

## Sport Specialization in Youth: A Literature Review

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### Abstract

**Objective:** Youth participation in sport is reviewed to include its history, current growth patterns, reasons behind sport specialization, and the implications of sport specialization. The effects of early skill acquisition, and the sociological, psychological, and physical/physiological aspects to help develop safeguards to meet the needs of young athletes are discussed.

**Study Design and Selection:** A review of the research and scholarly literature related to the youth population in the United States was performed. This included accessing the Mayo Clinic Library database, MANTIS, and Index Medicus.

**Results and Discussion:** Specialization in a single sport, although not new to society, has become increasingly popular. Sport specialization training can begin as early as at the age of 5 or 6. The training is throughout the year and may take up to four hours every day.

Some in the sports community find sport specialization to be a reflection of a highly developed society and see the skill acquisition and enhancement as beneficial to success in a given sport; the potential for a collegiate athletic scholarship; or making a varsity, elite, or even professional-level team.

Regular physical activity and sport, together with a balanced diet, are essential to promote optimal growth and maturation, sufficient physical fitness and mental vigor, as well as psychological and social benefits that help in coping with stress and anxiety. Too much or too specific involvement with a sport or activity, however, can be potentially dangerous, involving physiologi-

cal/physical, psychological, and sociological risks to youth.

Despite the importance of this topic, a substantial reference base, pertaining specifically to sport specialization is lacking. The results were often limited to a non-specific age range within the youth population primarily in the United States, as opposed to a worldwide population. Also, a majority of the references contained more physiological results, as opposed to psychological and sociological findings. The results and conclusions drawn from this sampling cannot be generalized to all sports or athletes as a whole.

**Conclusion:** Sport specialization by youth is a contentious issue that needs to be fully understood by all involved in sport. The potential health, psychological, and sociological risks must be weighed against the benefits of obtaining sharper skills, which may enhance playing time, possibly bringing scholarship opportunities, or reaching to an elite level of play.

**Key Indexing Terms:** sport specialization, sport injury

### INTRODUCTION

Sports participation can provide youth with a pro-social environment that fosters fair play, competitiveness, and achievement. The psychological and social benefits of regular physical activity help in coping with stress and anxiety, counterbalance the burden and symptoms of excessive quiet sitting and mental concentration, and have a favorable influence on developing a positive self-image and functional social relationships.<sup>1</sup> Sports may also help protect participants against negative influences that can lead to delinquency and drug abuse. Also, because team rules and guidelines often promote health-enhancing behaviors—such as proper nutrition and avoidance of smoking—sports participation may promote healthy lifestyles via social environment pathways.<sup>2,3</sup>

Participation in sports is considered a rite of passage for children and adolescents in contemporary American

society. Over the past five decades, however, a fundamental shift has occurred—from spontaneous, fun-oriented, youth-organized activities to highly structured competitions and programs organized by adults.<sup>4,5</sup> An offshoot of this shift is sport specialization, defined as students who limit their participation to one sport on a year-round basis.<sup>6</sup>

An interesting dichotomy in the literature recognizes the importance of specialization to optimize pediatric performance while admitting that specialization exposes these athletes to physical, psychological, and social damage. For instance, Hill and Simons<sup>6</sup> state that a certain degree of specialization is necessary for optimal individual and team performance in sport. Additionally, Ericsson et al.<sup>7</sup> found that an athlete who practices a skill with increased frequency and duration could become more proficient at that skill. There are, however, concerns about youth sport specialization such as withdrawal/burnout and the over-involvement and expectations of parents and adults in youth sport programs.<sup>8</sup> Adverse physiological consequences following excessive training have also been found.<sup>9</sup>

A recent policy statement from the American Academy of Pediatrics<sup>10</sup> concluded that youngsters should be discouraged from specialization in a single sport before adolescence to avoid physical and psychological damage. The risks range from overuse injuries such as stress fractures to delayed menstruation, eating disorders, emotional stress, and burnout. Waiting to specialize until the age of 12 or 13, when children are more emotionally and physically mature, helps ensure that they are pursuing an activity that really interests them, rather than trying to fulfill a parent's or coach's dream. Critics, however, contend that this could hamper or handicap talented youngsters and change the face of elite-level sports.<sup>11</sup>

Because of the controversy surrounding this topic, a better understanding of the impact of sport specialization on health and sport management is needed in the sports community—among athletes, coaches, parents, athletic directors, health care providers, media, and sports governing bodies.

