



## Chapter 3: Long Term Athlete Development

### Long Term Athlete Development and the BKL

Long Term Athletic Development (LTAD) refers to the framework of athlete education and development that can be used to teach caregivers/parents, coaches, and administrators optimal ways to educate and develop high-performing athletes. LTAD focuses on developmental rather than chronological age and links athlete education with physical and psychological growth, as opposed to calendar years. Developed in part by internationally recognized coach educator Istvan Balyi, the LTAD model aggregates widely accepted principles of athletic development that have been the basis of physical education for years.

US Ski and Snowboard (USSS) defines LTAD as the “managed developmental progression for an athlete that will both maximize their long-term potential and enjoyment in their sport.” The idea behind LTAD is essentially what BKL clubs have been doing for years: letting kids have fun while learning how to cross country ski, and focusing on the basic building blocks of movement before focusing on specific skills. As mentioned in Chapter 2, the development of aptitudes is the primary mission of BKL instruction, and the refinement of technique is of secondary importance.

The goal of LTAD and the BKL is not necessarily to create high performing athletes, but rather to create healthy, active individuals who know how to move well and enjoy being outside. We want to create a healthy community of young people who will love their sport, and want to stay involved after they complete BKL. To do this, children must develop what is known as physical literacy. Physical literacy is just what it sounds like, learning how to move well and put together the basic building block movements that make us human.

Physical literacy involves learning the **ABCs of agility, balance, and coordination**, so that children can have the ability to move confidently and appropriately during their chosen sport or activity. Science shows that when children become more competent, they participate more vigorously, play longer, and perform better. As a caregiver/parent of a young child, it is imperative that you put them in an environment that teaches the basic movements and skills of physical literacy. This does not mean only organized sports programs, but also backyard play, running and jumping at the playground, swimming or sledding with the family, or biking with friends.



## **LONG TERM ATHLETE DEVELOPMENT MODEL**

# **Lifelong Participation**

**As skiers grow older, some of them move up to the next level of racing, while others stay active and involved recreationally.**

**College & Elite Racing**  
**"Training to Win"**

**Junior Racing**  
**"Starting to specialize"**

**BKL**  
**Physical Literacy**  
**AGILITY, BALANCE, COORDINATION**

*The goal of LTAD is to create healthy, active individuals for life*



**The Long Term Athlete Development Model:** The diagram on the previous page is a visualization of the Long Term Athlete Development model showing the transition from BKL up through lifelong participation. By the end of the BKL years we want all children to have developed physical literacy before moving onto whatever comes next. Some children will transition to the next level of racing, which could be training with their local club for Eastern Cup races, or joining their local high school team. After the junior level, some children will go on to another level of racing which could be college or an elite team. At each level, a large group of children will choose not to continue onto the next level of competitive involvement. This is totally fine! These children will have developed physical literacy, and will hopefully enjoy skiing enough to stay involved recreationally.

### **Stages of Long Term Athlete Development**

*Adapted from "Is It Wise to Specialize?: What Every Parent Needs to Know About Early Sports Specialization and its Effect Upon Your Child's Athletic Performance" by John O'Sullivan*

The LTAD model applies to athletes of every age, not just BKL participants. From a developmental age viewpoint, there are seven stages of LTAD starting with pre-BKL. Below we will go through those stages, focusing most heavily on the first three stages up until age 12. Up until that point, caregivers/parents are at the forefront of promoting physical literacy.

Some kids figure out the basic movements and skills on their own, but others do not and must be taught and encouraged to learn and play. Introducing and training the correct skills at the correct times of development allows both kids and adults to become active and stay active. **It's important to remember that the ages given in this chapter are general guidelines. Every child develops differently and there is no way to definitively say what will happen at a given age!**

### **The Seven Stages of LTAD**

1. Active Start (ages 0-6)
2. FUNdamentals (girls 6-8, boys 6-9)
3. Learn to Train (girls 8-11, boys 9-12)
4. Train to Train (girls 11-15, boys 12-16)
5. Train to Compete (girls 15-21, boys 16-23)
6. Train to Win (girls 18+, boys 19+)
7. Active for Life (any age)

Stages 1-3 are when children develop physical literacy. In these stages it is important to teach movement and sport fundamentals before children reach puberty so that they have the basic skills needed to remain active for life. Those basic skills provide a foundation for elite-level



competition at the older ages if that is the path the child chooses, or provides the building blocks towards being an active healthy adult.

