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HN-300-E

18 March 2021

The Effect of Early Sports Specialization on Young Athletes' Physical and Mental Health

Introduction

Over the past twenty years, participation in youth sports has increased dramatically across the country.¹ This overall increase in participation has been well documented across all age groups.¹ In the USA today about 60 million children from ages 6-18 participate in some form of organized athletics.¹ In general playing sports as a child has many positive benefits including learning respect for teammates and others, increased self-esteem, courage to try new things, and increased self-discipline as well as better grades, stronger peer relationships, and greater involvement in volunteer work.² The notable increase in participation has led to about 72% of children between the ages of 8 and 17 participating in organized sports.³ Due to the high levels of participation, youth athletics have become a more competitive environment than ever before for young athletes. The increased levels of competition have caused more kids to specialize in one sport at an earlier age than in the past in order to gain a competitive edge on their opponents. This relatively new phenomenon is commonly referred to as early sports specialization (ESS). Early sports specialization is typically defined as “year-round (8+ months/year) intensive training in a single sport at the exclusion of other sports”.⁴ This definition is made to include athletes who “choose a main sport, participate for greater than 8 months per year in 1 main sport and quit all other sports to focus on 1 sport”.⁵ In regards to ESS, early age is typically considered

to be around age 12 or below but it is becoming more common for athletes to specialize before the age of 10. ESS has only recently become more common as about 77.7% of high school athletic directors have reported an increase in ESS at their respective schools.⁴ The increased popularity of this fast-growing trend has made become a very controversial topic with limited research. Parents, coaches, as well as the athletes themselves often wrongfully associate ESS with elite athletic performance. They believe that without specialization it is impossible for their child or athlete to succeed in their sport and become an elite level athlete. Research has had conflicting evidence regarding the truth of that claim, but research has been able to confirm the various negative effects ESS has on young athletes and their health. New research has been able to find that ESS may be the source of increased musculoskeletal and overuse injury rates. Researchers have also found that ESS can lead to a variety of mental health issues such as burnout, overdependence, and manipulation. It is now being hypothesized that these increased injury rates are due to the high training volumes commonly associated with ESS. Therefore, despite the common belief that ESS is the only path to success as we can see its effects can truly be detrimental and derail a young athlete's career. Early sports specialization by elementary and middle school-aged athletes in organized sports negatively affects both their physical and mental health.

Why Specialize?

The increased popularity of early sports specialization is multifactorial as the reasoning for this major decision by the athlete can be due to a variety of reasons depending on their circumstances. The most popular reasoning behind this increase is due to the common misinterpretation of the 10,000-hour rule study from 1993 by Ericsson et al. This study later popularized by Malcolm Gladwell found that by beginning a task at a very young age and

acquiring high amounts of practice (approx. 5000-10000 hours) leads to an increased chance of becoming an expert.^{6,7} The number of hours is obviously not a concrete number as it depends on the person, the task, and the type of training required. But the study was performed on musicians, mathematicians, and chess players.⁷ The study did not test this theory on athletes which is why the 10,000-hour rule may not even be applicable to sports. Athletics require physical development by the athlete as well as a certain skillset in order to be successful.⁷ This study does not take these factors into account as none of the subjects were athletes who were trying to reach an elite level at their respective sport. This study may also not be applicable to ESS because specialization in sport before maturity can sometimes be detrimental to achievement as it often leads to increased injury risk.³ The 10,000 hour rule study is one the main causes of the notable increased levels of ESS in youth athletics although there is currently no significant evidence supporting the claim that it can be applied to sports and athletes.