## DISCUSSION

### Youth Sport Participation

The involvement of preadolescents in organized sports is a relatively recent phenomenon. In the early 20<sup>th</sup> century, physical activity was a regular part of the average child's life. Sports and games provided an additional outlet for physical activity and were characterized by play that was generally spontaneous, unstructured, and without adult involvement.<sup>11</sup> Public

schools during this time were the primary source of organized sports, but competitive sport for youth in elementary and middle schools began shifting toward non-school programs by the 1930s as national youth agencies (e.g., YMCA), national youth sport organizations (e.g., Little League Baseball), national governing bodies (e.g., USA Gymnastics), and local service clubs (e.g., Eugene Emerald KidSports) gained prominence.<sup>12</sup>

Youth sports participation rates have been estimated between 20<sup>13</sup> and 35 million<sup>14</sup> annually, including 6 to 8 million in school programs.<sup>15</sup> Although more than 17 million children and adolescents in the United States participate in an organized non-school-sponsored sport,<sup>16</sup> between one-fourth and one-half of the participants stop playing in any given year.<sup>16-18</sup> Attrition was higher for black students and students who had sustained athletic injuries.<sup>16</sup>

Many challenges face today's educators and professionals involved in youth sport: (a) declining participation levels at certain ages, especially for girls; (b) the prominence of untrained coaches at both the community and school levels; (c) the pressure by adults to have youths specialize earlier in a sport, resulting in year-round seasons and the probability of earlier attrition or burnout; and (d) the need for more opportunities for at-risk youth.<sup>14</sup>

Nevertheless, during the 2000-2001 school year, both boys' and girls' participation in high school athletic programs increased for the 12<sup>th</sup> consecutive year.<sup>19</sup> Nationwide, 62.4% of high school students reported participation on one or more school and/or non-school sport team in the previous year. Across all ethnic groups, male students (69.9%) were more likely than female students (53.4%) to participate in sports. Participation of younger students (65.6%) was higher than that of older students (58.1%), and white students (65.4%) were more likely than African American (55.2%) or Hispanic students (52.5%) to participate. The majority of sports participants played on school teams (22.5%) or a combination of school and non-school teams (29%). Only 11% of all students participated only on a team run by an organization outside of school.<sup>20</sup>

### Current Trends in Sport Specialization

Guttman<sup>21</sup> has referred to specialization within youth sports as a reflection of a highly developed society. Rewards for expertise in a specific area outweigh generalized knowledge or skills, leading to competition for those specialized roles—and to specialization among youth athletes at progressively earlier ages. With a substantial body of evidence suggesting that elite per-

formers require more than 10 years of practice to acquire the necessary skills and expertise to perform at the international level,<sup>22</sup> it is no wonder that parents are having their children specialize, and at earlier ages.

Early specialization is one of the most striking features of modern sports. Since international-level participants appear to be getting younger, specialization in sports such as gymnastics, figure skating, tennis, and swimming at an early age has become of growing concern.<sup>23-25</sup> Practical experience shows that to win at that level, it is necessary to pass through the initial instruction stage by age 7 or 8, to begin intensified specialization with sufficiently large training loads in the chosen sports events by 10 or 11, and to win at a level commensurate with the results for the USSR's Master of Sport at 12 or 13.<sup>26</sup>

### Reasons for Sport Specialization

Various theories seek to explain why specialization occurs in sports. Novak<sup>27</sup> views it within the context of play, games, and sport as the progressive loss of freedom in exchange for increased excellence and precision. Thus, young athletes who choose to specialize sacrifice creative spontaneity and playful impulses to become increasingly oriented toward record-setting and quantitative assessments.<sup>21,28</sup>