**Stages 1 & 2:** In Stages 1 and 2, kids should be changing activities seasonally to avoid burnout and boredom. These activities can be structured but should still focus on FUN; competitive games and matches should be kept to a minimum. Kids begin to read the game going on around them and thus can make decisions, and movements based upon what is happening during the match. Let them see the game, and try not to see it for them! These are times when children are sensitive to developing agility, balance, coordination, as well as hand and foot speed through fun activities and games, and not necessarily training regimens and drills. Every sport can develop these skills, and even a soccer coach can be working on catching while jumping, running, and doing forward rolls. If your child has a preferred sport, there is nothing wrong with them participating two to three times a week, but make sure they are doing other sports or activities three times a week as well. This well-rounded approach helps to master all aspects of physical literacy and keeps the child excited and engaged.

**Stage 3:** Stage 3 is an age where children begin to convert their foundational movements into basic sports skills. This stage is called the “Golden Age of Learning.” If you think about it, this makes perfect sense as this stage comes to a close when the child hits puberty, the growth spurt occurs, and there is a temporary loss of coordination and motor control. This is the best time to learn sport-specific skills as the child is still in control of their body and can see daily and weekly improvement from their hard work. This is the sensitive period of accelerated skill development and must not be overlooked or shortchanged by overemphasizing competition (as often happens). The emphasis should continue to be on more training and less competition, with at least a 2: 1 or 3: 1 practice to “game” ratio. This is a great time to develop strength, flexibility, and some stamina, but through relays, games, and fun races instead of physically demanding regimens.

One very interesting thing to note about this stage is that it can be either a great advantage or disadvantage to a late-developing athlete. With excellent coaching, in a proper development environment, a young athlete who hits puberty later than their classmates has a longer period in which to develop fundamental and sport specific skills. They remain in the “Golden Age” longer than their peers, and if they take advantage of this extra time, their technical skill base can surpass the early developers. Unfortunately, it is common that late developers are overlooked for select-level sports teams simply because they have not grown enough and are therefore not as strong or fast.

The current overemphasis on competition at these young ages funnels out these late developers as coaches pick the biggest and strongest players for success in competition. This is a worrying



trend because studies show that the late developers who are kept within the high-level training regimen become better long-term performers because of a better skill base. If your child is in this stage, and they are a late developer, make sure they are in the right coaching and developmental environment. They should continue to focus on their skills and not things like strength and speed, which will come naturally a bit later.

**Stages 4-6:** Stages 4-6 begin to focus on the elite training of athletes. Remember that not everyone will follow that path, and some children may jump from Stage 3 to Stage 7 (Active for Life). For the children who choose to focus on training for a specific sport, Stages 4 - 6 are when the development of each athlete is maximized. Stage 7 is focused on taking these properly developed athletes and making them lifelong participants in recreational and competitive sports.

**Let's Play:** Remember playing outside until someone called you into dinner? Remember falling down, getting snow down your neck, and laughing? Remember making snow angels, igloos, and tunnels until your snow pants were soaking wet? Remember coming in breathless from a game of tag? In the "olden days" most outside play time was un-**adult**-erated, and not subject to the level of planning involved in most kids activities today.

Nowadays, the after school play is controlled by adults, mostly out of necessity. It usually requires a car and an adult-organized sport. Bob Bigelow, who played for U Penn's Ivy League championship basketball teams ('73, '74, '75) and the NBA for four years, is the author of the book *Just Let the Kids Play*. He points out that "When adults set up structures and systems for their children they looked at the only models they knew: varsity high school, college and professional sports. With adults at the helm, youth sport programs grew exponentially." However, with adults at the helm some of the elements of fun and freedom in youth sports are lost. It's important to remember that youth sports, especially skiing, are about having fun with friends, playing games, and being active. Skiing is a means, not necessarily the reason, for being outside in the snow. The Bill Koch Youth Ski League should make fun, snowy memories for your children this winter and every winter.

