

Recommendations for Monitoring and Supporting Growth and Development in Youth Athletes

Eugene Ketselman, DPT, CSCS
Convergent Movement and Performance



Childhood and adolescence is a time of change, not just in physical appearance, but also in physical performance and ability. Athletes, parents, and coaches often go through a rollercoaster of experiences. Inconsistent sports performance, onset of pain and injury, and changes in motivation and love of the sport bring about many ups, downs, twists, and turns. The key is to realize that this track is not as unpredictable as you may think. Following the recommendations provided below will allow you to be pro-active in addressing common difficulties during periods of growth and development.

This guide will function as an introduction to the impact growth and development has on sports performance and injury risk. A detailed “at-home” method of measuring and monitoring physical growth will be presented. Most importantly, this guide will illustrate how to utilize the information gathered from measuring and monitoring growth to make appropriate daily decisions for optimizing sports performance while reducing injury risk.

This guide will give you the key details needed to act prior to the onset of pain or injury. If pain or injury has occurred, be sure to consult with a licensed healthcare provider for additional details and instructions.

Key factors to consider

Physical growth, development, and maturation bring about a multitude of factors that must be considered. It's important to keep in mind that structurally, youth athletes are not fully developed, and are undergoing changes that directly impact sports performance and injury risk. Periods of growth, particularly rapid growth commonly termed "growth spurts," may bring fourth inconsistent or worsened physical performance as well as increased injury risk.

Sports and physical performance

It is completely normal and therefore predictable to see inconsistent or worsening physical and sports performance during times of rapid growth^{1,2,4,6,7}. The child's bones begin to develop quickly, and so the nervous system, muscles, and tendons are left behind trying to catch up. You'll easily notice changes in body awareness and control, coordination, technique, and skill. It may seem as though the athlete is lacking strength and losing flexibility. You may even notice your athlete struggling to do the things that he or she had previously been able to do.

But this should not be a cause of alarm or frustration! Your child is not necessarily lazy or doing something wrong. Rather, these troubles will quickly resolve as the child "grows into" his or her body, and adequate time is spent on age-appropriate flexibility, strength, conditioning, and speed training. The key is to allow for an environment where the child can essentially re-learn how to move

Injury risk

Along with decreased performance, there may be an associated increased risk of injury during times of rapid growth.^{4,6} There are 2 primary reasons for an increased risk of injury during childhood and adolescent growth spurts.

(1) Decreased body awareness and control

Just as with sports performance, decreased body awareness and control plays a significant role in injury risk.⁶ It is far more likely to experience an accidental traumatic injury such as a fall, collision, broken bone, dislocation, or torn ligament when the athlete has difficulty controlling his or her body and moves in an awkward or unpredictable way during sport.

Accidental traumatic injuries are not the only types of injuries that are affected by impaired body awareness and control. There may also be an increased risk for overuse injuries in those athletes that are having difficulty with coordination, movement patterns, technique, and skills. These overuse injuries may be a result of inefficient movement patterns leading to excessive stress placed onto surrounding tissues.

(2) Physically underdeveloped

The second reason for an increased risk of injury during growth spurts is the tendency for the child or adolescent's bones, ligaments, muscles, and tendons to be underdeveloped and therefore weaker in structure.^{4,6} If you notice that your child is growing, this indicates that his or her growth plates are still open. Essentially, an open growth plate means that the ends of the

child's bones are structured more like cartilage than mature bone, making them softer and more easily irritated or damaged.

Furthermore, keep in mind that muscles and tendons function to move these bones. If the bones grow rapidly, the muscles and tendons become "tighter" and are also forced to work much harder.^{4,6} During periods of rapid growth, the demands placed on muscles and tendons significantly increase within a short period of time. The muscles and tendons may not be prepared for this level of work, which may potentially lead to muscle or tendon pain or injury.

Practical Tips: How to use this information

1. Record and monitor physical growth

- Regularly and consistently monitor growth in your child by taking height and limb length measurements at least 1x/month. By maintaining a log of measurements taken at this frequency, you will be able to quickly pick up on any patterns of gradual and/or rapid growth. This will allow you to be proactive in appropriately handling this delicate time rather than being reactive to a problem that has already developed.
- If your records show physical growth at an average gradual pace, then you know that there is POTENTIAL for a growth-related injury or a decrease in performance because the growth plates are still open. However, keep in mind that this does not necessarily place your child at greater risk of injury.
- If your records show a rapid increase in physical growth, commonly known as a growth spurt, then there is an INCREASED RISK for a growth-related injury and/or declining sports performance.^{1,2,4,6,7}
- If your athlete is an adolescent and your records show that he or she is no longer growing, then the injury risks presented in this guide potentially no longer apply.

The following includes an explanation of how to perform the specific recommended measurements so that you can monitor and track your child's growth and development at home. We will be looking at total height, upper body height, lower body height, and wingspan (arm) length.⁶ By tracking these 4 specific measurements, you will be able to pinpoint whether your child is growing uniformly throughout the body, or if your child's growth is concentrated to specific regions of the body.

Keep in mind that there is no "good" or "bad," so please don't think that we are looking for growth to happen in specific areas or in specific ways. Instead, the goal is to simply be aware that if you notice one part of the body growing more than another, it may indicate that the region growing has the potential of performance deficits or for carrying greater risk for injury.

