

Sport Specialization and the Creation of Elite Soccer Athletes

A Synthesis of the Research Literature

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Nathan Lawson

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THE COLLEGE AT BROCKPORT  
STATE UNIVERSITY OF NEW YORK  
BROCKPORT, NEW YORK

Department of Kinesiology, Sport Studies, and Physical Education

Sport Specialization and the Creation of Elite Soccer Athletes

*Cathy Houston-Wilson*

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Instructor Approval

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*Cathy Houston-Wilson*

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Chairperson Approval

Date

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### **Abstract**

There are many contributing factors to sport specialization at an early age whether these are intrinsic or extrinsic motivation, parental influence and amount of practice time. There are positive and negative effects of sports specialization and sports generalization. Therefore, the purpose of this synthesis was to review the literature on sport specialization and the creation of an elite athlete in the realm of soccer. The research shows the need for sport specialization early in soccer is not necessary because it is not necessary to reach peak performance early as compared to a sport such as gymnastics. With the physical developments our body endures an athlete will not reach peak performance in soccer until a later age in life. In an athlete's adolescent years it is imperative that we provide choice to our adolescents to select the pathway (recreational or elite) and activities that will keep the athlete motivated and engaged in the sport. The most important factor on the creation is the use of deliberate practice. It was found that the more hours spent in deliberate practice the higher chance of becoming an elite athlete. Further research and education is still needed in order to promote future research.

## Chapter 1 – Introduction

Over the years there has been an upsurge in athletes who specialize in a sport at earlier and earlier ages. Sports specialization refers to an athlete's focus on one sport and its specific training opposed to athletes who engage in sports generalization and diversification, where they participate in a variety of sports (Jayanthi, Pinkham, Dugas, Patrick & LaBella, 2013). This increase in sport specialization is believed to be due to athletes wanting to receive scholarships to college and compete at the highest level of their given sport. Over the last 30 years there has been a drastic shift in the landscape of adolescent athletics. In the past, sports generalization was the norm. Adolescents participate in sports and activities due to the perceived enjoyment while obtaining the numerous benefits that sport can offer. Sport activities help to build a child's self-esteem, while allowing for social interactions among teammates and developing other character traits such as leadership and discipline. While in the past sport generalization was more common, recently sports specialization has become more prevalent in adolescent athletics. The previous mentioned benefits are now coupled with acceleration in the level of competitiveness. This rise is causing more competitive events at younger ages, specific training protocols, and sport specification. There are no longer seasons and parents are encouraged to have their child play in organized competitive matches and practice year round (Caruso, 2017). "In the United States, youth participating in sports has increased from approximately 18 million in 1987 to 60 million in 2008" (Ferguson & Stern, 2014, p. 379) Depending on the sport, the athlete may benefit from sports specialization or sports generalization. Sport specialization benefits sports such as tennis, golf or swimming due to the efficient, repetitive movements which have the greatest likelihood of employing deliberate practice to create an elite athlete. While sports generalization can bring

success in team sports due to the potential to develop numerous motor skills that can be used in the crossover of many sports (Caruso, 2017).

While it appears sport specialization may have some benefits for individual sports the relationship between sport specialization and team sports may not hold true. Instead, athletes who play team sports can find many cross-over sports that enhance their game. For example, when examining the effect of diversification on soccer athletes, Nagel (2016) found that soccer athletes who also participate in lacrosse have demonstrated benefits such as comfort with the layout of the field and a greater sense of field of vision. In addition, diversification promotes fitness and stamina during the off-season. Although tennis may appear to have no correlation to soccer, it actually demonstrates cross over very well. Skills such as agility, acceleration and anticipation in order to effectively read an opponents' next move helps to improve skills in soccer as well. Volleyball is another sport that strongly crosses over with soccer. Volleyball helps players develop vertical skills and improve aspects of their vertical game that can be seen in tasks such as winning a head ball. Learning how to properly track and adjust to balls in the air is a necessary skill, and it must be practiced. Volleyball may also help a player to improve their jumping ability, coordination, and spatial awareness which are all essential skills for a soccer player. In addition, as a team sport volleyball requires that teammates are able to use quick, efficient communication in order to be able to coordinate with each other. (Nagel, 2016) Team play is the basis of soccer and volleyball which can help a player improve in a lot more ways than one may think. (Nagel, 2016)

### **Statement of the Problem**

The literature reveals that there are issues associated with both sport specialization and sport diversification. In addition, parent pressure on their child to exceed in a certain sport with the hope of increased playing time, notoriety, scholarships and even professional play have been shown to have a detrimental effect on athletes, most notably burn-out and injuries. Specific to soccer, does sport specialization yield a better soccer player or should those who wish to excel in soccer, participate in a variety of sports?