Parents play an important role in promoting specialization. They apply pressure on their children to specialize by providing tuition to summer camps and clinics, by paying for private lessons, and by developing special facilities for a certain sport in their homes.<sup>29</sup> Coaches promote specialization by convincing athletes that year-round training in a sport is needed both to attract collegiate athletic scholarships and to win high school championships.<sup>30-31</sup> Communities also traditionally support some school sport programs over others.<sup>32,33</sup> Another reason attributed for the rise in sport specialization by child athletes is the increasing commercialization of sport.<sup>3</sup>

### Advantages and Disadvantages of Sport Specialization

Specialization is a complex process that should not occur until a general consensus about the advantages and disadvantages is established. In most cases, preadolescent children should be encouraged to develop skills necessary for many sports before specialization occurs.<sup>34</sup> Children between ages 6 and 9 should develop movement skills associated with body awareness. Little emphasis should be placed on conditioning and developing sport-specific skills. Children between the ages of 10 and 12 should develop skills necessary

for a variety of sports. However, competition should be de-emphasized to minimize stress and to enhance learning. Children over age 12 should participate in a general sport fitness program with emphasis on developing muscular and cardiorespiratory endurance.<sup>35</sup>

### Advantages

It has been suggested that a certain degree of specialization is necessary for optimal individual and team performance in sports.<sup>6</sup> While little support in the literature exists with regard to the positive aspects of sport specialization, there is belief, even among those who do not favor sport specialization, that it is appropriate only after a certain age.<sup>10</sup> Additionally, training in a specific sport should only begin when the general conditioning for the sport is almost completed and when the young athlete's character, talent, and inclination suggest that his/her chances for success are good.<sup>36</sup>

Benefits of specialization seem to be mostly in motor skill acquisition and enhancement of scholarship opportunities. Expert performance is hypothesized to result from a period of preparation in three phases. The first phase begins with an introduction to the activity, followed by formal instruction. During the second phase, the individual increases practice time and ends in a decision to commit completely to the task. The third phase consists of full-time involvement in the activity.<sup>7</sup> Individuals at an earlier starting age are hypothesized to attain a higher level of performance than those who train equally hard but commit at a later age.<sup>22,37</sup> With the relatively short career of most athletes and a perceived finite amount of time with which an individual can reach peak performance, many athletes and coaches believe it is a mistake not to specialize.<sup>8</sup>

Concerns have centered on the suggestion that intensive training causes growth retardation and puberty delay in female athletes, specifically gymnasts. Interestingly, male gymnasts also have consistently short statures and late maturation, but these trends are not attributed to intensive training.<sup>38,39</sup> It is likely that young athletes select themselves, or are selected by coaches and sport systems, into their specific sport. Therefore, in general, the difference observed in stature between athletes and non-athletes is mainly the result of natural selection occurring based on the nature of the individual, not as a result of the nurturing impact of the sport. With regard to pubertal development, the evidence suggests that the tempo of puberty is slowed in some sports, but it has not yet been possible to identify whether this is an effect of nature or nurture.<sup>38</sup>

Other positive aspects of sport specialization are the potential for a collegiate athletic scholarship; fulfillment of a desire to achieve excellence; increased recognition and upward mobility; and a means for a marginal player to achieve varsity, elite, or professional status—or a trip to the Olympics.<sup>40</sup> Athletes who wish to specialize have seen the opportunity to do so increase with the advent of club teams and leagues, which often are well organized and run by coaches affiliated with the local high school or college. In sports like soccer and girls' volleyball, club teams are essential to teens aspiring to college-level play. These teams play organized school sports all year long.

Sport specialization also has been studied among athletic directors. This research indicated that a majority of them perceived that coaches who promoted specialization had a positive effect on player skills in that sport (81.8%) and on the overall performance of their teams (57.4%).<sup>6</sup>

#### *Disadvantages*

Potential negative effects of sport specialization include physical and psychological burnout, loss of social contacts through other sports, loss of transferable athletic skills, and loss of the influence of coaches of other sports.<sup>6</sup> Certain sports, such as gymnastics, place negative stresses on the athletes. Many aspiring young gymnasts devote nearly all of their time to the sport, thereby suffering from social isolation and a lack of social development opportunities.<sup>41</sup> The potential negative effects of sport specialization are three: physiological/physical, psychological, and sociological. These components, however, are not exclusive to gymnasts, but potentially to all youth who partake in a single sport all year.

