fast with others, reading the course and finding the best line. Race on flat pedals in short races with friends. Set some skill based goals for each race. See if you can reach your goals and set new ones as you progress.

LEARN TO TRAIN: Ages 9 (F)/10(M) to growth spurt, or 1 to 5 years in Cycling

The theme of the *Learn to Train* stage is *Developing Skills*. Participants build on the foundation of physical literacy formed in the *Active Start* and *FUNdamentals* stages. In this stage cyclists are introduced to a season-long training program with a major emphasis on acquiring and developing cycling skills. They should participate in multiple sports and multiple cycling disciplines. In youth age 9 to 12, windows of trainability are important: unloaded speed (e.g. leg speed) and technical skills are highly trainable in this stage. Participants are typically most interested in being with friends and experiencing the fun of competition but they may not be too interested in "serious training". At the end of this stage, some participants are competing in local series or even provincial events; use these races to have fun, be with friends and to learn. Help them focus on fun and becoming a "skills champion"!

BUILD WINNING MTB SKILLS

MTB technical skills, including starting, cornering, passing, climbing, managing obstacles, and jumping are the foundation of success. These skills are best developed when the athlete is from 8 to 12 years old, a sensitive period of adaptation for the body and mind. High performance in MTB is impossible to reach without these skills, and the skills can transfer to other kinds of cycling and to other sports. Here's what top coaches and sport scientists tell us about learning winning skills:

- Learning occurs best if the learner is interested and engaged. Since some young riders can have short attention spans, the best learning is often through fun games specifically designed to build skills.
- Even in older children and adults, skills are learned best when learners use an experimental approach, trying out variations of the skill to see what works best.
- When learners are highly motivated, they usually enjoy practicing a skill over and over again until they feel confident and fast. The coach can provide quality feedback during these sessions to encourage and motivate the athlete. Riders should be encouraged to keep having fun and to attempt new variations on each skill once a reasonable level of confidence and skill has been achieved. If the rider struggles to learn a new skill, a short break or a new activity can help the athlete to refresh and recharge before attempting to master the new skill again.

What does this look like in MTB?

- A good mix of relaxed fun and intentional focus as riders challenge themselves to learn skills.
- Riders using flat pedals (not clips) for all kinds of skill learning, throughout their careers. Using flat pedals encourages better bike and body coordination and forces the rider to learn correct form for hops, manuals, jumps and other skills. Even top international riders spend some time working on skill development using flat pedals.
- Participation in other sports to develop well-rounded athleticism, balance, agility, object-control (e.g. ball- or puck-handling) and eye-hand and eye-foot coordination.
- Riders playing all kinds of games, on and off the bike, to develop a wide range of athletic skills.
- Coaches who know how to mix up activities and try different approaches to help riders "get" a skill- not just by telling, but by demonstrating, trying different movements, and watching different situations and advanced riders.
- Advanced riders helping newer riders out, and being role models for them.
- Competitions that focus on skill development ahead of performance (winning).

A list of key MTB skills is provided on page 25.

mechanic's corner

At this stage, it is important for the young rider to be in tune with the bike's performance. A clean bike is a happy bike! Learn the basic 10-minute bike wash: this will help in detecting wear so parts can be replaced BEFORE they fail, and being able to address basic maintenance such as braking and shifting. Introduce the concept of tire pressure and tire tread for various conditions and suspension setup. Again, proper fit is crucial. Not only is it important to provide the right size bike, educating the young athletes in proper positioning - seat height and position, handlebar reach, adjusting the controls - will allow them to learn faster and reduce the danger of overuse injuries. It is important to note that saddle height can change several times during the course of a season as they grow quickly!

SPEED: *Build the engine!*
LTAD: Train to Train

Being best in the world requires: "Technical skill and tactical fundamentals at speed, under pressure, while fatigued."

- ADAPTED FROM WAYNE GOLDSMITH, 2003

The three main objectives for the *Train to Train* stage:

1. BUILD THE ENGINE

Yearly training program to build the rider's overall training capacity and preparedness for competition. Training includes MTB specific rides as well as some on-road training. Other cycling disciplines, like BMX, can be used to enhance training and skill development. Riders at this level typically train 5-6 times per week Training sessions may be as short as 60 minutes with some endurance sessions up to a couple of hours long

2. SKILL REFINEMENT

MTB racing is "technical skill and tactical fundamentals, at speed, under pressure, while fatigued" (adapted from Goldsmith, 2003) Develop and refine skills in progressively more challenging situations with higher speed. Skills include starts and sprint to single track, pumping terrain with manuals, jumps, drops and cornering. Climbing and descending technique is key. A rider's skill level becomes highly developed in this stage.

3. ADVANCED RACE SKILLS

Improve race tactics: maintaining speed, trail positioning, corner positioning, finding the best line. Compete in Provincial level racing and gradually introduce National level races when appropriate. Focus on racing to learn; put limited emphasis on results and series standings, and lots of emphasis on achieving goals and becoming a better racer. Try different strategies and find what works best for you

TRAIN TO TRAIN: After growth spurt and/or 3 to 6 years in Cycling

The theme of the *Train to Train* stage is *Building the Engine*. Participants build on their physical literacy and the solid base of MTB skills developed in the *Learn to Train* stage. In this stage cyclists follow a yearly training program with a major emphasis on building fitness while further developing and refining MTB cycling skills. They should continue to participate in multiple sports and incorporate other cycling disciplines, such as road cycling into their training. In some regions, riders choose to add a winter sport, during the colder months, that compliments their cycling specific training – which makes it easier to train year round and maintain motivation. In youth age 13 to 16, windows of trainability are important: aerobic power, anaerobic power and strength become trainable after the growth spurt. Participants are becoming more interested in serious training and being the best, but still want to be with friends and experience the fun

of competition. Late-entry adults coming from other sports enter here, and will require skill review and development. Some late entry athletes can be candidates for accelerated development, and pass through stages rapidly. Focus on progressive physical development and refining skills, and keep it fun!