The involvement of adults in childhood exercise has resulted in several issues:

- We organize child play to be like the adult play we remember from high school or college
- We demand adult-like physical and emotional responses to sport
- We take the games and play out and put in drills and competition

Not only is the fun of sport lost, but so is an integral part of physical, mental, and emotional development. Without the chance for their bodies to learn necessary physical skills, or their



minds to discover a love of sport, it's no wonder so many kids drop out, burn out, and leave sport and exercise as fast as they can.

**Growing Up Should Be A Game:** In the preface to his book, *Total Training for Young Champions*, Tudor Bompa, Ph.D. bridges the gap between research and application, and supports the idea of a long-term approach to children's physical development and training. Bompa's research supports the core philosophy of the New England Bill Koch Youth Ski League, and some of the key points of the Children's Bill of Rights (see Chapter 1 on page 9) which are:

- All kids should have fun while learning to cross country ski.
- They should be in a safe and healthy environment where they can develop physically, psychologically, and socially.
- They should participate to the best of their respective abilities.

Two key excerpts from Bompa's preface are below:

“Childhood is the most physically active state of human development. Children like to play games and participate in physical activity and sports, and they certainly like to compete. Coaches often become role models, and children dream of surpassing the achievements of Michael Jordan, Kurt Browning, Joe Montana, Tara Lipinski, Carl Lewis or Nadia Comaneci. It is, however, a grave mistake to submit children to the training programs of adults.”

“Children are unique at each stage in their development, with differing physiological capabilities at each stage of growth. The physical and psychological changes (at times abrupt) that occur at each stage are accompanied by critical behavioral transformations. It is important for anyone working with children to be well informed regarding all the physical, emotional, and cognitive changes they go through during the development stages, and to structure training that is best suited at each stage.” (Bompa, p. ix)

## **Specialization**

When children specialize in a sport, it becomes the one sport that they participate in and train for year round. This goes beyond simply having a favorite sport, or adding in sport specific training in the off season to whatever else a child is doing. When a child specializes, all other sports and activities are pushed aside. Specialization is not necessarily a bad thing, but it needs to be timed correctly in order to avoid negatively affecting a child's development.

There is a trend today to push children to specialize early. Whether it is a year round ski training program, a club soccer team, or a travel basketball league, kids are increasingly dedicating their time and energy to one sport at an early age. While the intent may be good - helping a child



become the best they can be at a sport that they love - caregivers/parents must remember that children should learn to move well before they can learn to ski well (or play soccer or basketball well). The **ABC's** of agility, balance, and coordination, and the development of physical literacy, are the building blocks of high level performance. These skills are not learned through sport specific focus, but rather through what is known as **multilateral development**.

Multilateral development boils down to participating in multiple sports or activities until a child is developmentally ready to specialize. By taking part in a wide range of activities, children have more time to develop the broad motor and cognitive skills needed to develop physical literacy. Multilateral development (also known as sport sampling ) not only helps children become better all around athletes, but also helps them to have a more enjoyable sport experience by having the skills to be able to take part in a wide range of social and athletic situations (recess, free play, pick up games, etc).

By learning to move well and have fun before dialing in sport-specific techniques, children also stay healthier by avoiding overuse injuries. A study of 1,200 youth athletes by Dr. Neeru Jayanthi of Loyola University found that early specialization in a single sport is one of the strongest predictors of injury. Athletes in the study who specialized too early were 70% to 93% more likely to be injured than children who played multiple sports.