#### *Physiological/Physical Factors*

Adverse consequences from intense training and competition have been reported in the lay and medical literature.<sup>42</sup> Anecdotal reports and case studies, however, are insufficient grounds for drawing conclusions about the safety of intense training or high-level competition.<sup>10</sup> Research has demonstrated that a high emphasis on competition greatly increases the desire for coaches to over-train children with inappropriate volume and intensity in practices/competition. Adverse physiological consequences follow excessive training, including delayed menarche and increased risk of overuse injuries to immature musculoskeletal systems.<sup>43</sup>

While some researchers note that critical periods may exist when a sport is learned best,<sup>44</sup> scientific evidence does not support the belief that specific skills must be learned and perfected before the onset of puberty.

Moreover, future athletic excellence is difficult to predict because of the ongoing effects of growth and maturation and the variability of learning experiences at different times and in different settings.<sup>45,46</sup> Early exposure to a variety of activities is more beneficial than prematurely pushing a child to learn a particular skill or specialize in one sport before he or she is developmentally ready.<sup>45,49</sup> In the physiological/physical realm of sport specialization, there are four areas of concern: musculoskeletal, nutritional, sexual maturation, and cardiac.

*Musculoskeletal System.* An increase in physical activity stimulates musculoskeletal growth, and repetitive stress can stimulate positive adaptive responses in the musculoskeletal structures. Excessive stress or overload, however, can lead to tissue breakdown and injury. To realize maximum gains, athletes must correctly identify and train just below the threshold for injury.<sup>10</sup>

Excessive sports training in child and adult athletes can lead to overuse injuries (tendinopathy or tendinosis, apophysitis, stress fractures). Growing athletes may be predisposed to repetitive stress injuries, such as traction apophysitis (Osgood-Schlatter disease, Sever disease, medial epicondylitis [Little League elbow]), injuries to developing joint surfaces (osteochondritis dissecans), and/or injuries to the immature spine (spondylolysis, spondylolisthesis, vertebral apophysitis).<sup>50</sup> The physiological stress experienced by many prepubescent athletes is caused by repetitive training cycles: swimmer's shoulder, tennis player's elbow, and runner's stress fractures are common examples. It is important for athletes to specialize in a sport when they are physically ready to participate in repetitive cycles.<sup>51</sup>

*Nutrition.* For the child athlete, an adequate diet is critical because nutritional needs are increased with the training and growth process.<sup>10</sup> It has been noted that female gymnasts are at risk for nutritional disorders due to the pressure to maintain a prototypic mesomorphic body appearance (i.e., thin and muscular). This pressure encourages atypical eating behavior, which may lead to eating disorders<sup>52-55</sup> often seen in gymnastics.<sup>56</sup>

*Sexual maturation.* Athletic girls tend to experience menarche at a later age than non-athletic girls, leading to concern that intensive sports training may delay sexual maturation. The average age of menarche in North America is 12.3 to 12.8 years, while that of athletes in a wide variety of sports is typically one to two years later. Poor nutrition, training stress, and low lev-

els of body fat have been hypothesized to account for this delay. Alternatively, it is possible that the later age of menarche in athletes simply reflects a pre-selection phenomenon.<sup>56</sup> For instance, girls who have narrow hips, slender physiques, long legs, and low levels of body fat—advantageous characteristics in many girls' sports—are more likely to experience later menarche, regardless of sports participation.<sup>10</sup> Elite gymnasts, however, are often involved in serious, regimented training by the age of 10 that may make inappropriate physical demands with consequential long-term effects on sexual maturation.<sup>42</sup>

Secondary amenorrhea, or cessation of menstrual cycles after menarche, can occur as a result of intense athletic training. Prolonged amenorrhea may cause diminished bone mass from the associated decrease in estrogen secretion, augmenting the risk for stress fractures and the potential for osteoporosis in adulthood. Efforts to improve nutrition or diminish training volume in these girls may permit resumption of menses and diminish these risks.<sup>10</sup>