There also many external factors that play a key role in an athlete's decision to specialize such as their coaches, parents, perceived economic benefits, and the media. Young athletes usually do not make the decision to specialize on their own as they often have ESS forced onto them and are too young to recognize the true importance of this decision and the commitment it truly takes to train all year round for one sport. Coaches are usually the first to recommend ESS to young athletes because they are the first ones to recognize an athlete as talented or gifted.⁷ This label puts additional unwanted pressure on the athlete which can often lead to them specializing in a sport before they are mentally and physically ready. Despite coaches often being the first to recognize an athlete's potential and usually encouraging specialization they typically do have the same goals and interests in mind as the athlete and their parents. That is why athletes should only specialize if they feel it is right for them, not because their coach

believes they are too talented to waste their time playing other sports in the offseason. Another major external factor that influences athletes when making this decision is their parents. Surprisingly parents are usually the strongest initiator for ESS because they want to do whatever is necessary to give their child an edge on the competition.⁷ Many parents want their child to succeed in athletics because sports provide an objective measure of success which is often wrongfully equated with good parenting.⁸ Since many parents believe that performance in sport is a good gauge of how well they are parenting they become over involved in their child's athletic career. The common belief that ESS is the only way for their child to succeed in their respective sport stems from the success stories told by various professional athletes. For example, the now famous story of Tiger Woods's path to stardom. Tiger became a successful golfer because of early specialization in the sport, coupled with a dominating parent and a regulated lifestyle during childhood and adolescence. Stories like Tiger's and many others told on television give parents the false perception that ESS is necessary if their child is going to become an elite and successful athlete.⁹ Another common external factor that leads to ESS is the perceived economic benefits. Many young athletes choose to specialize because they believe it will increase their odds of receiving a partial or full athletic scholarship in college or even becoming a professional athlete. But statistics suggest that these are often unrealistic and lofty expectations as a very small percentage of childhood athletes receive partial or full athletic scholarships in college and even fewer are able to play sports at a professional level. Two other factors that are often overlooked are the athletes themselves and the media. When athletes are given the label of gifted or talented by their coaches and/or parents this increases the already high amount of pressure they put on themselves to succeed leading to them specializing in order to try and maximize their odds of success.^{8,9} The media can also play a role as it constantly

pushes the narrative that ESS will lead to success in athletics through various commercials and advertisements for sports specific year round training programs.⁷ Overall, there are variety of external factors that play a key role and can affect an athlete's decision to specialize at a young age.

Position Statements on ESS

Due to the growing popularity of ESS over the past decade various organizations and associations have provided position statements on this topic. All of these statements are slightly different but almost none of them are in support of ESS. Statements from the American Medical Society for Sports Medicine (AMSSM), America Academy of Pediatrics, National Athletic Trainers Associations, International Society for Sports Psychology, World Health Organization, International Federation of Sports Medicine, National Association for Sports and Physical Education, and the American Orthopedic Society for Sports Medicine all strongly oppose ESS due to variety of negative effects it can have on athletes' physical and mental health.^{7,10} The AMSSM's statement regarding this trend demonstrates the dangers of ESS on young athletes' health by stating ESS "may increase the risk for overuse injury and burnout and should be avoided at younger ages".¹⁰ Due to concerns regarding the effect of ESS on injury rates and burnout at least 7 major sport authorities have also published statements opposing ESS including USA baseball, USA cycling, and USA swimming. Many of these authorities now also provide guidelines and rules such as limiting pitch counts, gear ratios, and practice times in order to help protect young athletes' development and maturity.⁴ The various statements opposing ESS from a wide variety of reputable organizations demonstrate the true dangers it can have on young athletes' health from a physical as well as a psychological standpoint.