**When to Specialize:** To figure out when it's time for a child to specialize, it's important to find out first if they even want to do so. Outside pressure from parents and coaches can negatively impact the youth sports experience and make training and competition stressful instead of fun. So if you are a parent pushing your child to take that next step and start training for skiing more seriously, remember that specialization might not be what's best for your child. Perhaps they enjoy cross country skiing more for its amazing social aspect or they simply enjoy being outside in the snow!

The second thing to remember is that all children are in a different place developmentally so there is no clearly defined age when you can say "now it's time to specialize." Generally somewhere between the ages of 11-15 for girls and 12-16 for boys (Stage 4 of LTAD) is when children are ready to start training seriously for their chosen sport. Think about the term "chosen sport" which implies ownership and is a decision that needs to come from the child. Specialization will start to happen naturally when a child is ready. They will truly enjoy their sport and want to take it more seriously. By waiting until your child is ready to focus on one sport you will help set them up for a more successful path of athletic development, and help keep the sports experience fun.



**“Time for Romance”:** In 1985 Dr. Benjamin Bloom collaborated with other researchers from the University of Chicago on a study to understand how world-class talent was developed. The 120 subjects in their study included concert pianists, sculptors, tennis champions, Olympic swimmers, research neurologists, and mathematicians. Their results showed that successful individuals have similar learning and development phases which they called the Initiation, Specialization, and High Performance phases.

Bloom noted that these same phases had been identified as early as 1929 by educational researcher, Alfred North Whitehead. Whitehead divided learning into three distinct phases: Romance, Precision, and Integration. The BKL years encompass the Romance Phase, which is “characterized by play, exploration, fun, and a time when children learn fundamental skills and develop a love for their chosen field, be it sport, music, art or academics.” (Gibbons, “Development of Excellence”) It is also a time when their first teachers and coaches inspired in them a love of the sport or activity, taught them the value of hard work, provided many opportunities for success, and provided immediate rewards.

### **Everyone is an Athlete at Some Time in Their Life**

- Two children who are the same chronological age could be as far as two to six years apart developmentally.
- In a group of 10 year olds, there are kids who are biologically 6 years old and biologically 13 years old. Do you ignore the “6 year old” and lavish attention on the “13 year old”?
- Only 25% of kids who excel as juniors are still in their sport as adults.

Consider Michael Jordan, who was cut from his high school varsity basketball program as a sophomore. Jordan grew six inches between his sophomore and junior seasons in high school, kept growing at UNC and went on to become perhaps the greatest player in the history of the game. “I had no idea that all this would happen,” his father told the Chicago Tribune in 1990. “If I had, I might’ve pushed him too hard and screwed it up. As it is, everything happened very naturally.”

Robert Malina, retired director of the Institute of the Study of Youth Sports at Michigan State University, concurs. “Early identification of ‘talent’ is no guarantee of success in sports during childhood let alone during adolescence and adulthood. There are simply too many intervening variables associated with normal growth, maturation and development and the sports system itself.”



## Age Sensitive Development of Youth

by Stuart Kremzner, "Training is most effective when it stimulates maturing abilities rather than those already matured" (Drabik, 1989)

Teaching young children skills and ski movement patterns can be optimized with the application of some basic motor learning principles. Improving their overall athletic development can also be optimized if we integrate the principles of age sensitive development. Age sensitive development refers to periods of time in a youth's life where they are much more receptive to developing certain fundamental neuromuscular skills (balance, timing, rhythm, coordination, and speed of movement). If the child is stimulated with a given element in this receptive time, they will develop this skill much more rapidly. When this is done there are very rapid biomotor and physiological adaptations of children when stimulated/trained at highly receptive age ranges.

The largest amount of neuromuscular development in youth occurs between the ages of 3 and 16 in the nervous system. This is the optimal period for balance, rhythm, motor engram, speed, and power development. These are known as the child's "Golden Years." Since the nervous system controls all of the functioning of our muscles, we have a great deal to benefit from this. For example at ages 9-10 females are much more responsive to balance training. If we develop and train these elements, the body adapts at a far more rapid rate in this dimension

The major reason for the application of these principles is that it will lead to much greater advancement and development of foundation abilities in young athletes. **When we train athletes in more receptive periods we make gains over months that would normally take years at a different age. Doing so optimizes:**

- Neuromuscular development
- Physiological development
- Strength development
- Injury prevention
- Rapid development of foundational skills
- Plasticity

An increased focus on neuromuscular development of young athletes will also improve the foundational skills of Agility, Balance, and Coordination (the ABC's of LTAD).