**Cardiac Issues.** Potential concern exists with regard to cardiac problems, but based on limited data, there is no indication that intense athletic training of the child athlete results in heart injury. Closer study of the cardiac characteristics of children training at elite levels, however, is necessary before this conclusion can be verified.<sup>10</sup> Although child athletes have superior cardiac functional capacity compared with non-athletes, data obtained from studies using animals and humans indicate that myocardial function can be depressed, at least transiently, after intense exercise. Echocardiographic studies have indicated a transient decrease in left ventricular contractility after extremes of athletic competition.<sup>57</sup>

### **Psychological Factors**

Young children who have played in structured sport programs tend to have higher levels of pre-competitive anxiety that predisposes them to emotional trauma and injuries. Also, higher levels of pre-competitive anxiety have been linked to low levels of enjoyment. Sport psychologists have determined that a lack of fun and enjoyment is the No. 1 reason children leave organized sport. Intensive sports participation may take time away from normal social and developmental activities and can lead to isolation or other problems, including depression, anxiety, conversion reactions, and eating disorders.<sup>45-46,48-49,58-60</sup>

A few athletes develop overtraining syndrome and may leave sports completely. A youngster who is too embarrassed to quit or who is pressured to continue may

incur a sports-related self-injury in order to leave gracefully.<sup>61</sup> Children who leave sport tend to be sedentary adults.<sup>43</sup> Also, children who specialize in a sport and experience a great deal of success at an early age may have difficulty coping with athletic failure later in life.<sup>62</sup>

Two psychological concerns related to the experience of children in specialized training programs include youth sport withdrawal/burnout and the overinvolvement and high expectations of parents and adults in youth sport programs. Withdrawal from sport becomes a concern when the reasons cited by participants are negative and a result of the system in which they compete.<sup>5</sup> Withdrawal may be a normal occurrence,<sup>63</sup> or it may come about when the benefits of participating are outweighed by the competitive emphasis of a program,<sup>15</sup> a pressure to win,<sup>63</sup> and time constraints.<sup>64</sup>

Burnout has been referred to as the long-term end result of emotional and/or physical exhaustion<sup>37</sup> and occurs when a previously enjoyable activity becomes a source of stress.<sup>65</sup> Gould<sup>66</sup> identified environmental characteristics related to burnout, including demanding performance expectations and continual competition, while personal factors such as perfectionism and a singular focus on athletic involvement were also cited.

Burnout from physical and emotional stress, missed social and educational opportunities, and disruptions of family life may become the norm for those who choose sport specialization. Gould et al.<sup>67</sup> identified several characteristic patterns of burnout that include logistical factors (time demand, overwhelming focus on sport), social concerns (lack of social life, lack of those they could relate to), and psychological considerations (emphasis on ranking and going professional, scholarship pressure, lack of fun, an interest in other activities). Coakley<sup>68</sup> felt that burnout went beyond chronic stress and individual psychological resources. He felt that those who are heavily involved with intensive sport specialization for relatively long periods have a constrained set of life experiences leading to the development of a unidimensional self-concept, and power relationships in and around sport that seriously restrict young athletes' control over their lives. Their sport participation involved social experiences that fostered the development of a single identity exclusively related to sport participation and perpetuated a limited set of social relationships directly tied to sport. The people in their lives continuously responded to them in terms of their specialized sport roles, their time was almost exclusively devoted to the development of specialized skills, and their goals were well-defined and

tied to assumptions of commitment to long-term specialized sport training.

One interesting study conducted by Barynina and Vaitsekhovskii<sup>66</sup> looked at athletes who began specializing in swimming early (at 7 to 8 years), met the criteria for a USSR Master of Sport at age 11 to 15, took part successfully in high-level competition, joined the USSR national teams, and achieved results at a national and international level. After some time had passed (between 2 and 20 years after their sport careers ended), they asked how early sessions in a sport had affected the social, psychological, and medical aspects of the athletes' lives. They found that the earlier the athletes began specialized training, the shorter their stay on the national team and the sooner they left big-time sports. Among the reasons for leaving big-time sports, these swimmers cited psychological fatigue, general health, and loads that were difficult to withstand.