Effects of ESS on Physical Health- Musculoskeletal Injuries

One of the main concerns surrounding ESS is the effect it can have on an athletes' physical health as it has recently become associated with both musculoskeletal and overuse injuries. Various studies have been able to identify a link between ESS and both increased incidence and prevalence of sports related injuries. Musculoskeletal injuries are not as commonly thought of as a potential effect of ESS, but they have been found to occur at an increased rate both early and later on in the career of athletes who specialize at a young age. A recent study by Hall et al. were able to successfully identify this link when looking at a large cohort of middle and high school age female athletes specifically soccer, basketball, and volleyball players.^{6,10} The researchers found that of the 546 subjects who specialized in one sport those athletes had an increased risk of developing patellofemoral pain by about 1.5 fold compared to the athletes who played multiple sports.¹¹ They also found that those same specialized athletes had a 4x greater risk of developing Sinding-Larsen-Johansson disease (patellar tendinopathy) and Osgood-Schlatter disease.¹¹ Another similar study by Jayanthi et al. studied 500 teenage tennis players for 1 year and found that athletes who specialized in tennis were 1.5x more likely to report an injury.¹² These studies help to demonstrate the risks ESS poses on athletes' physical health at the time of specialization as it can lead to increased risk of developing musculoskeletal injuries. Various studies have now also started to look into the effect ESS has on injury rates later on in athletes' careers.

Musculoskeletal injuries have now been found to not only occur at an increased rate at the time of specialization but also occur at an increased rate throughout the athletes' careers. A recent study by Ahlquist et al. looked into the effect of ESS on both injury rates at the time of specialization as well as later on in the athletes' careers. Their study's subjects consisted of National College Athletic Association (NCAA) Division 1 athletes. The study's original

hypothesis that ESS and the high training volume (HTV) would be risk factors for injury and/or surgery was supported by their results.¹ The results from the study found that athletes who specialized before the age of 14 were more likely to have a history of injuries, multiple injuries, multiple college injuries, greater number of total injuries, and more time out for injury.¹

Researchers also found that athletes who trained for greater than 28 hours per week in their respective sport before high school were more likely to report multiple injuries, multiple college injuries, a surgical injury, multiple surgical injuries, a greater number of total injuries, and more time out for injury.¹ Therefore Ahlquist concluded that Division 1 athletes who specialized and/or had HTV early in their career were more likely to sustain injuries and miss more time due to these injuries compared to those who played multiple sports. HTV is now often associated with ESS and will be specifically talked about later in this paper. Another study that looked at the effect of ESS on injury rates later on in athletes' careers was conducted by Andrew Wilhelm et al. in 2017. The subjects for their study consisted of 102 professional baseball players. The study found that Major League Baseball (MLB) players who specialized early in their careers were more likely to report injuries than those who did not.⁴ The researchers concluded based on these results "that there was a statistically significant increase in risk of a serious injury as a professional athlete if the player had specialized prior to high school".⁴ In conclusion, ESS can be linked to increased musculoskeletal and overall injury rates both during adolescence and later on in life. Athletes must recognize when considering ESS that the effect it can have on their physical health will last throughout their entire athletic career. They must also consider the effect of ESS on overuse injury rates as well.

Effects of ESS on Physical Health- Overuse Injuries

Overuse injuries are often recognized as one of the most common potential side effects of ESS as this type of injury is often associated with high amounts of training and an increased workload performed by athletes. Overuse injuries are typically defined as injuries that are a “consequence of repeated microtrauma in a tendon, muscle, or bone associated with chronic repetition of specific sports activities”.⁹ Some examples of these specific sports activities that are often associated with overuse injuries are tennis serving, shoulder action in swimming, gymnastic routines, running, and baseball pitching.⁹ Baseball pitching specifically has typically been associated with overuse injuries as many young pitchers decide to specialize in just baseball and some even decide to specialize in just pitching at a very young age. A study by Fleisig et al. looked at how an increase in innings pitched would affect athletes’ overuse injury rates. The researchers looked at a group of youth baseball pitchers for a period of 10 years and found that the players who pitched more than 100 innings a year were at a 3.5x greater risk of developing an injury specifically an overuse injury.¹³ Similar studies have also found that pitchers who pitched more than 8 months out of the year (typical for athletes who specialize in baseball as they often play in the spring, summer, and fall months) were also at an increased risk of injury. The increased risk associated with increased innings pitched demonstrates that ESS for young baseball players especially pitchers may actually do more harm than good because of the extra stress placed on their pitching arm on a yearly basis. Due to the increased overuse injury rates associated with ESS many researchers are starting to believe that increased levels of ESS have been the cause for the recent increase in the number of elbow and shoulder surgeries performed yearly. The increased risk can be due to a failure to develop sound fundamental movement patterns by specialized baseball players since they are specializing in one sport too early on in their athletic career. Another important finding from these studies was the overuse injuries were