### **Research Questions**

1. Is specializing in one sport the best option for athletes who wish to become elite athletes in soccer or should these athletes participate in a variety of sports to yield this outcome?
2. What other factors have an impact on the development of elite soccer athletes?

### **Purpose of the Study**

The purpose of this synthesis is to review the literature on the effects of sport specialization in the development of elite soccer athletes.

### **Operational Definitions**

Elite athlete is an athlete who is able play at college level and beyond

Sports Specialization relates to intense training in one sport at the exclusion of others.

Sport Diversification participation in a variety of sports and activities through which an athlete develops multilateral physical, social, and psychological skills

### **Delimitations**

1. The literature review will be specific to soccer.

2. The literature review will include soccer athletes who range in age from children to young adults (elementary through college).
3. The literature review includes information on sport specialization and sport diversification.

## Chapter 2- Methods

The purpose of this synthesis is to review the literature on the effects of sport specialization in the development of elite soccer athletes. The studies collected for this synthesis were found using the online database from The College at Brockport Drake Memorial library website and EBSCO Host database. Within EBSCO Host the SPORT Discus full text database was searched. The criteria selected included scholarly article, peer reviewed journals and full access text. Other articles that were selected as part of the literature review process provided context on the topic, background information and supplemental information to complete the review process. A total of 14 articles were chosen to support the purpose of the study. All sources used are cited in the reference section of this paper.

In order to find articles and research studies keywords that were related to the problem statement were used, such as sport specialization, elite athlete, parental influence, soccer, athletic burnout, genetics, sport diversification and deliberate practice. All of the keywords that were used for the search yielded an abundance of relevant sources. There was an extensive amount of information regarding sport specialization which required keywords to be arranged into different combination, including two to three words simultaneously, in order to generate a larger amount of articles. This process was repeated until a sufficient amount of articles were obtained. When searching “sport specialization” 1019 results were found. When searching “sport specialization” and “elite athlete” 112 results were found. When searching “sport specialization” and “soccer” 52 results were found. These results were then searched through using the delimitations of this particular study.

The articles required for the literature review needed to be peer-reviewed publications and scholarly articles. In addition the research articles used were from 2001 to present. Only articles that related to sport specialization and elite athletes were used in this synthesis review. All of the information obtained is applicable in determining the effects of sport specialization in the development of elite soccer athletes. From these searches a total of 14 articles met the criteria and were synthesized for the study. The 14 articles chosen for the literature review were from *Kinesiology Review*, *Sport Journal*, *Psychology of Sport & Exercise*, *High Ability Studies*, *International Journal of Sports Science & Coaching*, *Journal of Sports Sciences*, and *Scandinavian Journal of Medicine & Science in Sports*, *British Journal of Sports Medicine*, *Journal of Sport Behavior*, *Sport & Exercise Psychology Review* and *Journal of Sports Medicine & Physical Fitness*.

The center of this project revolves around soccer athletes between the ages of 5-18. Due to the nature of the study subjects used retrospective studies in order to obtain relevant data therefore athletes who were over the age of 18 were used. The critical mass of the synthesis was 1224 male soccer players, 37 female soccer players, 1190 male and female athletes in sports other than soccer between the ages of 5-18 years old and 34 parents of soccer athletes.

## **Chapter 3-The Literature Review**

The purpose of this chapter is to review the literature regarding the effects of sport specialization in the development of elite soccer athletes. This chapter will provide readers the information relating to sport specialization/ diversification. Specifically, the following topics covered: theoretical framework for sport specialization, deliberate practice, early vs late specialization, athletic burnout and genetics and parental influence.