## Skill Development and Motor learning

Development of a motor skill is dependent upon several variables:

1. The complexity of the skill
2. One's base level of learning, and



### 3. The level of motor development one has.

For a child to learn a simple skill, it takes about 2-3 months to learn. Learning a complex skill takes about 2 years. Perfection takes an infinite amount of time.

The acquisition of a skill does not occur at once, but rather through four phases. During the first phase, due to poor neuromuscular coordination, useless movements occur. Coaches should not misjudge the lack of neuromuscular coordination as insufficient talent potential, but rather as a physiological reality. During the second phase, movements are tense. In the third phase the motor skill is established through adequate coordination of the nervous processes. Thus, the skill or the dynamic stereotype is formed” (Krestovnikov, 1951 in Bompa, 1990). The fourth and final phase of skill development is the mastery of the skill which is “characterized by performing fine movements with high efficiency as well as the ability to adapt the skill to eventual environment changes” (Bompa, 1990). Learning of the skill takes a great deal of time and practice i.e. thousands of repetitions. This is what takes the skill from a cerebral level, (thinking about the technique as you do it) to the cerebellar level (having the motion become automatic or reflexive). 39

Due to neural factors it is important for the coach to know how to manipulate the neural load for skill development. Since skiing has such a large balance component, manipulating the proprioceptive load variables is a good means of teaching/improving balance and accelerating the learning process. One way to improve one’s balance is to increase the proprioceptive load by removing one of the elements of balance. One’s balance consists of neuromuscular feedback, the visual field, and vestibular motor feedback. Removing one of those factors increases the load on the other variables. Hence doing balance drills with eyes closed will create a higher load on the other senses.

Another means of training this is to change the feedback characteristics of the environment by making the environment variable. This can be achieved by doing balance drills on the sand, snow, or in bare feet. Last, but not least, try knocking the athlete out of balance through the tossing of a ball, or pulling on the torso or a limb with a theraband.

**Motor Skill/Technique Development:** The “Golden Years” of development are the optimal times for motor engram development and patterning of motor skills. This is not to say that at later ages this does not happen, but the acquisition of the motor skill will take longer at older ages.



### **Sensitive Periods of Coordination Training**

- Balance: Age 10-11 in males, 9-10 in females
- Movement Adequacy: Age 8-13
- Kinesthetic Differentiation (the ability to correctly estimate differences in form, timing, distance, and strength modulation): Age 6-7 and 10-11
- Reaction Time: Age 8-10
- Rhythmic Motion: Age 9-10 in males, 7-9 in females
- Spatial Orientation: Age 12-14
- Synchronization of Movements in Time: Age 6-8

### **Practical Application of these Training Principles**

- For optimal adaptation, need to have 2-3 sessions per week
- Many of the exercises can be used as a warm-up
- The exercises are best done when well rested
- Sessions only need to be 15-30 minutes long

The key is to keep it fun! Whether these exercises are integrated into the warm-up or a workout, it is best to keep the kids moving the whole time. Intersperse high level activity with stretching or flexibility rest phases. The following chapter has examples of workouts and exercises.

Suggested games include (see game descriptions on page 80)

- Simon Says
- Follow the Leader
- Most number in time
- Relay races

**Speed, Power, and Strength Development in Young People:** Development of speed, power, and strength in young people are all neuromuscularly based and therefore the same concepts as above apply. Many of these drills and exercises overlap so a drill for rhythm can also be used for power. Single leg hops and jumping rope both develop rhythm and power, not to mention upper and lower body coordination.