Measurement:	Standing Height	Sitting Height	Lower Body Height	Wingspan
How:			= Standing Height – Sitting Height	
Represents:	Head-to-heel length	Head-and-spine length	Leg length	Arm-and-hand length

2. Focus on nutrition

- Although these recommendations for nutrition apply throughout the lifespan, they are particularly important during times of rapid growth. Our bodies grow and develop from the nutrients and energy we absorb, and we absorb nutrients and energy through the food and fluids we consume. Keep in mind that active children and adults in general require increased nutrients and energy compared to the needs of sedentary individuals. This is the case so that an active individual can perform and recover from physical activity. Now when the athlete is also undergoing a period of rapid growth and development, there is even greater necessity to maintain optimal nutrition.
- It is highly recommended that your child maintains a diet consisting of nutrient dense and unprocessed food.^{3,4,6} Decrease the consumption of packaged pre-prepared microwavable meals and junk food. Instead, replace them with a large variety of healthy proteins, carbohydrates, and fats, along with an additional emphasis on vegetables and fruit. This is extremely important because sports and physical activity may stress the underdeveloped bones and soft tissue. Adequate nutrition is essential to recovery and repair.
- Encourage your child to maintain adequate hydration by regularly consuming water throughout the day while avoiding sugary and processed drinks such as sodas.^{3,4,6}

3. Ensure adequate sleep

- Although these recommendations for sleep apply throughout the lifespan, they are particularly important during times of rapid growth. Sleep has been shown to significantly influence the extent to which a child or adolescent's body grows and develops, as well as repairs from physical activity.
- Do your best to instill a regular and consistent sleep schedule consisting of a minimum of 7-8 hours of sleep / night.

4. Limit stress

- It is particularly important to limit stress during periods of physical growth. There is a wealth of evidence in the scientific research literature demonstrating that undesirable emotions such as stress and depression have a direct negative impact on the health of growth plates, hormones, and overall physical growth and development.^{4,5,6}

- Avoid becoming frustrated or angry with your child if his or her performance begins to worsen during these times of increased growth. It's simply a sign that your child is going through a normal, healthy, and highly predictable process. Please realize that children are enormously influenced by the emotions, beliefs, and actions of those in their surrounding environment.
- Take the time to speak to your child about the fact that a worsening of abilities, skills, technique, and overall performance is a normal and expected process during times of increased growth. Ensure them that there is nothing wrong with them, they are not a disappointment, and that this phase will pass. Trust me they are likely just as frustrated as you and their coaches. Focus on helping your child reduce the disappointment and fear that is common during this time.

5. Strategically modify physical activity

- It is recommended to begin modifying physical activity, even if only through minor adjustments, the moment you notice an increase in the rate at which your athlete is growing. The adjustments do not necessarily need to be dramatic, however acting before the onset of pain or injury tends to yield much greater results as compared to being reactive after pain or injury begins.
- Decrease the intensity, frequency, and/or duration with which your child performs repetitive and high impact activities.^{1,4,6,7} Repetitive high impact activities tend to include jogging/running, jumping/landing, kicking, throwing, or tumbling. You are not stopping the activity altogether, and the decrease in intensity, frequency, and/or duration do not necessarily need to be dramatic. So please don't allow this process of "backing off" to frustrate or scare you. This period of modification is temporary and lasts until the period of rapid growth normalizes.
- Replace the time you would otherwise spend on repetitive high impact activity with a variety of drills and exercises that focus on:
 - Body awareness, balance, control, coordination, technique, and skill.^{1,4,6,7}
 - Correcting both muscle strength and muscle length (flexibility) imbalances through age-appropriate and non-painful exercise.^{1,4,6,7}

Citations

1. Baechle TR, Earle RW. Essentials of Strength Training and Conditioning. Human Kinetics; 2008.
2. Bisi MC, Stagni R. Development of gait motor control: what happens after a sudden increase in height during adolescence?. Biomed Eng Online. 2016;15(1):47.
3. Calvo MS, Tucker KL. Is phosphorus intake that exceeds dietary requirements a risk factor in bone health?. Ann N Y Acad Sci. 2013;1301:29-35.
4. Micheli LJ, Klein JD. Sports injuries in children and adolescents. Br J Sports Med. 1991;25(1):6-9.
5. Sävendahl L. The effect of acute and chronic stress on growth. Sci Signal. 2012;5(247):pt9.
6. Tilley D. Changing Gymnastics Culture Reflections, Lessons, and Visions for the Future. Shift Publication; 2018.
7. Zatsiorsky VM, Kraemer WJ. Science and Practice of Strength Training. Human Kinetics; 2006.

Author Bio

Dr. Eugene Ketselman is a New Jersey licensed Physical Therapist, Certified Strength and Conditioning Specialist, Sports Performance Coach, and owner of Convergent Movement and Performance, home of where physical therapy, fitness, and performance training converge. Dr. Ketselman's mission is to help youth athletes realize their full potential while simultaneously reducing set-backs from pain and injury.

Please do not hesitate to contact Dr. Ketselman with any questions regarding youth sports development or the information presented within this article.

www.convergentmp.com

eket@convergentmp.com

(908) 304-3620