



Applying the Concepts of Long-Term Athlete Development to Skiing and Snowboarding

Long-term athlete development (LTAD) can be defined as the optimal training, competition and recovery programming with relation to biological development and maturation. Recent research clearly shows that youth and adolescents respond to training and competition very differently than adults, though sport programs are often put together that treat children as miniature adults. The challenge for our sports is to figure out how to modify training, competition and recovery during different phases of development to best take advantage of windows of opportunity for improvement. For example, a specific strength training regimen would yield significantly different results when done by an athlete that is pre-puberty compared to an athlete that is post-puberty. In fact, research has shown that in addition there are differences in when males and females experience these changes in relation to puberty and in response to hormonal changes and other factors. Ultimately, for the USSA, LTAD is about doing the right things at each level of development that will most likely lead the skier or rider to their full potential in the long run. This is often somewhat in conflict with what might lead that athlete to success in the short run.

Since each individual athlete develops at different rates, one key tenet of LTAD programming is that athletes of the same age will need different programs, based on their biological development, as well as their previous training experience. The USSA Training Systems are organized into six phases that are based on the biological age (pre-puberty, puberty and post-puberty) and training age, as well as chronological age (how old they are). The USSA Training Systems are intended to challenge us to think about the best answers to the following questions:

- What aspects of training should be prioritized during different phases of development?
- What should competition look like at each phase and how much should it be an emphasis?
- What ratio of training should be general sport focused (fundamental skiing/riding skills) versus specific preparation?
- When is it appropriate for skiers/riders to start to specialize and focus the majority of their training and competition time in a chosen discipline(s)?
- How does the level of structure change through the developmental phases?
- How does the system accommodate athletes on an elite performance track? How does the system accommodate athletes on a participatory track?
- What do we recommend in the areas of conditioning, technical and tactical skiing/riding skills, equipment selection and prep, performance psychology, competition emphasis and participation in other sports for each phase?

The idea in creating the USSA Training Systems is not simply to define what has been done or is being done now to develop skiers and riders, but rather to factor the most recent scientific research on child development in sport along with knowledge of the

demands of skiing and snowboarding at the elite level to describe a step-wise progression that is most likely to create a deeper pool of talented athletes with skills to compete at a world class level and to improve the athletes' overall experience in sport.

The six phases are the same for each USSA sport, since they relate to the biological development of the child. Phases 1-3 are pre-puberty, phase 4 is during the pubescent growth spurt, phase 5 is following the growth spurt and phase 6 is full maturation. The training age is specific to each sport. Training age is defined as the number of years a skier/rider has been actively and regularly involved in the sport.

Based on the phases, these are factors that have been considered when putting specific recommendations into the boxes of the USSA Training System matrix:

- **Motor skills development:** The optimal window for the development of motor skills is from around age 7-8 until the start of the adolescent growth spurt. Therefore, the primary focus in the 2nd half of phase 2 and throughout phase 3 should be on developing the fundamentals for skiing and riding that the athletes will build on at later stages. Some additional considerations:
 - Habits learned during this period are often quite difficult to unlearn at later stages. This reinforces the importance of learning efficient techniques for a variety of situations during this window.
 - Kids naturally incorporate the motor skills learned from one activity into another at this age, a process called multi-lateral development. This is why it is generally recommended to expose the kids to a variety of sports, and when on snow, to do a variety of different activities. For example, pressure control skills for the halfpipe are also learned in the moguls, on rolly groomed terrain, tree trails, etc.
 - In phase 4, during the growth spurt, many athletes enter an awkward phase where their coordination is impeded. A focus on the fundamentals should continue, but gains will generally be slower and sometimes there can be a drop-off. It can be a very difficult time to learn new, complex motor patterns.
 - Young athletes' kinesthetic awareness is still developing through phase 3, so coaches should understand that athletes may have a hard time knowing what the right movements should feel like.

- **Strength development:** The optimal window for gains in strength is immediately following the peak of the growth spurt for girls (average age 12) and 12-18 months following the peak of the growth spurt for boys (peak is at age 14 on average, so the window starts at age 15 on average).
 - Girls often don't take advantage of the window because it is so early, and may be more susceptible to injuries later because of this
 - Strength gains can be made earlier, and strength exercises focused on proper technique and minimal loading are encouraged before these windows so athletes are ready

- **Endurance/stamina:** There appears to be an optimal window for gains in aerobic fitness that starts with the onset of the growth spurt.
 - Consider the role endurance plays as a foundation for higher intensity training, for maintaining performance over a long training or competition day

- **Flexibility:** Phase 2 is a window of rapid gains in flexibility with proper training. The growth spurt (phase 4) is also an important flexibility period, but the goal is to maintain mobility. It should be trained throughout the development phases.
 - Emphasize functional mobility
- **Speed:** Research shows a speed window for rapid gains in phase 2 and around phase 4. Speed expressed as quickness of short duration efforts (5 seconds in phase 2, 5-20 seconds in phase 4) in linear, lateral and changes of direction.
 - Think about tempo for skiers and riders in these phases compared with that of elite level skiers and riders. Are exercises, courses and features set up such that the athletes can mirror the tempo of their elite level counterparts? Continual training at a slower tempo may ingrain ineffective movement patterns that are hard to change later on.
 - Where adding quickness would be an appropriate progression to a technical skill exercise, be sure to include it during this window.
- **Vision:** Visual depth perception reaches adult capacity at around age 12. Athletes may struggle before around age 13 to focus their vision on proper cues and will tend to focus on what is easiest or most interesting to see. Coaches should use visual aids to help direct focus and be aware of existing visual references that may distract skiers. At the same time, if visual aids are set in the wrong place or there are too many it can be counterproductive.
- **Auditory:** Auditory abilities, specifically auditory discrimination and auditory memory reach maturity after the motor skills window for most athletes. Therefore, learning how to do new skills by just listening to coach directions is very difficult for most at these ages.
- **Kinesthetic:** Kinesthetic awareness is still developing through phase 3. Coaches may need to manually guide children through proper movements. The fact that many perceptual abilities related to vision, audition and touch-kinesthesia are still developing and do not reach maturity until 12-13 years old means the coach must alter their approach when teaching new skills and refining existing skills to their young skiers and riders.

Other sports have adapted their training and competition so that the actual performance more closely mimics the adult version. Some examples seem obvious, such as lowering the hoop in basketball or playing with a smaller ball on smaller fields in soccer for children. In tennis youth are being encouraged to play sideways across one half of the court using new balls that bounce lower and lighter rackets that allow the kids to swing with similar effort as an adult would and have rallies that are similar in speed to adults playing on a full court. Hockey teams are doing more practice and games across the width of the ice rather than the full length of the ice to get more touches with the puck. Alpine ski racing rules now require the use of shorter gates that are easier for smaller skiers to clear and course sets promote quicker turns. All stakeholders need to work together to make training and competition for skiers and riders of all ages work better for them to achieve their full potential and enjoy their time involved in skiing and snowboarding competition programs. The USSA Training Systems provide a framework to make this happen.