BUILD THE ENGINE

In the *Train to Train* stage the cyclist begins to think of him or herself as a "serious" athlete, with competition-focused goals and a yearly training program. For young riders, the beginning of the stage is determined by the growth spurt, which marks the beginning of a period when the athlete can benefit from more aerobic endurance training, and slightly later, from strength and anaerobic training. This is the ideal time to begin building "the engine" or the body's energy systems. At first this should still be done using fun, skill-based activities rather than high intensity interval training or time in the weight room. Here are recommendations for building a strong MTB engine:

- Be aware of and monitor maturation, which may occur at different rates in different athletes. Note the window of trainability starts at the growth spurt (ages 11-12 girls, 12-13 boys).
- Use skill-building activities such as repetition of starts, riding technical loops, or practice races to develop speed, power and endurance.
- Develop self-awareness and good training routines: refine warm up/cool down, begin to learn training zones using perception of exertion, breathing rate and heart rate.
- Aerobic power and speed: Mix development through fun, games and skill-based training, and specific training. Later in the stage introduce road-based cycling training as part of the structured training program.
- Strength: Build core strength and stability using own body weight exercises.
- Follow a yearly training program with single periodization.
- By the end of stage, train 5-6 times per week. Add regular long rides to develop endurance and training capacity.
- Introduce goal-setting based on achieving 3-6 week skill and physical performance (fitness) objectives.
- Include work on skill execution when fatigued or under pressure on a regular basis in training.
- Introduce performance measurement (monitoring) based on skills performance of skills and use of functional movement screen. Later in stage introduce monitoring of aerobic and anaerobic power.
- Select competitions based on specific criteria: development of skills and tactics, trying a higher level of competition for learning, or trying harder terrain for the first time.
- At first select only a few races per season where performance and ranking matter. Increase the emphasis on performance progressively. Ensure there is enough time for recovery and training between competitions in the plan.
- By the end of stage work toward performing on demand in designated races.
- Develop a post-training and racing recovery routine, consisting of stretching, self-massage, use of foam rollers etc.

mechanic's corner

At this stage, young athletes should feel empowered in proper bike fit and bike maintenance, under the watchful eye of a coach and/or pro mechanic. A proper bike fit is vital to maximize performance as well as comfort on long and frequent rides and avoid overuse injuries. When invited on a club or team training camp and competition project, the athlete should have gathered enough knowledge to perform bike preparation - washing the bike, adjusting brakes and derailleurs, tuning the suspension for the requirements of the course, choosing tire tread and proper air pressure and performing a bolt check. Note that at this stage, it is not the latest and greatest that will win the races - avoid trying to gain an advantage by having the lightest bike of the field. Know how to adapt your riding style to equipment choices – e.g. lightweight race tires require a smooth riding style. Dealing with feed and tech zones is important as well. Being able to communicate efficiently a problem to the mechanic in the pits, staying calm and collected while a repair is made to the bike and restarting the race with a proper pacing strategy are all important traits to develop. It is valuable to have a reliable bike that will withstand the whole race season - changing parts as needed - and that will hold up at major events such as provincial or national championships.

STRATEGY: *Be the smartest!*
LTAD: Train to Compete

"Don't focus on being the best, focus on always getting better and you never know how far you will go. It takes a long time to achieve success because there is always something new to learn about being an athlete. Never stop learning and make sure you are enjoying the process along the way. Take advantage of the opportunities you get to ride your bike and keep going until the fun stops."

GEOFF KABUSH,
CANADIAN TEAM MEMBER

The three main objectives for the *Train to Compete* stage:

1. PERFECTING RACE SKILLS

Perfect race strategy and tactics through participation in national and international events. U23 racers compete in races up to World Cup and World Championships. Intentional use of racing for learning and performance. The focus of this stage is on athletes entering the high performance pathway and challenging themselves to become world-class in international competition.

2. OPTIMIZING THE ENGINE

Periodized annual training program guided by regular performance monitoring; build endurance, aerobic power and speed training on road and MTB. By end of stage, ride 6 to 10 sessions per week in season, up to 4 hours per session, for a total 600-800 hours per year. Careful attention to recovery and preventive strengthening to minimize overuse injuries. Look for "breakthrough" workouts and races and understand why these occur.

3. LEARNING THE RACING LIFE

Learn to balance training, racing, sponsor and life demands. Many athletes will learn these skills as part of a National Team camp or international racing opportunity. Learn how to travel and compete as part of a winning team. e.g. managing travel fatigue, living arrangements, sponsor agreements and financial matters. Contribute to your team effectively. Develop mental performance skills to maintain ideal performance state.

TRAIN TO COMPETE: High performance cyclists with 5 to 7+ years experience

Train to Compete is the stage where high performance cyclists learn the craft of racing in national and international-level races and work to perform on demand in these events. By this stage athletes should have advanced technical skills and highly developed physical fitness, so the focus turns to learning and refining race tactics and mental performance skills when competing. Some exceptional athletes from other sports enter at this stage and require accelerated development. Athletes in this stage are committed to their racing careers as members of teams including national development and U23 teams. Challenges include learning to compete on a world stage, optimizing preparation and recovery while travelling and competing in a high number of races, while maintaining life balance. Physical ability alone is not enough- to succeed athletes will learn to be both the fastest and smartest.

PERFECTING RACE SKILLS

In the Train to Compete stage the athlete is committed to high performance, and MTB training and competition is a central part of the athlete's life. These are critical years as the athlete strives for selection to higher level teams and performance in national championships and international races. The "engine" is optimized through focused training that follows a periodized annual program in a quality daily training environment, and a main focus is on perfecting race skills in progressively higher levels of competition. Perfecting race skills involves developing a number of advanced integrated skills:

Physical performance skills- in addition to optimizing the engine, work on:

- Building training capacity- the ability to regularly sustain 15 or more hours a week of focused training and competition including work on threshold power, aerobic power and speed.
- Being able to manage multiple consecutive long training sessions.
- Recovery techniques- stretching, self-massage, foam roller, contrast baths, and nutrition for recovery.

Mental performance skills:

- Race focus, decision-making under pressure
- Refining competition routines pre-race and post-race
- Managing performance state by learning to maintain focus, use routines and relaxation techniques
- Managing distraction, learning to focus and re-focus in adverse conditions.

Tactical skills:

- Course analysis and visualization: understanding where bottlenecks, high- and low-speed sections will be in the race
- Analysis of opponents: how they are likely to respond to the course features and other opponents
- Self-analysis: strengths and weaknesses, how to manage pace and energy relative to the course and opponents, where to attack and recover
- How to manage different scenarios such as a good or poor start, puncture, crash etc. to maximize performance.

Life skills:

- Managing travel, nutrition and recovery for competition projects
- Building self-awareness and self-sufficiency, resilience, and a support network
- Managing self-expectations: "don't believe your own press/ blog" but focus on realistic objectives and improvement.
- Living with team mates and team staff; organizational and inter-personal skills
- Maintaining life balance, progressing in other aspects of life while devoting maximum effort to racing.