### **Theoretical framework for Sport Specialization**

There are three main models of sports specialization: mountain of motor development, developmental model of sport participation, and the spirals of engagement trajectory model (Goodway & Robinson, 2015). Based upon the summary of these models, by taking into account motor development and physical growth. It is suggested to use a developmental trajectory approach in order to facilitate high levels of participation, reduce burnout and meet a child's individual interests by following a certain time frame. According to Goodway and Robinson (2015) in the early childhood years (ages 3-7) the athlete should be developing fundamental motor skill competence through a wide variety of programs that are not specific to any particular sport. The athlete will become successful in a particular skill such as catching balls of varying sizes using their hands. A wider developmental base will provide athletes with the most positive outcomes. In the upper elementary years (age 7-11) athletes should begin to take part in multiple sports using the motor skills that were learned at an earlier age. The athletes should be encouraged to focus on their fundamental motor skills. In the middle school years (ages 11-13) athletes should continue sport sampling with a focus on one of two trajectories, deliberate practice of the sport they intend to specialize in or development of skills through activities that will lead to lifelong physical activity. Finally, the high school years (age 14-18) the athletes

continue down the path of the middle school years while narrowing the focus onto one sport. Through the developmental trajectory model athletes will be able to maximize participation, minimize dropout and follow a pathway tailored to allowing an athlete to reach their maximum potential.

### **Deliberate Practice**

It was originally thought by Ericsson and Charness (1994) that in order to attain expertise that at least 10 years of experience were required, but others have shown that expertise and skill level are not necessarily correlated. Children with unique abilities do not receive mastery of their skill overnight. It is believed that having inherent skills gives you an advantage, but through deliberate practice others are able to reach the elite level. Deliberate practice is more than just play and basic repetition. Deliberate practice, in the context of sports, can be defined as an activity engaged in by athletes that are highly structured with the intention of improving specific aspects of competition performance (Jayanthi et al. 2013). For team sports, such as soccer, practicing within a team setting, as opposed to individually has been identified as more beneficial (Ward, Hodges, Starkes & Williams, 2007). A person that is becoming an expert or elite will be able to focus on breaking down skills into smaller pieces and practicing those skills daily in order master those skills. Current skill level can be directly related to previous amounts of deliberate practice. The athlete that engaged in higher levels of practice for longer periods of time is more likely to become elite.

There have been several studies done to assess the effect of deliberate practice on the creation of elite athletes in soccer. Ward, Hodges Strakes and Williams (2007), examined deliberate practice and its effect on the development of expertise. During this study 203 male soccer players between the ages of 8-18 were selected. The elite athletes were from 4 English

soccer associations run by premier league clubs while the sub elite players were recruited from elementary and high schools in the area. The participants were given domain specific questionnaires. Next the athlete's biographic information as well as retrospective practice history in soccer and activity ratings for domain specific (soccer practice), domain related (watching soccer) and non-domain specific (homework). The biographic information yielded no conclusion, elite players did not have a physical advantage. The most significant variable between the elite and sub elite players was found in the retrospective practice history. Team practice was the only variable to separate skill group at each age. The data provided suggests that play without deliberate practice will not help to yield elite players. It is found that deliberate practice contributes to a higher chance of becoming an elite athlete. It was found that U-18 sub elite players accumulated 2,890 hours in playful, soccer-related activities, and invested only 998 team and 1,102 individual hours in deliberate practice. In contrast, U-18 elite players spent only 1,971 hours in playful activities compared to 2,484 team hours and 2,058 individual hours of deliberate practice. These results help to show a correlation between deliberate practice and the ability to become an elite athlete. (Ward, et.al, 2007)

Supporting this research is a study by Ford, Ward, Hodges and Williams (2009) assessed deliberate practice and the early engagement theory in soccer. For this study three groups of athletes were selected. The first group consisted of "still- elite" players who were in elite programs at the time of the study. The next group "ex- elite" players, entered into elite programs at the same age as the "still- elite" players but are now over the age of 12 and consider elite compared to their peers. The final group was "recreational" which was the control group that participates in soccer recreationally was. All participants were asked about their time playing soccer between the ages of 6-12. A sports and physical activity participation questionnaire was

given to the athletes where they recalled competition, practice and play. It was concluded that athletes in the three groups participated in the same amount of sports outside of soccer, at an average of 1.5 sports other than soccer. There was a difference in the average number of hours per year in soccer activity where the still elite athletes participated in two times as many average hours in soccer as the ex-elite athletes in the same time frame. The recreational group participated in fewer hours per year in soccer practice. The still elite group participated in more hours of soccer practices or deliberate practice in soccer but not in regular play as opposed to the recreational group. This shows that successful soccer players participate in a higher amount of deliberate play in soccer. Deliberate practice is essential in the acquisition of expert performance in soccer and reaching professional status.

