

## Adolescent Growth and Development with Implications for Youth Sports Coaches

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### Abstract

The past 20 years have witnessed a rapid growth in youth and school based sports. With about 60 million American youth participating in organized sports, the need has never been greater for coaches that understand the rapid physical and emotional changes that occur during adolescence, especially during peak height velocity. The purpose of this commentary is to advocate for applying scientific principles of adolescent growth and development to youth sports coaching. The vehicle for this argument is a hypothetical high school and two fictitious coaches. It was concluded that well-informed and reflective coaches could readily apply basic principles of adolescent growth and development to practice design and game competition. The likely results include a better, safer, more rewarding experience for millions of youth.

### Introduction

School based and organized youth sports have afforded millions of youth, opportunities to develop motor skills, increase physical fitness, gain social interaction and have fun. In fact, it was estimated by the National Council of Youth Sports (2008) that 60 million American youth ages 6-18 participate in organized sport. On the surface, this would seem good news for a nation beleaguered by a youth obesity epidemic. However, the competitive nature of today's youth sports--at all levels--has resulted in misguided goals such as elite year round play, single sport focus and even college scholarships. Unfortunately, sport experiences that are too intense and too specialized, particularly during rapid growth acceleration--can lead to overuse injuries, drop out and a generally bad experience for too many youth. Fundamental to successful youth sport experiences are enlightened coaches, aware of youth growth and development and who know how to match practice and game situations to the physical and emotional characteristics of youth. This quality takes on added importance during the adolescent growth spurt, a period of accelerating physical and emotional change. Unfortunately, many youth sport coaches lack understanding of this critical developmental period [1]. This stands to reason as the demand for well-trained coaches most certainly exceeds available supply. The purpose of this commentary is to appeal for application of scientific principles of growth and development by youth sports coaches. The vehicle is a hypothetical high school and two fictitious soccer coaches, Mac and Sherry.

### Context

Varsity coaches Mac and Sherry take considerable pride in the soccer programs they developed at Pine Valley High School. They attribute much of their programs' success to the outstanding feeder programs they implemented in the middle school. Indeed, the middle school program has been so successful and popular that coaches Mac

and Sherry have a bit of a problem: How will their staff accommodate the large number of candidates for the middle school soccer teams this year? With 75 boys and girls trying out for middle school soccer, these coaches must make some difficult decisions regarding team selection.

The dilemma facing coaches Mac and Sherry is not unique. Given the exponential growth in youth and school-based sports that have occurred over the past 20 years, coaches are often faced with having to cut players, even at the middle school level. Mac and Sherry began to address this problem by looking at their middle school team rosters over the past several seasons. They soon observed that many of the key players on the current high school varsity teams were only marginal players back in middle school. Likewise, some players that excelled in middle school did not live up to their advanced billing in high school.

Mac and Sherry soon realized that they could not design a fail-safe system to evaluate players at the middle school level. No matter how masterful the eye, it is not realistic for a coach to briefly evaluate the athletic ability of a twelve-year-old and predict where that child will be performance-wise in three years. Mac and Sherry had to confront the adolescent growth spurt, a four-year period of rapidly accelerated and highly varied physical growth.

Among the most critical challenges facing coaches today is contending with the extraordinary physical changes that occur as the young athlete passes from childhood through adolescence. While the grade school years (K-5) may be a time of relative calm and tranquility, adolescence is most certainly a dynamic period. Changes in the nervous and endocrine systems accelerate physical growth, shifts in shoulder and hip width, cardiovascular performance, and secondary sex characteristics [1,2]. Sometimes these changes go hand-in-hand with a period of awkwardness, especially among boys. However, this period of awkwardness is short-lived and does not affect all adolescents [3].

During adolescence, boys develop wider shoulders and longer arms giving them an advantage in throwing activities. Likewise, boys' narrower hips and longer legs help them run faster and jump farther. In adolescence, girls trend toward wider hips and narrower shoulders. While somewhat disadvantaged in running and throwing events, girls have a clear advantage in activities that depend on balance and stability [4].

Youngsters will differ greatly on how they weather the turbulent years of adolescence. It may be tempting to think that the kid who dominates early on will be the best athlete in the later years of high school. On the contrary, the child who develops late and perhaps goes through an awkward stage may emerge a few years later as an athlete with considerable ability. We now know that the exceptional athlete in elementary school may not be the best athlete in middle school and the best athlete in middle school may not be the star performer in high school [5]. Coaches and school administrators should design sports

programs that effectively transition kids from childhood through adolescence.

## Knowledge Base

Upper limits of physical growth are established by the child's genetic make-up. In fact, this principle holds true for several key areas of growth including height, trunk length, arm and leg length and shoulder girdle width. Boys will attain their final adult height between the ages of eighteen and twenty one, while girls will usually achieve maximum height at sixteen to eighteen years. During peak height velocity, it is not unusual for a youngster to grow seven or more inches in a year. Typically, the growth rate during adolescence is three inches per year for girls and 4 inches for boys [6].

Growth rates vary considerably from youngster to youngster. Indeed, some will have essentially completed the growth process while others of the same age are just getting started. These extremely varied growth rates often result in physical mismatches during sports competition. Think of the 97 lb little league batter facing a 6' 1", 185 lbs. hurler. Scenarios such as this are not uncommon because most school and youth sports are organized by chronological age.

If one looks at growth rate from the child's first entry into organized sports at age six through varsity competition at age seventeen, a clear pattern emerges: During childhood (ages 6-11) the rate of growth is relatively slow, stable and predictable (2"/yr.). This stage is followed immediately by a four-year cycle of rapid growth acceleration then deceleration. Therefore the childhood years are an ideal time to teach basic sports skills because the child does not have to contend with a rapidly changing body [7].