To optimize development of these skills, the mental and tactical skills should be developed in both training and competition environments. Competitions should be selected and used intentionally:

- Select competitions based on specific criteria: at first, development of skills and tactics, trying a higher level of competition for learning, or trying harder terrain for the first time. Later select competitions based on selection requirements and opportunity to face higher levels of competition and the demand of international racing.
- At first select only a few races per season where performance and ranking matter. Increase the emphasis on performance progressively. The achieving a desired result (objective goal) is the result of doing the little things correctly in the race (a focus on process goals).
- Ensure there is enough time planned for recovery and training between competitions.
- Use opportunities to model higher-level competition, e.g. use Canada Games to model multi-sport Games.
- Intentionally use international competition to learn to prepare, race, recover, travel and live in unfamiliar environments with focus on attaining performance goals.

mechanic's corner

At this stage, we are trying to maximise performance with attention to details that will matter. Know your normal, what works best for you. Be consistent with your equipment choices and have a reliable bike that can be counted upon in major races. Know how to travel efficiently with your bike and gear as travel requirements will grow exponentially at this stage, finding the delicate balance between not bringing the enough equipment to adapt to various race courses and bringing too much. Perform regular scheduled maintenance at home, by yourself or a by trusted mechanic, between races and travels. Bike fit continues to be crucial at this stage, and attention to detail with a certified bike fit specialist is important, at the very least once a year when you receive your new bike. It is key to avoiding overuse injuries as many hours will be spent riding in this position and maximizing the performance on the bike. Know and trust various mechanics on the national team or pro teams, learn how to work with them to provide a positive experience for all and the chance to broaden your knowledge. What does it take to be the best in the world? The train to compete athlete has to develop excellent skills and knowledge that will be perfected in the train to win stage as an elite.

WHAT DOES IT TAKE TO BECOME A CHAMPION?

Progressive, stage-appropriate assessment, development, perfecting all performance areas, willingness to challenge yourself to be the best…and love of the sport!

TACTICAL
Pre-ride course
Race starts
Passing
Pace management
Maintain speed

LIFE SKILLS
Self-sufficiency
Self-awareness
Resilience
Support group

TECHNICAL
Pedal
Mount & dismount
Brake
Gearing
Corner
Climb
Descend
Accelerate
Pass
Pump & roll
Drop
Lift
Jump
Group skills

MENTAL
Goal-setting
Decision making
Attention control
Emotional control
Ideal performance State

SOCIAL
Interpersonal
Problem solving
Conflict resolution
Communication

PHYSICAL
Physical literacy
Agility
Balance
Coordination
Flexibility
Strength
Speed
Power
Anaerobic power
Aerobic power
Threshold

SUCCESS: *Be World Champion!*
LTAD: Train to Win

"If you want to give your (Kids) athletes a lasting gift, show them the joy in their sport and the pursuit of improvement. This is what will allow them to put in the long hours required to make it to the top and the drive to cross the finish line first.

CATHARINE PENDREL, CANADIAN TEAM MEMBER

The three main objectives for the *Train to Win* stage:

1. GAP ANALYSIS

Create an inventory of the skills and abilities needed to win. Analyze how you compare to the best in the World on each skill and ability. Create a periodized annual training with your coach that helps you narrow the gap between you and the best riders. Training is typically 6 days and 2-4 hours per day totaling 800-1000 hours per year. Pay careful attention to recovery and regeneration.

2. EARNING SUCCESS

Technical and tactical skills are mastered and adaptable to all conditions. Mental preparation and performance skills are highly developed. Constant search for ways to improve and refine performance. Small margins separate the best at this level. With the support of the coach, the athlete systematically develops all of the tools needed to succeed at the highest levels of the sport.

3. LIFE SKILLS & BALANCE

Manage the demands of international racing – develops ways to deal with travel, nutrition, sponsor demands and other factors to maintain health and peak performance. Develop self-awareness and monitoring to know how to respond effectively to challenges. Be a professional in all aspects of sport and life. Becoming empowered and independent leads to high levels of confidence in competition.

TRAIN TO WIN: Elite athletes with 8 to 10+ years experience

The Train to Win stage is the pinnacle of athletic development. Athletes in this stage transition from U23 and become elite professional cyclists and/or senior national team members. The focus is on constant, total preparation in all areas to permit the athlete to "perform on demand" in major competitions and Games. Technical and tactical skills are perfected and become highly adaptable. Fitness is maintained with careful monitoring and attention to recovery techniques to minimize risk of over training or injury. Athletes in this stage face heavy demands on their time due to travel and competitions as well as sponsors and media, so mental preparation skills become increasingly important.

EARNING SUCCESS

At the top of the sport small margins separate the best competitors and the focus is on detail and excellence in each area of performance. The Train to Win athlete is a professional and/or National Team member who is fully committed to cycling and is working to stay on top of the cycling world. Training intelligently and focusing on competitive success is a full time investment. At this level "performance on demand" or the ability to perform when it matters is crucial.

Physical focus:

- Perfecting all physical abilities.
- Highly aware of own body and can monitor and self-manage training and recovery.
- Perfecting recovery/regeneration techniques.
- Trains 800-1000 training hours per year, 6 to 10 sessions/16 to 20 hours/week, with sessions up to 2.00- 4:00 hours.
- May participate in up to 1 other sport (i.e. XC-Ski in winter) but is now specialized in MTB.
- Annual plan with 1-2 significant peaks.
- Regular performance monitoring and adjustment of training and recovery accordingly.

Technical and tactical focus:

- Refining and perfecting technical and tactical skills. Automatic reaction in all conditions.
- High degree of awareness of opponents and course technical requirements and can adapt tactics to all conditions.