not limited to the dominant extremity.⁴ Therefore, the increased stress on the athlete's pitching arm is not the only factor leading to the increased rate of overuse injuries. The increased overuse injury rates seen in these studies is likely not only due to increased physical stress on the throwing arm but also a variety of other factors including decreased time off, increased psychological stress, and increased practice time by athletes who specialize. Since the increased overuse injury rates were not limited to the pitching arm the findings from these studies may also be able to be applied to other sports.

Extensive research has also been conducted on the association between ESS and overuse in many other sports besides baseball. Jayanthi's study that was mentioned earlier looked into this link. The results from this study found that total training time per week and sports specialization were independent risk factors for serious overuse injuries such as spondylosis, osteochondritis dissecans and stress factors in young athletes.^{10,12} Part of the reason for overuse injury rates increasing in athletes who specialize is not only the increased training but also "certain sports... mechanics and training" predispose athletes to potential risk of developing overuse injury due to their respective biomechanical risks.⁵ Some of these sports include soccer, swimming, and tennis which are highly competitive sports that athletes often specialize in very early on in their career. Researchers hypothesize that one of the best ways for athletes who want to specialize at a young age to decrease their risk of developing these movement-specific overuse injuries is diversified training which is typically performed by athletes who play multiple sports.² Based on the recent research ESS poses many risks to an athlete's physical health as it is now often correctly associated with increased risk of both musculoskeletal and overuse injuries. Despite these recent findings and developments regarding athletes' physical health, ESS may do even more significant damage to athletes' mental and psychological health.

Effects of ESS on Mental Health

An athlete's mental health is a very fragile thing due to the high amounts of pressure and psychological stress that comes with playing competitive sports on a daily basis. If an athlete's mental health is suffering it is very likely that their performance is suffering as well. ESS can have a profound negative effect on athletes' mental health by leaving them potentially susceptible to burnout, overdependence/manipulation, and social isolation. Burnout is the main and most significant psychological effect of ESS on mental health. Burnout develops over an extended period of time and is commonly seen in athletes who play one sport all year round for an extended period of time.⁹ In many cases burnout is often first demonstrated through the typical signs of chronic stress such as agitation, loss of interest in sport, depression, and lack of energy.⁹ One of the main causes of burnout that often leads to an athlete losing their passion for a sport they once loved is they start to believe they cannot meet the high demands they put on themselves physically and athletically (not meeting their own lofty expectations).⁹ Athletes who specialize usually have high expectations and goals for their performance as they obviously are very committed and put significant amounts of practice time and training into their respective sport. If they start to believe they cannot reach these high expectations they set for themselves, they often decide to quit the sport altogether in order to avoid the possible disappointment. Some other potential causes include decrease in athletic accomplishments and achievements, negative evaluations and feedback from coaches, overtraining, and/or injury and fear of reinjury.⁹ As you can see there are various potential causes of burnout that can occur when an athlete specializes at too young of age. Burnout is very detrimental to a young athlete as it not only ruins their love of a sport, but it can also result in a sedentary lifestyle which is even more detrimental to their overall health and wellness especially at a young age as this could eventually lead to a lifetime of

inactivity. Overall, studies have found that psychological burnout from ESS can be due to the increased pressure associated with it and often leads to decreased athletic achievement and earlier retirement from sports.⁵