### **Sociological Factors**

Sport is considered an excellent environment for children to develop cooperative skills, pro-social behaviors, and close relationships,<sup>69</sup> and some of the most frequently cited reasons for sport involvement are social in nature.<sup>13,17,70</sup> Peer and group interaction is a recognized and promoted characteristic of sport participation, even at advanced levels.<sup>8</sup> Athletes on a team establish a social subculture of similar values, beliefs, and attitudes.<sup>71</sup> Team members identify with these behaviors and expectations and base their self-concepts on the degree to which other members of the group accept them.<sup>8</sup> Baxter-Jones and Helms<sup>72</sup> found that athletes in gymnastics, soccer, swimming, and tennis did not feel their participation hindered social development. Coakley<sup>41</sup> hypothesized that under certain conditions, sport can help children develop supportive relationships.

Practices common among specialized sports as a means of legitimizing an identity as a committed athlete, however, can be harmful, especially when athletes adopt unhealthy weight control methods in sports that emphasize physical appearance, such as gymnastics, diving, and figure skating.<sup>71</sup> Also, athletes who devote most of their time to training may feel socially handcuffed by training constraints.<sup>42,67</sup> The rigorous schedules of many year-round sports include training that may exceed 30 to 40 hours per week, in addition to frequent weekend competitions and associated travel time.

At the elite level, gymnasts practice an average of 30 to 45 hours per week.<sup>73,74</sup> They may leave home

before age 12 to train. In some cases, their coaches adopt them. At every competitive level, critical coaching with the goal of winning is paramount.<sup>75</sup> Young female gymnasts begin traveling extensively and staying in hotels. They are often expected to behave as independent adults before reaching puberty. Parents and coaches often say enthusiasm and love for the sport are the source of the child's desire to be involved at such intense levels, but this may be little more than self-deception and an abrogation of adult responsibility.<sup>42</sup> Social contact outside of school is largely limited to the athletes who train together, and the interactions that occur in high-level sport during training are minimal. Athletes are taught that a total commitment of time, energy, and emotions is needed to succeed, which often means that school, family, and peer ties suffer.<sup>8</sup>

### **Recommendations for Parents, Coaches, Health Care Providers, and Sports Administrators**

In most of the research, winning has always been rated as less important for participation than "to have fun," "to improve skills," "to be with friends," and "fitness benefits."<sup>76-77</sup> Unfortunately, in most situations, winning is equated with success. Society holds that programs, coaches, and teams are successful only if they have a winning season. If there were more of an effort to set personal and team performance goals, more programs would experience success. Teams taking the floor against stronger opponents often appear defeated within minutes because success is measured only by outcome. Therefore, coaches need to focus on performance, rather than outcome, to measure their team's real success—which would take a strong commitment from the administration, as well as educating parents and the public.<sup>18</sup>

Sport administrators should have a thorough understanding of structural and functional differences that exist between children and adults and design programs that are safe in both training and competition. Special education/certification programs (clinics/seminars) need to be organized and systematically implemented for coaches working with the children of a defined age group.<sup>9</sup>

Sport managers/administrators as well as all those involved with athletics need to know that not every child is going to be an elite athlete, but every child deserves to have an opportunity to participate. There should be a variety of programs within the sport to ensure that the needs of the vast majority of the children are not sacrificed for the highly skilled minority. Organizational and administrative policies should support coaches who emphasize skill improvement, rather than winning, as long as the coaches provide a good

atmosphere for athletes to succeed. Sport administrators should control participation in two respects: (a) costs—to make it affordable for young athletes and their parents, no matter their economic standing; and (b) intensity—the balance of participation and competition must not interfere with the young athletes' and their families' social lives.<sup>9</sup> The balance between developing a successful sports program and understanding the dimensions associated with sport specialization creates difficult decisions for athletic directors/managers, but these decisions should be viewed within the proper context that sports in schools should be fundamentally educational and child-based.