Mental focus:

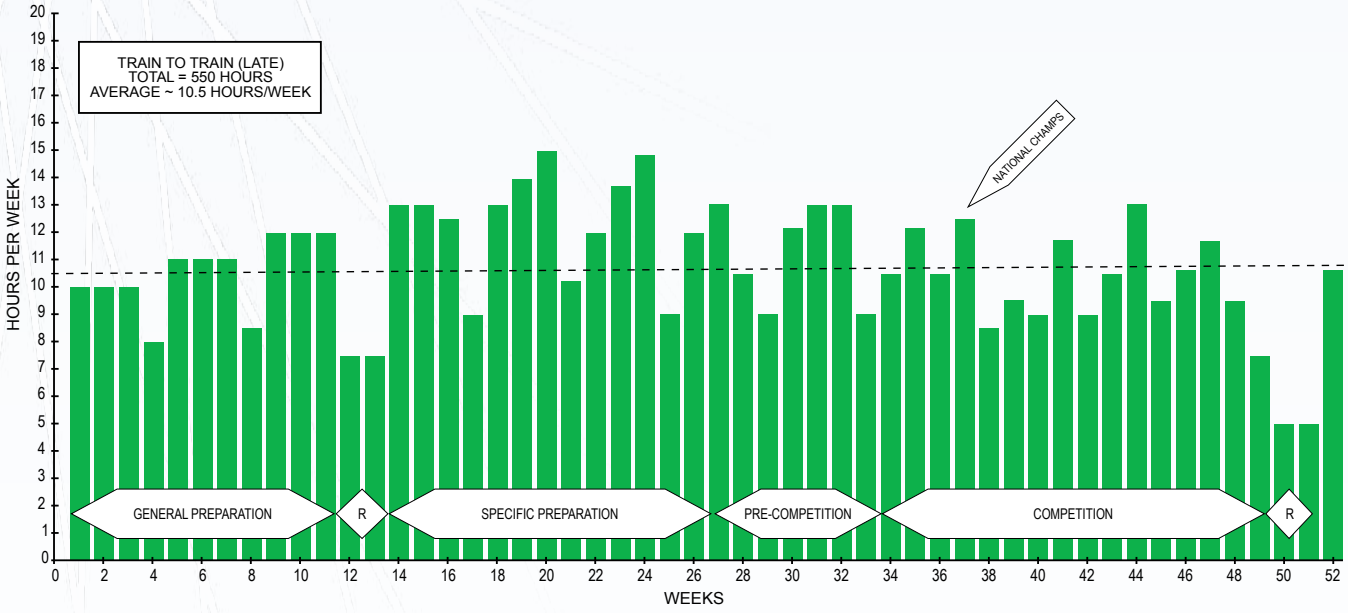
- Completely focused on next steps in sport success e.g. National Team, Worlds, Olympics.
- Refining mental skills for training and competition.
- Able to "perform on demand" in high-pressure competition situations.
- Has developed resilience: the ability to overcome obstacles, maintain focus, and maximize performance in any situation.

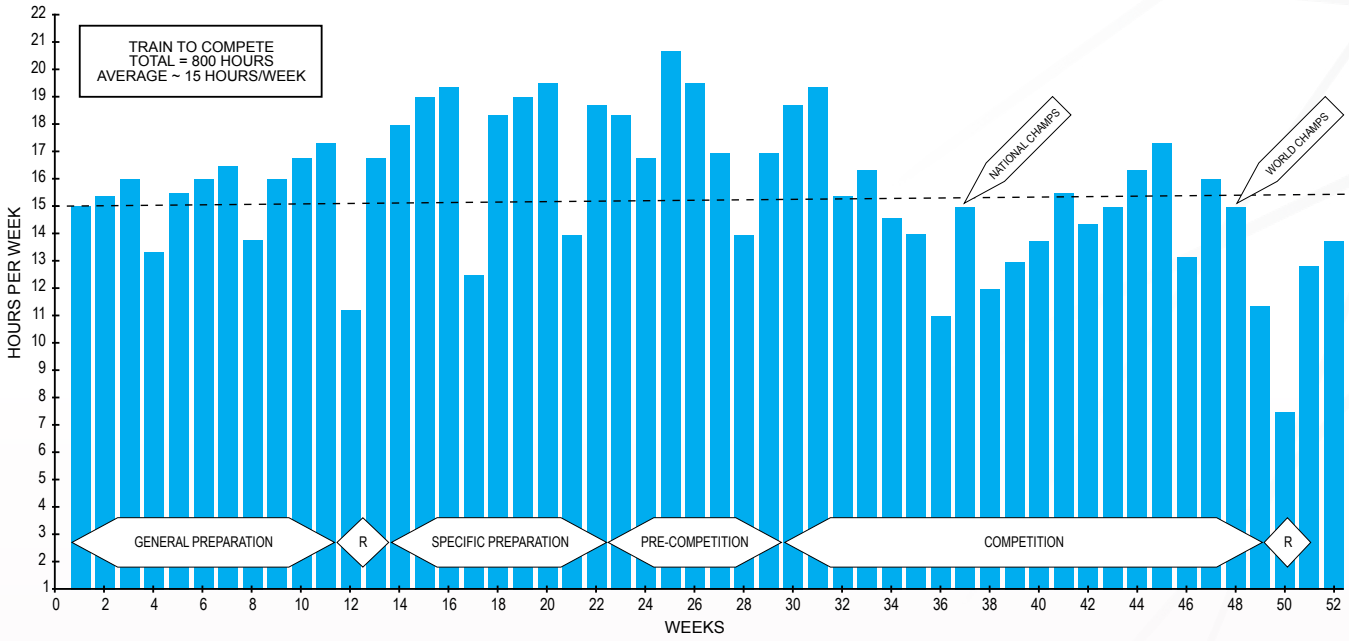
Life skills focus:

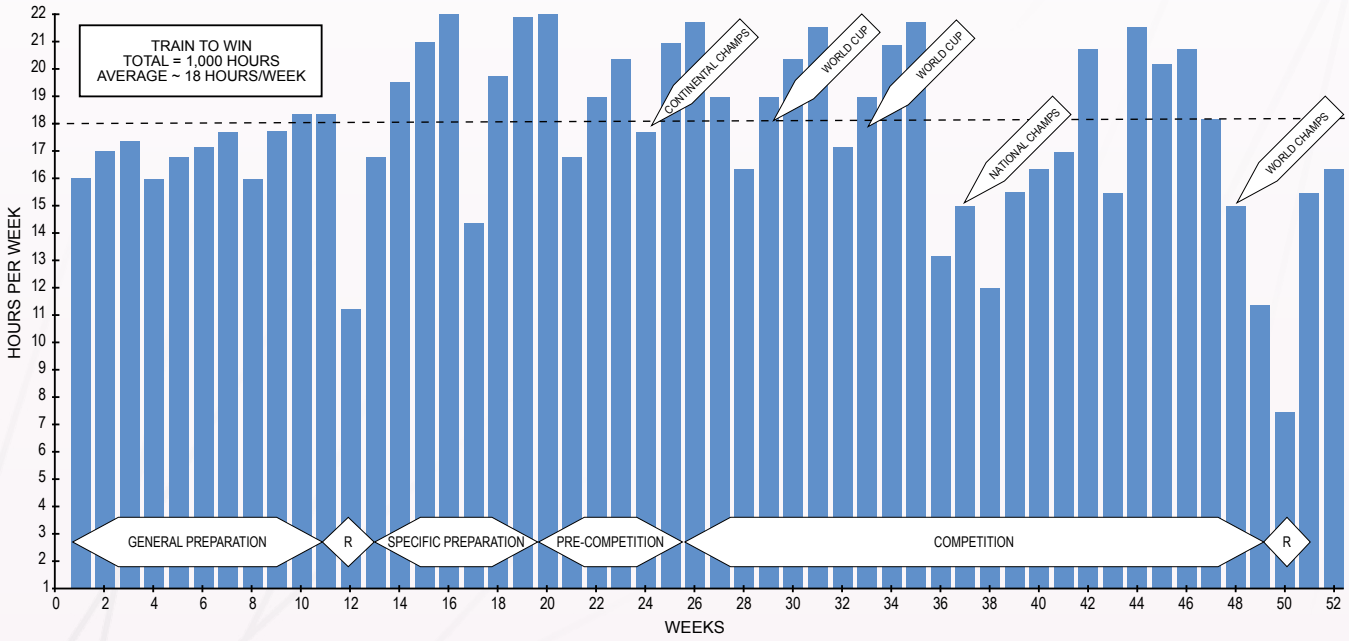
- Has built a support network including family, coach, sport science and health care to help sustain sport career.
- Dealing with higher expectations in sport while remaining grounded in the fundamentals that brought the rider to this performance level.
- Mental performance skills to enhance future performances after a major success has already been achieved.
- Able to maintain performance level while balancing life skills with high performance success. Copes with life challenges in balancing school, family, personal relationships and work. Some of these expectations may change as the athletes experience greater success.

Periodization Stage by Stage

The following examples compare training and racing volume in hours per week for a male MTB XC racer in the late *Train to Train* stage, the *Train to Compete* stage (U23) and the *Train to Win* stage. While the shape of the three plans are similar, the volume increases for each stage. The Train to Win athlete also has a longer competition period and more "peaks and valleys" in volume due to more frequent international competition.




TRAIN TO COMPETE
TOTAL = 800 HOURS
AVERAGE ~ 15 HOURS/WEEK
HOURS PER WEEK
WEEKS
NATIONAL CHAMPS
WORLD CHAMPS
GENERAL PREPARATION
R
SPECIFIC PREPARATION
PRE-COMPETITION
COMPETITION
R


TRAIN TO WIN
TOTAL = 1,000 HOURS
AVERAGE ~ 18 HOURS/WEEK
HOURS PER WEEK
WEEKS
CONTINENTAL CHAMPS
WORLD CUP
WORLD CUP
NATIONAL CHAMPS
WORLD CHAMPS
GENERAL PREPARATION
R
SPECIFIC PREPARATION
PRE-COMPETITION
COMPETITION
R

STAY: *Ride, but give back!*
LTAD: Active for Life

"The great thing about our sport is you can compete as long as you want, or not compete at all. There's a challenge for everybody. But building the sport for others is an important challenge too! "

ALISON SYDOR, MOST DECORATED CANADIAN CROSS-COUNTRY MOUNTAIN BIKE CYCLIST.

She won a silver medal at the 1996 Summer Olympics in mountain bike, and has won 3 World Mountain Bike Championships gold medals : 1994 in Vail, Colorado; 1995 in Kirchzarten, Germany; 1996 in Cairns, Australia; and the 2002 relay race in Kaprun, Austria.

Alison Sydor has also won five silver medals (1992, 1999, 2000, 2001 and 2003) and three bronze (1998, 1999 (relay race), 2004) at mountain bike world championships, and one bronze at the road world championships (1991). In addition, Alison Sydor has been and still is a model for young cyclist across the country.

The three main objectives for the *Active for Life* stage:

1. KEEP RIDING!

Race for fun and adventure or simply be an active cyclist for life. Maintain fitness and find new challenges. Mountain biking is a great combination of fitness, finesse and athleticism. We think it's one of the best sports around.

2. GIVE BACK!

Support the sport as a coach or official, volunteer with a cycling club, build trails or ride for a cause. There are many ways to stay in cycling and contribute to the sport you love.

3. LIFE SKILLS & BALANCE

Cycling is great for fitness and personal growth. The A4L cyclist pays attention to healthy nutrition and physical activity and many other good habits to maintain health and peak performance.

ACTIVE FOR LIFE: Enter at any time after growth spurt

The Active for Life stage is for active cyclists of any age after the growth spurt. Development of a strong base of physical literacy means the A4L cyclist is confident about sport participation and understands the importance of activity to physical and emotional well-being and social life. The Active for Life cyclist may also be "Competitive for Life"- perhaps a late-entry cyclist learning about competition for the first time and serious about optimizing performance for masters-level competition. Either way he/she can also be a leader in the sport as an organizer, coach, official, trail builder or volunteer.

LOVE TO RIDE . . . BUT GIVE BACK

Although MTB has been part of Canadian cycling for about 30 years, it is still relatively new compared to other cycling sports. Different provinces and territories have different availability of tracks and coaches, different levels of organization, and (of course) different climates and proximities to racing in the USA. To create more opportunities for our racers we need to work together to build Canadian cycling. Cycling Canada, its partner provincial/territorial sport organizations (P/TSOs), coaches, organizers, volunteers, trail builders and parents all have key roles to:

- Implement the national LTAD framework for cycling development based on *Canadian Sport for Life principles*;
- Maintain a healthy perspective on competition, remembering that we are working to build individual growth and development, long-term gains and success, and a love for all kinds of sport and physical activity;
- Understand the importance of building skills in the "*MTB for Fun and Skill*" stages, and help younger riders to prioritize skill development ahead of winning.
- Create stage-appropriate development programs, competitions, and competition schedules that support rider development;
- Support coach and officials training programs, such as the National Coaching Certification Program (NCCP);
- Commit to ongoing personal and professional development, including NCCP certification, to provide the best quality of stage-appropriate development for athletes;
- Support the building and development of more quality MTB facilities and clubs;
- Work to keep cycling clean, healthy and fun for all cyclists.