### Changes in body proportions:

- Prior to adolescence, males have longer trunks and relatively shorter legs than females
- During and after adolescence, females generally have shorter legs than males of equal stature.
- During later childhood (ages 6-11), the ratio of shoulder-to-hip width is relatively stable for both males and females.
- During adolescence, however, males tend to develop wider shoulders relative to their hips. Among adolescent females, the shoulder-hip ratio remains relatively stable [4,8].

### Implications for sports performance:

- Wide shoulders and long limbs provide a mechanical advantage in propelling objects (throwing, striking, kicking).
- Long legs and narrow hips contribute to better mechanical efficiency in running and jumping.
- Shorter legs and wider hips are associated with better balancing ability and ability to make sudden stops while running.

Adolescent awkwardness—It appears that some adolescents, particularly males, experience a disruption in motor performance during the growth spurt. Studies indicate the highest rates of decline are in agility/speed, arm strength, and balance. It is noteworthy that a period of 'adolescent awkwardness' does not affect all youngsters [2].

## Coaching Points

### Childhood opportunities

\*The slow, stable predictable growth rate during later childhood (ages 6-12) is an ideal time for learning new motor skills. Children this age should be exposed to a broad array of sports opportunities.

### Predicting success

\*Among adolescents, the strength spurt can lag a year behind the height spurt. Be very cautious about predicting future athletic success (i.e., team selection) based on performance during the growth spurt.

### Positioning players

\*Consider body proportions when assigning players to positions: Long legs and broad shoulders are well suited to propelling objects; narrow hips and long legs for running; wide hips and short legs equal better balance and quick stops.

### Matching players

\*Make every effort to avoid physical mismatches during practice, games and competition.

Weight considerations--Before age 10, weight differences between boys and girls are minimal, with boys being slightly heavier. However, early in the adolescent growth spurt, girls are often heavier than their male counterparts. By age 14, girls weight has leveled off while boys continue to make substantial weight gains into their early twenties [9].

For the most part, changes in weight parallel those for height, with peak weight velocity following peak height velocity. During later childhood (ages 6-12) annual weight gain is approximately six and one half lbs./year. Among boys, peak weight velocity (highest rate of weight gain) is closer to peak height velocity than it is in girls. Boys' total fat mass remains stable at this time as weight gain is mainly due to increased height and muscle mass. Among girls, weight gains in adolescence are primarily due to increases in fat and height. Other sources of weight gain in adolescence include skeletal maturation, and enlargement of internal organs. While gains in height are largely a product of genetics, weight gains are generally attributable to diet, exercise, and lifestyle patterns. Generally boys at all ages have greater lean body mass than girls of the same age [10].

## Coaching Points:

### Weight and sports performance

\*During adolescence, the relationship of weight to skilled sports performance is highly task-specific: Heavier weight is often advantageous when propelling objects and a disadvantage when moving one's body through space. This information may be useful when assigning players to the most appropriate positions.

\*Except for extreme cases, the contributions of height and weight to sports performance are relatively low. Speed, coordination and skill are the more important factors underlying success in sport.

Self-concept involves an assessment of one's personal worth or lack of worth. It is essentially an understanding of one's assets, liabilities and personal characteristics. Above all, self-concept is learned: it is the product of our experiences and interactions with the world. Perhaps

more importantly, self-concept represents our feelings about those experiences.

During childhood, boys and girls develop a greater sense of freedom and independence. This occurs as the child's sphere of influences expands from home and family to school and teachers. During this period the child has an intense desire to please their parents and teachers. In later childhood, teachers' (or coaches') expectations of success are closely related to self-concept. In other words, kids tend to live up to what is expected of them.

The ability to tackle and achieve new tasks takes on greater importance for the teenager. Meaningful tasks will likely include success in sports and being an important part of the team. The wise teacher or coach recognizes the important influence of peers and the youngster's need to feel acceptance by the peer group.

Success (or failure) in sports is among the most important factors in self-concept development. By age five or six, children are either positively or adversely influenced by their perception of their motor abilities: Children who move well develop a strong sense of self; while those who experience repeated failure develop an expectation of failure. These children may deliberately choose to fail as a means of coping and to avoid painful situations. Naturally, the failure cycle is heightened by the many physical and hormonal changes associated with adolescence. The youngster who may be temporarily experiencing an awkward stage is especially vulnerable to failure and ridicule. In some cases, this youngster may drop out of sports altogether [10].

## Coaching Points

### Praise

\*When the athlete makes a good play, be frequent and generous with praise.

\*Look for opportunities to praise the child who may be less skilled than his/her peers.

### Acceptance

\*Accept each youngster as an important and valued member of the team: At some point, try to get each youngster into a starting role; try to get each young athlete into the game during the first half.

### Corrective feedback

\*When the young athlete makes a mistake, give corrective feedback in a positive manner.

### Encouragement

\*Recognize and encourage effort as well as skilled performance. Above all, never censure or criticize for a physical error.

## Conclusion

Varsity coaches Mac and Sherry, working closely with their administration, came up with a practical solution to the problem of too few opportunities for the large number of middle school soccer candidates. First, they collaborated with other schools in the area to offer multiple teams at the middle school level so that no child would be cut. Essentially, they formed a second league working closely with other schools to minimize transportation and officiating costs. They also instituted a policy that every middle school soccer player would play at least half of every game. Finally, they provided in-service training to the middle school coaches on the basics of adolescent growth and development, practice organization, and skills-based instruction. Above all they stressed to their coaching staff key points about youth development: a) In practice, drills should be structured in accord with the physical characteristics of the athlete; b) each youngster must believe that s/he is an important, contributing member of the team; and c) young athletes, of all ability levels, need frequent and generous praise.

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