Two of the other potential effects of ESS on an athlete's mental health is overdependence and manipulation. These two side effects often go hand in hand as one often leads to the other for many young athletes. Athletes who specialize at a very young age often live highly regulated lives. ESS puts many young athletes into a world that is typically highly regulated by adults such as their coaches and parents.⁹ At the time they usually do not recognize this, and it often leads to overdependence on the adults in their life. Overdependence at first may not seem like a major consequence as it often overlooked when considering the effect of ESS on mental and psychological health. But often times it can lead to a variety of behavioral problems in the future especially during adolescence.^{2,9} Overdependence also can lead into potential manipulation of the athlete's life outside of sports. Manipulation can occur in a variety of ways such as a strict diet or a controlled social life. Dietary restrictions occur often in certain sports as it may be encouraged in order for an athlete's body to fit into a certain gold standard. Some examples of these sports where this may be encouraged include gymnastics, figure skating, and ballet.⁹ These dietary restrictions can also lead to the athlete potentially suffering from an eating disorder due to the effect this pressure has on their self-image. Social manipulation may also occur as a result of ESS as athletes may receive preferential treatment from schools, coaches, etc. through increased access to resources including tutors and scholarships.⁹ Finally, social isolation can be another potential effect of ESS on an athlete's mental health. Youth sports are supposed to be a fun activity for children where they have the ability to compete and grow closer with their peers and friends. But this comradery and social development with the other children their age is often

compromised due to ESS. By specializing in one sport at a young age they become isolated from their peers and friends and miss out on potential bonding and developmental activities with their friends.⁹ The social isolation from their peers often effects their future relationships with friends as well as family members.² Despite the mental effects of ESS often being overlooked the tole it takes on athletes' mental health needs to be taken into account when considering specializing as the effects it has can have are profound and leave a lasting negative impact.

High Training Volume Associated with ESS

One of the main hypotheses researchers have formulated regarding the overall cause of the increase in both musculoskeletal and overuse injury rates due to ESS is the high training volume (HTV) commonly associated with specialization. HTV is defined as training of 28 hours or more per week in your respective sport.¹ HTV is often coupled with ESS because when an athlete specializes in a sport they concentrate and increase their overall training load in that sport. This typically leads to their training volume and conditioning frequency almost doubling while their overall rest time is significantly decreased compared to a normal multisport athlete.¹ By advising athletes not to specialize until late adolescence and manage their training volume researchers believe it may lead to a significantly lower risk of injury being associated with ESS.

Significance of Findings

The findings discussed in this paper are very important for young athletes as they can help to demonstrate the potential negative effects of ESS as often times these potential cons can be overlooked when an athlete is considering specializing. The results from the studies discussed demonstrate the negative effects ESS can have on physical and mental health both during specialization and later on in an athlete's career. I believe that by applying the results from these

studies we can help lower the risk of injury in athletes who specialize by making sure they do not specialize too young and avoid high training volumes as well. If athletes are able to specialize without having to deal with the potential negative consequences of ESS they may be able to increase their chances becoming an elite level athlete while also avoiding the potential negative health outcomes now being associated with specialization.

Conclusion

In conclusion, the increased participation level across all levels of youth sports has led to youth athletics being a more controlled and competitive environment. Many athletes and their parents have turned to early sports specialization (ESS) as a potential method to gain a competitive edge on their peers and fellow athletes. Many athletes do not make this decision on their own as they often are pushed to specialize by a variety of external factors most notably their parents and coaches. Due to ESS being a relatively new trend they do not recognize and know of the variety of potential negative effects of ESS. Early sports specialization by elementary and middle school aged athletes in organized sports negatively affects both their physical and mental health. ESS has been found by researchers to lead to increased incidence of musculoskeletal injuries and overuse injuries at the time of specialization as well as later in the athletes' careers. ESS also can leave young athletes who are already under a lot of stress susceptible to many potential negative mental health problems including burnout and social isolation. These physical and mental health effects lead to a variety of problems throughout the lives of athletes who specialize at too early of an age. By educating athletes about these potential cons of ESS they may be able to make a more well-educated and better-informed decision when thinking about specializing in one sport. If athletes begin specializing at a later age and manage their training volume when they do decide to specialize researchers hypothesize that it will lead to less of an

increase of overall injury rates due to ESS. That is why I believe the findings discussed in this paper are very important for young athletes and their parents as they help to effectively demonstrate the true effects ESS can have on their physical and mental health.

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