### **Early vs Late Specialization and athletic success**

There were several studies that discussed the difference between early and later sports specialization and what leads to more athletic success. Barreiros and Fonesca (2012) discussed senior or elite athletes and determined whether or not they had international experience in their youth and how this affected them later in their careers. The study looked at the sex of the athletes and determined females started involvement in international play significantly earlier than males but there was no significant difference in proportion of males/females that reached international status during youth. The type of sport they belonged to and found no significant difference in age of international debut of athletes from different sports. Finally, the amount of success the athlete had found a large proportion of athlete who did not participate in international competition in their youth competed in major competitions later in life. This helps to support the findings, that you do not need to specialize at an early age in order to become an elite athlete. (Barreiros & Fonesca, 2012)

Another study that evaluated early versus late specialization and an athlete's success was developed by Haugaasen, Toering and Jordet (2014). The authors aimed to look at whether engagement in non-soccer activities contributed to future success in soccer. It was found that 63% of soccer players participated in one or more sports outside of soccer. Subsequently 37% of the athletes participated in only soccer. The professional players stated that they started and finished their participation in sports outside soccer later than non-professionals. Although only the age-difference at which they finished deemed to be significant. The results showed that it is possible to become a senior athlete by engaging in other sports during your youth. This directly correlates to the idea that an athlete can specialize at a later age and become an elite athlete. The author concluded that while it is possible to reach elite status later in life without specializing in soccer at an early age, soccer specific practice may be where the elite players spent a majority of their time. The data suggests that the outside activities may relate to personal characteristics such as social skills. As stated earlier deliberate practice and the amount that is taken seems to be an important factor in determining athletic success later in life. (Haugaasen, Toering, & Jordet, 2014).

Examining the differences between early specialization and late specialization of elite athletes was studied by Moesch, Elbe, Hauge and Wilkman (2011). The major findings from this study demonstrated that by the age of 21 the elite athletes had around 1,000 more hours of training due to specialization at an early age. This study was able to show that elite athletes were more likely to specialize later in their athletic careers while semi elite athletes surprisingly had started playing their given sport at an earlier age and by 9 years old had more practice hours. The semi elite athletes go through milestones such as the developmental model of sports specialization states. There was also no large difference in the amount of time the athletes were

involved in other sports; semi elite athletes spent around 62 months in other sports while elite athletes spent 63 months. Overall this study was able to show that athletic ability can be made up for with late specialization. (Moesch, Elbe, Hauge & Wikman 2011).

### **Genetics**

When discussing sport specialization it is often asked whether an athlete is born or made. It is suggested that there are two key elements in the formation of an elite athlete the first being an athlete is born, they must possess certain genetic characteristics and conditions. (Rodríguez, 2016). The second element is the sports training they do. These elements are intertwined and independently, will only take an athlete so far. In some athletes their genetic potential will be of greater importance due to the role it plays in determining many of that individual's anatomical, biochemical, physiological, and behavioral characteristics (Tucker & Collins, 2012). It is also suggested, that where training maximizes the likelihood of obtaining a performance level, there is a genetic ceiling that the athlete can reach. This accounts for the observed dominance of certain populations in specific sports (Tucker & Collins, 2012). In the study on genetics and athletic performance by Guth and Roth (2014) they looked at different genes and if they were able to predict who would become an elite athlete. It was found that there are people who do possess a favorable genetic profile, thus when combined with an optimal training environment, this can lead to an elite athlete. However they were unable to find many genes that were consistently associated with elite athletic performance. Also there were no genes that are linked strongly enough to warrant their use in predicting athletic success. (Guth & Roth, 2014). While it appears that genetics can create a genetic ceiling that training cannot surpass, you can reach high levels with optimal training.

## **Athletic Burnout**

Burnout is known as physical or emotional exhaustion. This can cause an athlete, who may be able to reach the elite level of their sport, to quit playing and never fully reaching their potential. The current research in sport specialization shows that athletic burnout among athletes is becoming more and more prevalent. Athletic burnout can occur due to the physical, as well as the psychological, effects felt from trying to become an elite athlete. Injuries, increased training loads, performance impairments and situational pressure can all be factors that contribute to athletic burnout.