5 – A Blueprint for Athlete Development

LTAD is a framework for optimal training, competition and recovery throughout an athlete's career. It describes the principles of appropriate development for athletes in each stage - for example, when to focus on developing technical cycling skills, and when to focus on gathering competition experience. It also describes the range of activities, training, competition and other factors appropriate for athletes in that stage, always subject to individual athlete differences. LTAD can be thought of as *lifetime periodization*: a plan for an entire career as an athlete and as a physically active individual.

For the coach and athlete this raises important questions: When is an athlete ready to move to the next stage? What level of skills, fitness, and other abilities should he or she have, before attempting a higher level of competition? The table on page 25 helps to answer those questions, by providing an "at a glance" guide to recommended performance targets in key MTB performance factors across the stages of LTAD.

Key MTB Performance Factors

1. *Physical Literacy* is the mastering of fundamental movement skills and fundamental sport skills that permit a person to read their environment, make appropriate decisions, and move confidently and with control in a wide range of physical activities. To develop physical literacy, children in the *Active Start*, *FUNdamentals* and *Learn to Train* stages need to participate in many kinds of activity and sports, and develop sound skills. Canadian Sport for Life has developed a set of assessment tools called PLAY, or Physical Literacy Assessment for Youth. The following table recommends a PLAY score of 42 or more for the *FUNdamentals* stage and 50 or more in the *Learn to Train* stage. Visit www.physicalliteracy.ca/play to download the assessment tools (free download).
2. *Technical Skills* for MTB are movements such as turning, braking, climbing and jumping. As outlined in Cycling's National Coaching Certification Program, there are two levels of skills, the *Basic Skills* and complex, *Integrated Skills* that are built from several coordinated basic skills. Development of technical skills is a major focus in the *FUNdamentals* and *Learn to Train* stages. A simple scale for assessing skills is Developing – Proficient – Mastered (DPM):

   Developing means the participant is learning the basic movements and sequence of the skill and may not be able to perform the entire skill in all conditions. Frequent errors are made, especially at speed or when fatigued.

   Proficient means the participant has learned the basic movements and sequence of the skill and can perform the entire skill in most conditions with few errors. The participant is automating the skill and performs it at higher speeds and in more difficult conditions including fatigue.

   Mastered means the participant has automated the skill and can perform it error-free in almost all conditions including high speeds and when fatigued. The participant is capable of performing the skill in new ways or merging multiple skills in new sequences.
3. *Pedaling* is the essential cycling skill. Efficient pedaling depends on having an ideal cycling position, on spending hundreds of hours perfecting the pedal stroke, and on careful adjustments to optimize pedaling biomechanics. Otherwise energy is wasted, technical skills are more difficult to execute, and performance suffers. Development of pedaling technique is a major focus in the *Learn to Train* and *Train to Train* stage. Here, "Proficient" means pedaling at 100 rpm or higher for extended periods with high efficiency (low energy cost) while "Optimized" means pedaling has been analyzed and adjustments made so the cyclist can pedal at even higher rates, up to 120 rpm or more, with maximum efficiency.
4. *Maximal Aerobic Power (MAP)* - is the highest metabolic power output an individual can achieve using the aerobic energy system. It is also referred to as VO2max. There are a wide range of mechanical power outputs (i.e. measured with a power meter) that can elicit VO2max, but the mechanical power output an athlete can hold for approximately 4 minutes is heavily influenced by VO2max. The following table recommends goals for the end of the stage expressed as watts of power per kilogram of body mass (W/Kg) sustained in a 20 minutes field power test. Cycling Canada has also released a 3 minute power test to perform with development and performance athletes.

5. *Anaerobic Energy System:* is the ability to generate very high power output for very short period of time. This is critical: in MTB XC, for example, the technical and tactical ability to sprint from start to singletrack, to bridge / attack opponents and to climb steep hills are key determinants of success. As for the Aerobic Energy System, building the "engine" is a major focus of the *Train to Train*, *Train to Compete* and *Train to Win* stages. The following table recommends goals for the end of the stage, expressed as watts of power per kilogram of body mass (W/Kg) as maximum power output over a 5 second effort.
6. *Tactical Skills* are decision-making skills needed to obtain a competitive advantage. They include elements such as knowledge of terrain and course, starting, positioning, pace, passing and decisions around how and when to use these skills. Gaining experience in a wide range of competitive situations is essential to building tactical skill, and this is a major focus in the *Train to Compete* and *Train to Win* stages. A list of tactical skills can be found on p. 26. The Developing-Proficient-Mastered scale is used, with the addition of levels of competition: DPM in local/regional, national, and international-level competition.
7. *Mental Skills* include goal-setting, self-regulation of thoughts, focus and perception to create and maintain an ideal performance state under pressure. Like other skills, developing strong mental skills requires extensive practice however, unlike some other skills, the individual must attain a level of maturity and self-awareness before he/she can develop good mental skills. This is a major focus in the *Train to Compete* and *Train to Win* stages. A list of basic mental skills can be found on p.26. The same DPM scale in local, national and international levels of competition is used for assessment.
8. *Social Skills* refer to the ability to work effectively with others in a variety of social settings. While social skills have not traditionally been a focus of sport development programs, they are essential and become more important as the athlete enters higher-level competitions. The ability to work well with others in teams, while travelling, and at training camps and competitions, including the ability to work with managers, sponsors and the media and to actively contribute to team success on projects, makes a big difference to an athlete's success. A list of basic social skills can be found on p.26. The same DPM scale in local, national and international levels of competition is used for assessment.

9. *Life Skills* refers to the basic ability to cope, look after oneself, and be self-sufficient in a wide range of situations. Like social skills, life skills have not traditionally been a focus of sport development programs, but coaches know how much energy and focus is lost by athletes who can't adapt to different schedules, foods, and lifestyles when travelling to international competitions. At the highest levels of competition the ability to maintain balance, develop and rely on a personal support network, and be resilient in the face of adversity is essential. A list of basic life skills can be found on p.26. The DPM scale with the addition of a "Basic" level in the *Learn to Train* stage, is used for assessment.

These key performance factors and goals for each LTAD stage create a simplified approach to setting targets for developing the whole athlete. Each factor becomes a focus in the appropriate stage, and advanced performance factors are not assessed until it is appropriate to do so. The chart on the following page shows the evolution of these goals for MTB cyclists across the *FUNdamentals* to *Training to Win* stages. The focus areas for development in each stage are outlined in the stage colour.

Key MTB Performance Factors by LTAD Stage

See description of each factor and scale.

