

Implications for Training in Youth: Is Specialization Benefiting Kids?

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ABSTRACT

EARLY SPORTS SPECIALIZATION HAS BEEN A CONTROVERSIAL TOPIC IN THE FIELD OF SPORTS MEDICINE, TRAINING, AND CONDITIONING. RECENT STUDIES REPORT INCREASED SPORTS-RELATED INJURIES IN SINGLE-SPORT SPECIALIZED ATHLETES COMPARED WITH MULTISPORT SPECIALIZED ATHLETES. TWO STUDIES DEMONSTRATE THE PROPORTIONS OF ATHLETES WHO FOCUSED ON A SINGLE SPORT IN EARLY AGES AND ADVANCED TO ELITE LEVEL IN THEIR LATER CAREERS ARE <1%. FURTHERMORE, PERFORMING MULTIPLE SPORTS WAS IDENTIFIED AS AN INDICATOR FOR GREATER FUTURE ATHLETIC SUCCESS. SYNTHESIZING AVAILABLE EVIDENCE, PARTICIPATING IN MULTIPLE SPORTS SEEMS MORE BENEFICIAL THAN FOCUSING ON A SINGLE SPORT. IT IS IMPORTANT TO PROVIDE ADEQUATE RECOVERY TIME FOR PEDIATRIC AND ADOLESCENT ATHLETES BECAUSE THEY ARE IN A GROWTH SPURT PROCESS. FINALLY, BECAUSE A HISTORY OF PREVIOUS INJURY IS EVIDENCED AS A

RISK FACTOR FOR FUTURE SPORTS-RELATED INJURIES, PREVENTIVE APPROACHES SUCH AS RESISTANCE TRAINING NEED TO BE IMPLEMENTED WITHIN A TRAINING REGIMEN FOR YOUTH.

INTRODUCTION

The decision by young athletes to focus on a single sport early in their athletic careers is currently debated among those involved within sports medicine, training, and conditioning. Some believe that year-round, high-intensity training specialized to a single sport at an early age promotes superior skill sets and leads young athletes to successful future athletic careers. This notion is often offered to parents and legal guardians from coaching staffs as an opportunity to move to a more advanced class/team such as an elite-level class and traveling team squad. The promotion to the more advanced level and team usually entails even greater time commitments for young athletes. Increasing off-field time commitments by both athletes and their care givers, who often are involved in transportation, may factor into decisions to focus on one sport and drop out of other sports. Another potential factor may stem from friendships cultivated among young athletes. They likely enjoy spending significant amount of time through practices and competitions and develop cohesiveness

among friends in a particular sport, which may play a key role. For exceptional athletes, demonstrating superior athletic abilities relative to their peers at middle school- and high school-level competitions often gains attention from college coaches and scouts. Complementary comments received from college coaches and scouts tend to promote interests in pursuing further athletic success, and some may be looking for athletic scholarship opportunities. This phenomenon is often referred as "early sports specialization" (8,22,29).

Serious sport-related injuries, especially overuse injuries, are currently more prevalent in this age group than they were several decades ago (1,6,12). As a result, there is concern that this trend toward early sports specialization may be a contributing factor for the increase in overuse injuries in young athletes. The American Medical Society for Sports Medicine published a position statement on overuse injuries and burnout in youth sports in 2013 (4), which stated that "early sport specialization may not lead to long-term success in sports and may increase risk for overuse injury and burnout" (4). The American

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Academy of Pediatrics also highlighted the potential risk of focusing on a single sport in early ages from physical, physiological, and psychological standpoints (14). The American College of Sports Medicine further recommended a well-rounded general fitness program to prevent sports-related injuries (2). The American Orthopedic Society for Sports Medicine recently suggested the importance of developing a sound environment for the long-term health of the physically active youth with support of parents, clinicians, and coaches in their consensus statement (17). In short, some sports medicine organizations have announced their concerns for sports specialization through their statements. Scientific studies that focus on early sports specialization are limited. However, several recently published studies offer valuable insights in regards to the effects of sports specialization on athletic injuries and long-term athletic success. Thus, this article is focused on synthesizing scientific evidence of early sports specialization on musculoskeletal injury and future athleticism development in the youth population.