According to a study by Moen et al. (2017) there are three main dimension of athletic burnout. The first dimension is physical and emotional exhaustion, this is fatigue caused by practice and games. The second dimension is athletes not being able to reach the goals set for themselves or by others and having a lack of accomplishment. The third dimension is sport devaluation, this is where an athlete loses their passion for the sport or has a loss of interest in that sport. In this study, the researchers aimed to find a correlation between training load, injuries, perceived performance, positive affect and negative affect in order to predict which athletes would experience athletic burnout. Positive affect refers to the extent to which an individual subjectively experiences positive moods such as joy, interest, and alertness while negative affect is a personality variable that involves the experience of negative emotions including anger, contempt, disgust, guilt, fear, and nervousness and poor self-concept. In this study the researchers found that positive and negative affect were able to significantly and directly predict athlete burnout. The researchers used the cognitive activation of stress theory in order to determine whether situations had a positive or negative affect on an athlete. Positive affect helps to stimulate feelings on enthusiasm, high energy, high concentration and pleasure.

Positive stress or eustress has a positive affect and is that is interpreted as being beneficial for the athlete based on the questionnaire the athletes answered. Negative stress or distress is associated with high anxiety or pain and can ultimately lead to athlete burnout. This study found that 57% of the variance in athlete burnout and the direct effects on athlete burnout were caused from positive affect and negative affect variables. The researchers were also able to demonstrate indirect correlations to athletic burnout in illness and injuries. Through this study they were able to show that it is not just the amount of physical activity or stressors caused by deliberate practice that causes athletic burnout. But rather it is how the athlete relates to the emotional and cognitive stressors of obtaining the status of elite athlete. In order to prevent athletic burnout there must be a focus on positive affect and limit the amount of negative affect as long term negative stress can lead to athletic burnout.

Similarly, Curran, Appleton, Hill and Hall (2011) investigated the relationship between passion and athletic burnout. In their study the researchers aimed to observe two forms of passion obsessive and harmonious, and its relation to athletic burnout and motivation. Harmonious passion has been seen to increase positive outcomes and increase intrinsic joys. Obsessive passion has been seen to be caused by the undertaking of an activity to reach a reward. If individuals do not complete these goals or activities they may experience negative stressors. Harmonious passion can be seen as the love of a sport and participating in a sport because they get enjoyment out of it, while obsessive passion could be seen as an obligation to become an elite athlete and the stressors associated with needing to become elite. The researchers determined that harmonious passion leads to a lower chance of athletic burnout. Interestingly enough, obsessive passion was found to not actively correlate with athletic burnout. By looking at this we are able to see that the athletes who experience harmonious passion and enjoy the activity or sport they're

taking part in, leads to less of a chance of athletic burnout. Even though obsessive passion does not directly correlate with an increased chance of athletic burnout, other stressors such as depersonalization or a devaluation of sport may lead to athletic burnout.

### **Parental Influence**

The effect of parental influence has also been studied in relation to sport specialization. With the growing cost of college, parents encourage athletes to specialize in one sport at younger age, in order to obtain a scholarship later in life. Although this is the goal, scholarships are given to only 2.2% of girls and 2 % of boys across all sports. On one hand parents express enjoyment from the increased interactions with their child due to sports, while on the other hand they have challenges dealing with negative effects on a child such injuries or lack of motivation passion.

Livingston, Schmidt and Lehman (2016) interviewed parents in order to determine assessment of early and late specialization in soccer. Fifty nine parents from California soccer clubs between the ages of U8-U12 were surveyed relating to previous experiences, interactions with others in the soccer program, time and financial commitments, demographics, participation in other sports and reason for participation. This study was based on a 6 point Likert scale where 1 is strongly disagree and 6 is strongly agreed. The survey showed that the number one reason for parents to have their child participate competitive soccer programs was wanting their child to exercise regularly as well as to improve their soccer skills. The next reason parents get their children involved in competitive soccer clubs is the child's interest in the sport. Through the survey researchers were able to determine another rationale for their child's participation in the soccer was the desire for their child to receive a scholarship to college and having the opportunity to play soccer professionally. It is important to note that parents did not rate receiving a scholarship or professional contract as the main cause for participation. Even though

2/3 of the parents wanted the child to receive a scholarship or play professionally. By looking at this study we are able to see parent's motivation for having their child participate in a competitive soccer program. Parents strongly agreed with getting athletes involved in sports in order to become a member of a team and learn leadership skills. The social skills acquired through the soccer clubs and the child's motivation seemed to be the biggest influence on why a parent had the child involved in this club. On the other hand, the survey found there were negative aspects voiced by the particular parents. The parents of the athletes who began at an earlier age and the parents whose athletes spent a greater amount of time in the program both believed that their athlete's school work has suffered. Even with parents seeing a negative effect on the child's school work they continue to want the child involved in a program such as this because of all the benefits it offers.