Speed and power training can develop the following foundational abilities:

- Limb velocity
- Reaction time
- Frequency of movement
- Anaerobic efficiency (the amount of glycogen stored in muscles and the ability to produce energy in the absence of oxygen)



- Ability to perform work when the internal environment is disturbed (i.e. high body temperature, high lactate, etc.)

**Everyone Should Train Like a Bill Kocher:** Whether a child will become a world-class athlete or a Nobel poet laureate, each should begin with a happy, healthy childhood in order to lay the groundwork to be a happy, healthy adult. If a child is forced to specialize and skip a phase or more of emotional and physical development, they may find success, but it will be short-lived.

**Competition and Norwegian Youth Sports:** The Bill Koch Youth Ski League philosophy is that every child should have the opportunity to participate and to have a successful, fun, and rewarding experience. Every child should be rewarded for doing their best. The title of an early film about the Bill Koch Youth Ski League was titled, "I Hope I Get a Purple Ribbon." At the time all participation ribbons were purple. But how can we continue to encourage this when our American culture focuses everything on the winner?

Perhaps the first step is understanding how we became a nation for whom winning isn't everything, it's the only thing. Former Olympian and coach, Richard Taylor, takes a chapter in his book, *No Pain, No Gain? Athletes, Parents and Coaches Can Reshape American Sports Culture*, to look at the effect of our history on American culture, and the American view towards sport. He considers the effect of Puritanism, the American Revolution, the British motto – "the war was won on the playing fields of Eton," and our choice of heroes like Teddy Roosevelt.

We've been a nation of independent fighters for over 200 years, used to winning and heaping attention and money on the winners. Many people were raised and indoctrinated by the idea that competition is the only way to measure success, and just participating is not enough to be proud of. Rough stuff to put on children when they are still in the midst of developing self-esteem, confidence, and self-respect.

However, many studies are giving us a different perception of competition. A report put together by the Aspen Institute after the 2018 Winter Olympics took a close look at Norway's continued success in the winter games. What the report found is that Norwegian sports clubs follow a system very close to the LTAD model. Children are encouraged to participate in multiple sports, competition is de-emphasized until age 13, and coaches are encouraged to keep activities fun and engaging.



A quote from the head of the Norwegian Olympic Committee Tore Øvrebø sums up this ideology well:

“We like to win... but it shouldn't follow you and define you as an individual when you are a kid. We like it to be [about] play and having fun. They should learn social skills. Learn to take instructions, and think by themselves. Learn to know what the rules are. Learn why we are doing these things together. So there is a value system going through the [activity] that is actually about developing people. That's the main goal of sport, to develop people.”

This is not a new approach for Norway either. In *No Pain, No Gain?* Taylor reports that Norwegian children were markedly less competitive and more collaborative than American children:

“Norwegians grow up in a less competitive culture than Americans but routinely perform at significantly higher levels in world cross country ski competitions.... I will suggest that our unquestioning faith in competition has not only put us into contest with our fellow athletes, it has led us into an essentially adversarial relationship with both the body and the terrain as well. When competition is confused with combat and conquest, the body, the athlete, loses.” (Taylor, *No Pain, No Gain?* p. vi)

**Training Specifically for Competition:** There are always a number of Bill Koch Youth Ski League participants who are interested in the excitement and challenge of cross country ski competition, but it cannot be emphasized enough that most children are not oriented to the complexities of competition. Many younger children love to compete for the fun of it, but they are not as likely to enjoy *training* for an event. Older children may want a training program which improves their skiing performance, but they may not be ready for an arduous program. Coaches and caregivers/parents must be aware of a child's motivation for competition and develop a long-term program consistent with the child's physical development.

As children grow older and transition from BKL to junior racing, they become ready to specialize and train specifically for competition. However, the children can only be successful if the proper preparation has been accomplished at the BKL level. Training for competition can be immensely fun and rewarding, but we should not push children into that path until they are ready. Our job is to prepare them for these levels of physical focus, if they choose. And if they don't, we should have instilled in them an appreciation and a desire to pursue a lifetime of health and fitness.