EARLY SPORT SPECIALIZATION AND MUSCULOSKELETAL INJURIES

Several studies have identified an effect of early sports specialization on the prevalence and incidence of sport-related injuries. A retrospective cohort study conducted by Hall et al.(11) reported a 1.5-fold increase in relative risk of patellofemoral pain in single-sport specialized female athletes compared with multisport female athletes. In addition, single-sport female athletes had 4 times greater risk of Sinding-Larsen-Johansson disease/patellar tendinopathy and Osgood-Schlatter disease than multisport female athletes (11). Another study by Jayanthi et al.(15) analyzed approximately 500 teenage tennis players for 1 year and found a higher likelihood of reporting musculoskeletal injuries among young tennis players who solely participated in tennis. Another investigation of 1,200 young athletes conducted by Jayanthi et al.(16) reported that total time spent in training

per week and sports specialization was an independent risk factor for serious overuse injuries such as spondylolysis, osteochondritis dissecans, and stress fractures among young athletes who participate in a single sport. Furthermore, a recent clinical review highlighted a positive linear association between risk of serious overuse injuries and the level of sport specialization such as number of sports participations, >8 months per year training, and dropping out of other sports (23). Two other studies also indicated increased sports-related injury incidences in young athletes who participate in a single sport compared with multiple sports (11,15). Based on the reported evidence, experts in this field recommended participating in a variety of athletic activities to enhance motor skill developments and to promote ideal growth in young athletes (24).

AGE EFFECT ON FUTURE ATHLETIC SUCCESS

In regard to age, a cross-sectional study examining the starting ages of 2004 Olympians reported that the mean age of initial sports participation was 11.5 years (34). Although this study did not examine age of sports specialization and injury data, it is intriguing that the mean age of sports participation in Olympic athletes is approximately 11–12 years old, which seems remarkably later than many parents and coaches believe. However, another study supports this finding. To investigate optimum time to enhance athletic development, Danish scientists analyzed approximately 200 elite cyclists, rowers, weightlifters, swimmers, and track and field competitors (21). The conclusion was that the period of middle teens is vital to facilitate international level of athletic success (21). Based on this evidence, the age of athletic participation to determine future athletic success does not have to be below 10 years.

SPORT SPECIALIZATION AND FUTURE ATHLETIC SUCCESS

Although mass media tends to highlight successful stories of high profile

athletes who started participating in a certain sport at an early age, studies indicate that a relatively low proportion of young athletes who specialize in a single sport become international-level athletes later in their careers. According to a longitudinal study conducted in Germany, only 0.3% of young athletes who specialized in a single sport became international-level athletes (10). Similarly, another study conducted in Russia followed approximately 35,000 young athletes who were selected to train at a high-level training institution and found that only 0.14% became elite athletes (20). Findings from both studies implied that a chance to be an elite-level athlete is a low fraction, even if one is specialized to a single sport.

EFFECT OF PARTICIPATING IN MULTIPLE SPORTS

To determine a link between early sports specialization and future athletic successes, German researchers conducted a retrospective study of 1,558 German national-level athletes who were classified either as world class athletes (those who finished in the top 10 places at the Olympic competitions and/or senior world championships) or national-level athletes (those who were ranked in the top 10 at national senior championships, but not at international competitions) (10). The results indicated that single-sport athletes who started their athletic careers early demonstrated successful competition outcomes during the middle teenage period (<14 years old) (10); however, a later age of specialization was associated with senior world class success. In addition, more world class athletes not only participated in additional sports compared with the national-level athletes, but practiced additional sports for longer periods of time compared with the national-level competitors (10). Interestingly, when the world class athletes were categorized by the number of additional sports they participated in, the proportions of the world class athletes showed an increase. The proportions in number of participated sports among the world class athletes

were as follows: zero: 56%, 1 additional sport: 67%, 2 additional sports: 69%, and 3 or more additional sports: 76% (10). The overall training volumes were not different between the world class athletes and national-level athletes. However, the training volume for additional sport(s) was significantly greater in the world class athletes than that of the national-level athletes until the age of 10 years. Furthermore, the world class athletes focused on a single sport later in their careers compared with the national-level athletes (10). The authors of this study concluded that performing additional sport(s) is a predictor for greater athletic successes later in athletes' careers.