Goodman and James (2017) aimed to compare identical questionnaires based upon questions pertaining to parental involvement in the soccer player's career between parents and the athlete. For this study there were 34 male children aged 8-15, 33 fathers and 1 mother who were given a questionnaire based on a 5 point scale where 5 was always and 1 was never. They also assessed how helpful this involvement was with a 5 point Likert scale where 1 was very unhelpful and 5 was very helpful. Through the questionnaire it was found that the athletes believed their parents to be more involved than the parents believed. It was also found that parents and athletes had differing views on the parent's amount of involvement in their development. The athletes viewed the parents involvement in their sport positively and helpful towards their development. One aspect of the parent's involvement in the sport was parents being disappointed after a match or yelling during a match. This happened infrequently but was viewed as unhelpful to the athlete's development and could be seen as a negative stressor. The

researchers also found that parents believed they would give directive behavior to their child after a match 2.45 (sometimes) and the child believed they would critique those 2.94 (sometimes) by telling them what needed to be improved upon, how they played and some areas where technique can be improved. Although the parents and athletes differed on how much critique was given, the athletes and the parent almost perfectly agreed on how much praise was given at 3.82 and 3.81 respectively. This study helps to show how parents and athletes perceptions differ on the aspect of influence or through directive behavior. Although athletes are not being forced into a sport, their parents are coaching them and adding outside factors to their enjoyment of the game.

Baxter-Jones (2003) aimed to also show a correlation between parental influence and an athlete's participation in a high level sport. For this study 282 elite athletes in the sports of swimming, gymnastics, soccer and tennis between the ages of 8-17 were interviewed and asked why they began high level training. Of the 282 participants in the study, 32 were soccer players. It was found that a young athlete's participation in a high level soccer program was influenced foremost because of their own interest the sport (47%), and made the transition into high level training because of a coach (65%). Parents played the least amount of influence on an athlete's transition to the high level soccer training program at only 6%. Parents did have a significant role in their children first participating in soccer, introducing a child into soccer at 37% but had a low influence on the athlete moving from a recreational to higher level soccer program. Children began participation in soccer programs at the average age of 7.7 and began intensive training at 11.2. Both of these ages were the highest among all four of the sports group. While the ages for participation were the oldest in soccer, the cost of participation was the lowest and had the highest amount of self-motivation. This study revealed that the average annual cost to a

household being 3% for soccer families and as high as 12% for tennis families. 88% of soccer families also reported no financial strain whereas tennis parents reported a financial strain at 43%. By looking at this study it was found that soccer players aren't as heavily influenced by their parents and have a higher amount of self-motivation in moving on to the next step of their soccer careers on their own. The low cost of soccer as well as the later average age allows the athletes to make decisions based on their own motivation and parameters.

## Chapter 4- Discussion and Recommendations for Future Research

This synthesis reviewed 14 articles in order to understand the effects of sport specialization in the creation of elite soccer athletes. There are numerous factors that affect an athlete's ability to become an elite athlete. Specific factors discussed include theoretical framework for sport specialization, deliberate practice, early vs late specialization, athletic burnout, genetics and parental influence. The studies used aimed to show a correlation between early vs late specialization and the effect it has on creating an elite athlete. It is important to remember that one specific factor does not ensure the creation of an elite athlete but rather a combination of multiple factors can help to predict if an athlete can reach the elite level.

Is specializing in one sport the best option for athletes who wish to become elite athletes in soccer or should these athletes participate in a variety of sports to yield this outcome? According to the research in this synthesis it appears that an athlete should not specialize early in the sport of soccer. The development of motor competency at an early age allows for future success in life long fitness as well as provides a range of sports that athletes will be competent in. An athlete should compete in a wide variety of sports and activities and at a later high school age begin to specialize in one given sport. The need for sport specialization early in soccer is not necessary because an athlete does not need to reach peak performance early in their career. Peak performance can be reached at a relatively similar time whether an athlete specializes or not. Different sports such as gymnastics or swimming require an earlier age of entry into the sport which makes specialization more necessary. With the physical developments the body endures an athlete will not reach peak performance in soccer until a later age. In an athlete's adolescent years it is imperative that choices are provided to our adolescents to select the pathway (recreational or elite) and activities that will keep the athlete motivated and engaged in the sport.

