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Article - Review**Summary of Early Sport Specialization in Baseball**

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Background/ Scope of the Problem

Early sport specialization, defined as playing one sport for over eight months in a year without participation in any other sports, has gained significant popularity in recent years.^{1,2} Increasing numbers of young baseball players are leaving their local leagues for travel programs where they may pay thousands to play for a team year-round.³ Youth baseball players are competing in more games than ever. During the busiest months, summer travel teams routinely schedule around 80 games over the course of just three months.⁴ Putting this in perspective, Division I college programs play about 60 games per year over a five-month span.⁵

While teams, tournament hosts, and other entities profit from youth athletics, the question remains: does early specialization provide any benefit for the athletes? This article will discuss the perceived benefits and risks of early sport specialization in baseball, and how physicians can support athletes pursuing this path.

Perceived Benefits of Early Sport Specialization

Proponents of early sport specialization assert that by focusing on one sport from an early age, athletes can develop and strengthen specialized skills, thereby gaining a competitive edge.¹ Evoking the old adage “iron sharpens iron,” many parents believe that early exposure to competitive environments benefit their children’s athletic development as they learn to succeed against higher levels of competition compared to their local leagues. With this advantage, athletes often hope for increased opportunities to compete at higher levels such as college or professional baseball.

Athletes may elect to specialize out of a strong passion for their sport.⁶ Interviewed MLB players revealed that they chose to specialize early on because of their love for baseball.⁷ Engaging in sports can also have many psychological and physiological benefits, such as lower levels of stress, prevention of depression, and strengthening of the immune system.⁷

Risks and Drawbacks of Early Sport Specialization

Supporters of early specialization maintain that this training approach leads to increased achievement. However, it may not be necessary for achieving elite status as less than half of MLB players specialized in baseball at a young age.^{1,8}

Research correlates early specialization with a greater risk of injury.^{1,2,8,9,10} The most common injuries amongst baseball players are localized to the upper extremity for several reasons.¹¹ Repeated throwing motions place extreme amounts of valgus stress on the elbow joint; the ulnar collateral ligament (UCL) in particular absorbs most of the force.¹ Simple overuse is one mechanism of injury, but this risk is amplified by poor throwing biomechanics and length of play, the latter of which is influenced by early specialization and not adhering to pitch count limits. Biomechanics are impacted by the mobility of certain joints, degrees of maximal rotation, stride length, and more. For example, the timing of trunk rotation and degree of external rotation of the shoulder directly influence the amount of stress put on the UCL during the pitching delivery.¹²

In addition, a player’s position influences the types of injuries they are most at risk for.⁹ Pitchers are frequently afflicted by upper extremity injuries, while position players commonly suffer from rotation injuries. One example is in pars fractures and subsequent spondylolisthesis, which occur at higher rates in position players compared to pitchers.¹³

As for psychological risks, early specialization may increase risk of burnout in young athletes.^{1,14} Players that specialize are more likely to retire or drop out of their sport at an earlier age.¹⁴ However, the reason why athletes choose to play a sport may determine their risk of burnout. Pressure from parents may have a negative impact, a contrast to the MLB players who specialized because of their genuine passion.¹⁴

Discussion of Early Sport Specialization

While the benefits of early sport specialization depend on individual athletes’ abilities and goals, the undeniable fact is that this path increases risk for injury, irrespective of the level of competition. Unfortunately, as with most cases in medicine, the story of early specialization is not a “one size fits all”. It is important for healthcare providers to identify their patients’ goals, and subsequently create a treatment plan that optimizes performance while

minimizing injury. Providers should educate patients and family members about the increased risks of injury correlated with early specialization. These transparent and informative conversations are essential to achieving positive outcomes.

Consider how two athletes, one with lesser and one with greater athletic talent, weigh the benefits and risks of early specialization as they strive to reach their goal of playing on their school's varsity team. With additional training and focused instruction, the athlete with less talent may improve enough to make the team. From this player's perspective, the risk of injury may be worth achieving their goal. This is an individual decision influenced by fluctuating priorities and personal aspirations.

In contrast, early specialization and focused training may have diminishing returns for the more talented player. Irrespective of professional aspirations, research suggests that this player would benefit instead from diversifying their athletic abilities by participating in other sports.¹⁴ In doing so, athletes can learn movement patterns and strengthen their bodies in diverse manners, which translates to even better results in their primary sport.¹⁴

Physicians may not always be familiar with their patients' skill level or the amount of training it might take for these players to achieve their goals. Nonetheless, physicians can educate their patients, specifically sharing that early sport specialization not only increases the risk of injury but might not be necessary for those with high athletic ability. Athletes can then individually determine to what degree they believe specialization will help them achieve their goals and if they want to proceed.

For patients that decide to specialize, physicians can emphasize strategies to make this training as safe as possible for the patient. There are many recommendations on how to minimize injury risk for baseball players such as pitch limits and periods of time off from throwing each year.¹⁵ Teaching proper biomechanics to young players has the additional benefit of enhancing athletic performance. Additionally, if players do make it to elite levels of competition such as college or professional, this prevents the need to remap their biomechanics after their incorrect movement patterns have been solidified through years of playing.

No matter what, young players need a break from competition and should take time off each year to recover. While specialization may be beneficial on an individual basis, it is important to analyze how the players who get paid to specialize go about training. MLB organizations invest millions into player

development and training in the off season. Whether the focus is on mechanics, strength, or strategy, professional players take time off from competition each year to let their bodies rest and find other ways to gain a competitive advantage. As early sport specialization grows in popularity, it may be time to rethink how it is implemented. College baseball recruiters often focus their evaluations on the tools players have, such as proper mechanics, speed, strength, and projectable frames, all of which can be developed through focused training instead of competing in games. Future research should assess the efficacy of spending more time off the field improving strength and biomechanics versus competing in more games.

Current statements from the American Orthopaedic Society for Sports Medicine highlight a research gap relative to load management and how to keep youth athletes safe.¹⁶ It is not clear what types of training are safest for young athletes to perform year-round, and sport specific inquiries are necessary to address this question. Research into baseball should consider the effect of training proper biomechanics such as arm mapping, stride force and landing location, and hip rotation. This training can be done without throwing any baseballs or causing excess force or stress to be placed on the body. Often, young pitchers do not receive proper instruction on mechanics, and studies consistently find that certain movement patterns are associated with increased risk of injury.¹⁷ Identification and correction of mechanical flaws could lower injury risk in youth athletes and prevent injury down the road. Furthermore, evaluating the effectiveness of strengthening targeted muscle groups, such as the scapular stabilizers, is yet another strategy and point of research to lower injury rates in youth pitchers and throwing athletes.¹⁸

As more research is published and recommendations continue to change with the rapidly evolving landscape of youth athletics, it is imperative physicians remain up to date on the competition and training regimens of their patients. By having conversations early on about goals and safety, physicians have the ability to prevent injury while ensuring their patients live the lifestyle they choose.

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