TRAINING CONSIDERATIONS FOR YOUNG ATHLETES

According to the study by German researchers (10), early sports specialization may result in early athletic successes, but it is less likely to result in longer, senior-level success. Conversely, the evidence suggests that performing multiple sports at early ages is more beneficial for young athletes and more likely to generate greater successes later in their careers. Participating in different sports activities likely facilitates the development of better-rounded motor skill sets. According to Myer et al.(24), this approach helps develop the positive implications of skill transfer with sport diversification in youth. The transfer of skills from sport to sport as well as training of opposing muscle groups and flexibility patterns may promote and contribute to the development of superior overall athletic capability, which may more positively influence young athletes' well-rounded athleticism later in their careers. It is critical to keep in mind that young athletes are still in the process of growing. Among teenage athletes, especially prepubescent and pubescent athletes, adequate recovery time is necessary to promote appropriate growth. Jayanthi et al.(16) offer a simple and practical ratio: once the time spent for organized athletic activities exceeds twice that of free play time, the odds of sustaining serious

overuse injuries increase significantly. Several studies also indicate that participating in athletic activities more than 16 hours per week may increase risk of athletic injuries (15,19,27). Therefore, providing an environment in which young athletes can engage in multiple sports with proper recovery time would be ideal to enhance their athletic activities and success later in their lives.

Another important training consideration in youth is to protect young athletes from serious injuries. An example might include the early specialized young baseball pitcher. Lack of shoulder internal rotation range of motion called glenohumeral internal rotation deficit (GIRD) is a particularly alarming finding among young throwers (5,25,33) because it remains unknown whether or not the GIRD is fully reversible once it develops. To reduce the number of pitches, guidelines of less than 75 pitches per game, 600 pitches per season, and 2,000–3,000 pitches per year were proposed for 9–14-year-old athletes (35). In baseball, pitchers have a substantially greater number of skilled throws than field players. To avoid overpitching, it may be a good alternative to rotate players' positions frequently instead of focusing on solely pitching, especially while the players are still in the growth spurt. These tactics may not only protect young athletes from overpitching but provide all players experience at various positions, which may help to foster more comprehensive baseball skill development.

REDUCE MUSCULOSKELETAL INJURIES THROUGH PREVENTIVE TRAINING

Furthermore, several studies showed that a previous injury history is a risk factor for future injury (7,26). A previous history of traumatic knee injury such as anterior cruciate ligament (ACL) injury, increases the risk of subsequent ACL injury and other knee injuries. More specifically, athletes who sustained an ACL injury 1 time have 15 times greater risk of sustaining a second ACL injury relative to those who never had an ACL

injury (26). Furthermore, previous knee surgery itself can be a risk factor. A study performed by Rugg et al.(28) documented that those who underwent knee surgery before college showed 7–20 times higher likelihood of sustaining another knee injury in their college careers. To decrease the risk of ACL injury, prophylactic effectiveness of neuromuscular training was examined, and the results demonstrated a 74% risk reduction for noncontact ACL injury (31,32). One of the important components of neuromuscular training is the incorporation of strength training (30). Enhancing muscular strength seemed to be beneficial to prevent ACL injury (30). Historically, concerns for young athletes engaged in resistance training have been raised, particularly about risk of injury to growth cartilage. However, a recent international consensus statement based on available studies found no evidence to support this notion (18), and actually a few studies documented greater bone mass development in young athletes who regularly performed resistance training (3,9,13). In short, it is key to integrate preventive exercises to reduce potential risk of serious injuries among young athletes, and resistance training with proper form can be used as an effective intervention.

CONCLUSION

In summary, there is a growing concern among clinicians in the field of sports medicine regarding early sports specialization, which was reflected in their organizational statements (2,4,14,17). Recent research studies show increased sport-related injuries, especially overuse injuries, among young athletes who specialized in a single sport (11,15,16). In terms of age of participation, several studies showed that internationally prolific athletes begin participating in their sports around 11–12 years old (34), and the mid teens are a critical time for their future athletic success (21). Another study suggested that performing multiple sports is more beneficial than participating in a single sport at early ages, which also demonstrates an association

with greater athletic success later in their careers (20).

Based on the documented evidence, it seems to be more beneficial for young athletes to perform multiple sports rather than focusing on a single sport in early ages, which may potentially reduce overuse injuries among young athletes. In addition, adequate recovery periods need to be programmed into young athletes' training regimens while they are still growing. Avoidance of sports-related injuries should be one of the priorities in young athletes' training because past studies have shown that a previous injury history is a predictor for subsequent injuries (7,26). Preventive training such as resistance training can be used as a part of young athletes' training regimens. Incorporation of preventive training may potentially reduce the number of sports-related injuries, while further maximizing young athletes' future performance.

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