Parents should understand that their children's training will be long-term. The phrase, "a champion cannot be made overnight," while taught to athletes to ensure adherence and loyalty to a demanding schedule, ideally is a long-term training program's guiding philosophy. Such a program should allow for appropriate training breaks crucial for physiological and psychological recovery from training, at which time an athlete could balance complete rest from the sport with participation in other sports or activities at a lower level of intensity. When a child reaches an age at which he or she is physiologically and psychologically mature enough to handle increased training loads, specialization at that time may be justified to optimize the positive adaptations accompanying the advanced intensity and duration of training.<sup>5</sup> Parents should be advised to allow the child to participate in important decisions, respect the child's aspirations, and be wary of overinvolvement.<sup>14</sup>

Sport managers/administrators should work with parents to ensure that the child athlete has coaches who are knowledgeable about proper training techniques, equipment, and the unique physical, physiological, and emotional characteristics of young competitors.<sup>74</sup>

Coaches should strive for early recognition and prevention and treatment of overuse injuries. Child athletes should never be encouraged to "work through" such injuries.<sup>50</sup> Also, no sport program should restrict the diversification of physical skills or social development of athletes before 15 years of age. The child must also be permitted the freedom to choose programs that are less intense and allow for participation in other sport and non-sport activities without the guilt sometimes experienced by talented athletes who are pressured by adults to remain in a sport.<sup>8</sup>

When working with young athletes, coaches and sport administrators must stop attempting to model youth sport programs after elite or professional organiza-

tions. What is beneficial for, or required of, adult athletes can certainly be damaging to younger participants.<sup>6</sup>

Most likely as a result of earlier maturation in girls, specialization appears to be more of a concern for female athletes. Sports that are encouraged for girls prior to the onset of puberty often involve high risks of eating disorders, amenorrhea, and development and overuse injuries as a result of training. Female athletes should be encouraged to participate in a variety of sports at an early age and be educated on nutritional, developmental, and social issues before and during sport participation in adolescence.<sup>8</sup>

The health of the child athlete involved in intense training should be monitored regularly by a pediatrician. Attention should be focused on serial measurements of body composition, weight, and stature; cardiovascular findings; sexual maturation; and evidence of emotional stress. The pediatrician should be alert to signs and symptoms of overtraining, including decline in performance, weight loss, anorexia, and sleep disturbances.<sup>10</sup>

The intensely trained, specialized child athlete needs ongoing assessment of nutritional intake, with particular attention to total calories, a balanced diet, and intake of iron and calcium. Serial measurements of body weight are particularly important in ensuring the adequacy of caloric intake and early identification of pathologic eating behaviors.<sup>10</sup>

For every success story like Tiger Woods, there are numerous prodigies whose promise fizzled under pressure. No data currently exist to confirm or deny the effects of sport specialization on athletes who reached levels of greatness. Since too little is currently known to make meaningful decisions based on fact, future research in this area needs to address a number of questions:

- To what degree is early sport specialization harmful to the individual and society?
- What strategies could athletic programs employ to encourage multi-sport participation?
- Given the societal effects of fielding successful teams and developing elite athletes in a sport, will teams and programs be under increasing pressure to adopt a dehumanized sporting philosophy?
- What perceptions do athletes, coaches, and parents have of specialization that could be harmful?
- What are the long-term effects of specialization during the life of the athlete?

## CONCLUSION

Sport specialization is a contentious issue that needs to be fully understood by all involved in sport. The potential health, psychological, and sociological risks must be weighed against the benefits of obtaining sharper skills, which may enhance playing time, possibly scholarship opportunities, or reaching an elite level of play.

The decision to specialize in one sport involves several trade-offs. Specifically, athletes who specialize may sacrifice diverse educational benefits they could have experienced by participating in a variety of sports. Through specialization, however, these athletes may enhance their skills in a specific sport that, in turn, increases their chances of achieving an elite status in that sport.

The number of athletes who choose to specialize is unknown and obtaining such information is difficult, but should be a priority for youth sport researchers. Until research is conducted, those who are involved in the sports community must be cautious when dealing with the issue of sport specialization.

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