PERFORMANCE FACTOR	START! FUNdamentals	SKILL! Learn to Train	SPEED! Train to Train	STRATEGY! Train to Compete	SUCCESS! Train to Win
Physical Literacy	PLAYcoach > 42	PLAYcoach > 50			
Technical Skills	Developing	Proficient	Proficient-mastered	Mastered	Mastered
Pedalling	Developing	Proficient > 100 rpm	Proficient > 110 rpm	Mastered > 120 rpm	Mastered > 120 rpm
Functional (20 min field power test = +/- 105% of FTP)			5.0 W/kg (M) 4.6 W/kg (F)	5.5 W/kg (M) 5.0 W/kg (F)	6.0 W/kg (M) 5.4 W/kg (F)
Aerobic Power (3 min. critical power)			6.0 W/kg (M) 5.0 W/kg (F)	6.5 W/kg (M) 5.5 W/kg (F)	7.0 W/kg (M) 6.2 W/kg (F)
Anaerobic Power (for endurance MTB athletes) (5 sec. max power)			15 W/kg (M) 15 W/kg (F)	17 W/Kg (M) 15 W/Kg (F)	19 W/Kg (M) 17 W/Kg (F)
Short-Term Work Capacity (for endurance MTB athletes) 30s Mean Maximal Power			8.5 W/kg (M) 7.5 W/kg (F)	9.5 W/Kg (M) 8.5 W/Kg (W)	10 W/Kg (M) 9 W/Kg (W)
Tactical Skills		Basic - Prov	Developing - Nat'l	Proficient - Int'l	Mastered - Int'l
Mental Skills		Basic - Prov	Developing - Nat'l	Proficient - Int'l	Mastered - Int'l
Social Skills		Basic - Prov	Developing - Nat'l	Proficient - Int'l	Mastered - Int'l
Life Skills		Basic	Developing	Proficient	Mastered

Do you have the Gold Medal Profile?

TACTICAL, MENTAL, SOCIAL AND LIFE SKILLS FOR MTB	
TACTICAL SKILLS	**DEFINITION**
Pre-ride	The ability to quickly learn the course, decide how to manage technical elements (choose correct line, etc.) and develop a tactical plan for the race based on its characteristics.
Race starts	In mass start or head-to-head events, the ability to position for and choose the best line or path from the start, the correct gear, etc. in order to gain an advantage.
Passing	The ability to decide both the best place (line or path, as well as location on course) and time (considering fatigue and overall race situation) to pass competitors.
Pace management	The ability to maximize performance by maintaining the appropriate pace given course characteristics, opponents, and environmental conditions, relative to one's own level of fitness and technical skills.
Maintaining speed	The ability to select the best line, terrain, and gearing, and to execute the correct technical skills, to maximize efficiency (speed per output of energy) and performance.
MENTAL SKILLS	**DEFINITION**
Goal-setting	The ability to set medium and long-term goals for oneself based on a realistic estimation of one's own capabilities and likely future events.
Decision-Making	The ability to make quick, good decisions by gathering integrating a range of information and analyzing it relative to an accurate understanding of one's situation (abilities, environment, etc.)
Attention control (focus/re-focus)	The ability to maintain a desired focus or quickly return to focus on tasks, by paying attention to the important information (cues) and filtering out distractions and negative self-talk and emotions.
Emotional control	The ability to maintain an appropriate emotional level by blocking anger or anxiety as necessary. This includes self-awareness and ability to use techniques such as relaxation, self-talk, etc. to maintain the appropriate emotional state.
SOCIAL SKILLS	**DEFINITION**
Interpersonal skills	The ability to get along with and work well with others, using empathy, listening, and communicating clearly and choosing appropriate behaviour in context of the group.
Problem-solving skills	The ability to effectively gather information and understand the different sides of an issue, and creatively identify and recommend effective solutions.
Conflict resolution skills	The ability to understand the different sides of an issue, and creatively identify and recommend effective solutions or otherwise de-fuse conflicts.
Communication skills	Ability to communicate clearly using different media appropriate to context.
LIFE SKILLS	**DEFINITION**
Self-sufficiency	Ability to manage one's own affairs with minimum assistance from others, usually by being resourceful, hard-working, organized, and making effective decisions.
Support	Ability to identify and maintain a network of personal and/or professional support from others, in order to assist one to cope with various challenges and demands.
Resilience	Ability to bounce back from challenges and adversity, rather than becoming angry or giving up. Ability to learn from failure.
Self-awareness	Understanding oneself, having a realistic appreciations of one's strengths, weaknesses and abilities, and one's own emotional and intellectual make-up.

Conclusion

Providing the latest information on development, training and competition, like this guide, is part of Cycling Canada's commitment to the sport of MTB cycling in Canada. Our goal is not simply to help Canadian athletes onto international podiums, but to ensure that every athlete can enjoy participation in cycling and sport for a lifetime.

Our framework for growth is the *Canadian Sport for Life movement*. A key part of the movement is Long-Term Athlete Development, which is a comprehensive set of principles for effective participant development. LTAD is based on research combined with the practical experience of working with thousands of athletes and coach-instructors.

We believe:

- Life has different stages of development that include transitions from child to adolescent, to adult, and then to senior, resulting in changed capabilities.
- Training, competition and recovery programs should be based on participant capability rather than chronological age.
- For optimal development, sport and physical activity programs must be designed for the capability and gender of the participant.
- Physical literacy is the basis of life-long participation and excellence in sport and engagement in health enhancing physical activity.
- Every child has the potential to be an athlete; therefore, is genetically predisposed to be active if the environment encourages participation.
- Life-long participation and excellence in sport are best achieved by participating in a variety of sports at a young age to develop athleticism, then specializing in a particular sport later.
- There are sensitive periods during which there is accelerated adaptation to training during pre-puberty, puberty and early post-puberty.
- A variety of developmental, physical, mental, cognitive and emotional factors affect the planning of optimal training, competition and recovery programs.
- Providing guidance through the developmental stages of sport and physical activity will result in increased participation and performance across the lifespan.
- Mastery in sport develops over time, through participation in quality sport and physical activity programs.
- LTAD is participant/athlete centered, coach-led and organization-supported and, therefore, takes into account the demands of home, organized sport, community recreation and school.
- Quality sport and physical activity, combined with proper lifestyle, result in better health, disease prevention, enhanced learning, enjoyment and social interaction; leading to improved wellness.
- Sport practices, scientific knowledge and societal expectations are ever changing and, therefore, LTAD needs to continually adapt and improve.

We encourage you to support every athlete by following these principles, whether their time in MTB leads them to the podium, to other cycling disciplines, to other sports, or to contributing to sport in other ways.

Let's go!

Glossary of Terms

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 an acceleration in the rate of growth, which marks the onset of the adolescent growth spurt. The rate of 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.

Aerobic Endurance- Ability to exercise for long durations using aerobic energy systems. Also see **MAP**.

Anaerobic power is produced for short bursts when very high power output that exceeds the capacity of the aerobic system is needed.

Agility- The ability to move quickly in three dimensions while remaining in control of the movement.

Anthropometry: Measurement of body lengths and girths. In early stages height and weight should be measured regularly to help in determining Peak Height Velocity (growth spurt). Later, body fat measurement should be added.

Balance- Ability to remain upright while moving. Includes static balance and balancing while moving or gliding.

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-age 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 integration 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.

Coordination- Moving several parts of the body serially or simultaneously to achieve movement.

Community Initiation: A National Coaching Certification Program context describing coaches of entry-level pre-competitive athletes.

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 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 system 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."

Fine Motor Skills- Movements controlled by small muscles, e.g. hand or finger movements.

Functional Movement Screen- A test of core strength and balance while performing simple movements. See functionalmovement.com

Goal Setting- The ability to set targets for future behaviours or outcomes.

Gross Motor Skills- Large movements of the limbs and body using multiple joints and muscle groups.

Introduction to Competition: A National Coaching Certification Program context describing coaches of early-stage competitive athletes.

Maximal Aerobic Power (MAP)- is the highest power output an individual can achieve using the aerobic energy system. MAP occurs at maximum heart rate and can only be sustained for a few minutes.

Memory- Ability to retain and recall instructions, information, and experiences.

Mental Models- Ability to understand and manipulate mental models of real-world processes.

National Coaching Certification Program (NCCP)- Canada's coach education program which prepares coaches in Community, Introduction to Competition, Competition Development and Competition High Performance contexts.

Periodization: A training program broken down into phases (periods) to promote progressive development.

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

Physical literacy refers to the mastering of fundamental movement skills and fundamental sport skills that permit a person to read their environment, make appropriate decisions, and move confidently and with control in a wide range of physical activities, with a resulting sense of competence and confidence.

Position on the bicycle is a key determinant of power output and ability to perform technical skills. Numerous adjustments to the bicycle are made to accommodate it to the cyclist and her specific needs. Position should be set professionally, monitored and adjusted through growth, and optimized for the cyclist at maturity.

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 critical periods 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.

Sensitive periods of development refers to points in development when training or gaining a specific experience has an optimal effect on development. The same stimulus, introduced at an earlier or later time, has less or no effect, or may even retard later acquisition.

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.

Skill- The ability to perform complex movements with a high degree of precision and consistency. This includes both movement skills (agility, motion and object-control) and sport skills (reading and reacting to sport situations).

Speed 1- Speed increases due to improvements in neuromuscular coordination.

Speed 2- Speed increases due to improvements in energy systems, anaerobic alactic and lactic.

Strength 1- Strength increases due primarily to increases in neuromuscular coordination, not growth.

Strength 2- Strength increases due primarily to increases in lean muscle mass- hypertrophy.

Stamina- Also called "aerobic endurance" this is the ability to continue intense exercise for long periods.

Suppleness- Also called "Flexibility" this is the range of physical movement at the joints.

Technical Skills are bicycle handling skills including control skills (steering, braking) and ability to execute wheel lifts, jumps, drops, etc. Ideally technical skills are developed in the *Learn to Train* stage and mastered by the *Train to Compete* stage.

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."

Resources and Contacts

In addition to the resources and contacts listed here, useful information can be found at *www.cyclingcanada.ca*

Resources

Canadian Cycling Association Long-Term Athlete Development, Volume 1. 2008. Canadian Cycling Association, Ottawa, ON. ISBN 978-0-9809082-0-6

Canadian Sport for Life, 2005. Balyi, I., Cardinal, C., Higgs, C., Norris, S., and Way, R. Canadian Sport Centres, Vancouver, BC. ISBN 0-9738274-0-8

Goldsmith, W. Sports Skills: The 7 Skills Steps You Must Master in Every Sport. Retrieved from: *http://www.sportscoachingbrain.com/sports-skills/* on March 3, 2014

Vickers, J.N. 2000. *Decision Training: A New Approach in Coaching, Vancouver: Coaches Association of British Columbia*.

Additonal information on Canadian Sport for Life and Long-Term Athlete Development can be found at www.canadiansportforlife.ca

Provincial Cycling Associations

Cycling British Columbia
#201-210 West Broadway
Vancouver, BC V5Y 3W2
Direct: 604 737-3164
www.cyclingbc.net

Alberta Bicycle Association
Percy Page Centre, 11759 Groat Rd,
Edmonton, AB T5M 3K6
780 427-6352 (B)
www.albertabicycle.ab.ca

Saskatchewan Cycling Association
2205 Victoria Avenue,
Regina, Saskatchewan S4P 0S4
306 780-9299 (B)
www.saskcycling.ca

Manitoba Cycling Association
200 Main Street, Suite 309,
Winnipeg, Manitoba R3C 4M2
204 925-5686 (B)
www.cycling.mb.ca

Ontario Cycling Association
307-3 Concord Gate Toronto, Ontario
M3C 3N7
416 426-7243 (B)
www.ontariocycling.org

Fédération Québécoise des sports cyclistes
4545 Pierre de Coubertin Montréal,
Québec H1V 3R2
514 252-3071 (B)
www.fqsc.net

Vélo New Brunswick
P.O. Box 3145 Fredericton, New
Brunswick E3A 5G9
506 877-7809 (B)
www.velo.nb.ca

Atlantic Cycling Center,
200 Prom. Du Parc,
Dieppe, NB E1A 7Z3
Contact: Luc Arseneau

Bicycle Nova Scotia
5516 Spring Garden Rd, 4th Floor,
Halifax, Nova Scotia B3J 1G6
902 425-5454 x 316 (B)
www.bicycle.ns.ca

Bicycle Newfoundland and Labrador
P.O. Box 2127, Station C,
St. John's, Newfoundland A1B 4R3
709 738-8889 (B)
www.bnl.nf.ca

Cycling Association of Yukon
9B Diamond Way,
Whitehorse, Yukon Y1A 6G4
867 667-8212 (B)

Cycling PEI
P.O. Box 302
Charlottetown, PEI C1A 7K7
1800 247-6712
www.sportpei.pe.ca

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