Furthermore, outside activities help to develop social skills, other life skills and personal characteristics.

What other factors have an impact on the development of elite soccer athletes? The main factor that influences the development of an elite soccer athlete is deliberate practice and genetics. Possessing a more favorable genetic profile is only one half of the equation when determining an elite athlete. The athlete must also be able to combine their genetic profile with optimal training through deliberate practice. It can be stated that there is a genetic ceiling that an athlete could reach at a point in their career. An athlete with a more favorable genetic profile will not be able to reach their genetic ceiling without optimal training and deliberate practice. It is suggested that training aides in the attainment of the athletes genetic potential. A favorable genetic profile may allow an athlete to a difference in base grasp of a sport within their first exposure. This reflects an athlete's natural talent for the given sport and can be used by coaches in order to identify talent. This also helps to show that an athlete with a better genetic profile may need less deliberate training hours in order to reach a similar level of an athlete with less favorable genetic profile. It is concluded that more practice time equals a higher level of success thus meaning if you start practicing in one sport at an earlier age you will be able to reach a higher level of success. It was concluded that significant ground can be made up in the becoming an elite athlete through soccer specific practice and the amount of deliberate practice attained in that sport even with a less favorable genetic profile.

An athlete's motivation and parental influence can play a role in an athlete's ability to reach the elite level. If an athlete is participating in a sport because of a love for the game, without outside pressures, they experience less of a chance of athletic burnout. Negative stressors on an athlete will lead to a higher chance of athletic burnout causing an athlete to not be able to

reach their full potential. While it was thought that parents were pushing their children into one sport due to financial implications and wanting a child to receive a scholarship research proved otherwise. Instead, it was found that, it is more likely that the child chooses soccer because of their passion for the sport and a parent's desire to teach the athlete social as well as emotional skills.

To emphasize, one of the biggest determining factors of an athlete's success is the amount of time spent on deliberate practice. This supports the research that, the more an athlete participates in deliberate practice of a given sport the higher the chance the athlete will be able to reach an elite level of performance. Optimal training helps the athlete to improve overall ability better than recreational play and non-structured practices.

Sports generalization is advantageous for athletes whose peak performance isn't found until a later point in their careers. Soccer is a sport where athletes begin playing later, as well as join competitive clubs later, thus not peaking until later. Generalization allows an athlete to gain a variety of knowledge from other sports and helps the athlete develop, not only physically but cognitively and emotionally. On the other hand, sports specialization can cause a deficit in these crossover skills. Besides missing out on the benefits of varying sports, sports specialization at an early age can lead to social isolation, over dependence and burnout. By participating in only one sport athletes may miss opportunities to interact with other peers. As different sports are able to teach different characteristics to young athletes and help to mold them into adults. Also by participating in a sport from an early age an athlete may experience athletic burnout. Athletes may become tired of the sport they specialize in and will quit by the time they get to college if too much negative stressors are put onto a child in their athletic career. This can cause an athlete to quit their given sport before reaching their full potential.

This data is relevant for soccer players, coaches and parents of players in order to be able to create the most successful athlete. There is a variety of determining factors when discussing the creation of an elite athlete where one factor is not an overall determinate but a piece of the puzzle in what creates an elite athlete. Although nothing is guaranteed, the combination of factors that will create the greatest chance of becoming an elite athlete is: a commitment of time to deliberate practice, a favorable genetic profile and sports generalization at an early age. With knowing this, coaches can plan practices with a greater focus on optimal training, while parents and players can spend time on deliberate practice at home while still enjoying playing sports outside of their primary focus. With everyone knowing the importance of deliberate practice, time will be used more effectively. Finally, noting the benefits that different sports can teach athletes will help to prevent athletic burnout making for happy players, parents and coaches.

### **Recommendations for Future Research**

This synthesis was limited by the amount of female elite athletes studied and should be applied foremost to male soccer players. A suggestion for future studies would be a greater focus on elite female soccer athletes. There was adequate data based on females in sports other than soccer, but not enough information on female elite soccer players. An overwhelming amount of the articles were retrospective studies. Most of the studies found were done using retrospective studies having elite athletes look back on their journey from a young age to elite soccer status. In the future it is suggested to create a longitudinal in order to observe an athlete throughout their career which seems to be lacking in the research. Much of the research only looks at the elite athletes retrospectively which leaves gaps in the knowledge and literature. A longitudinal study will allow a researcher to look at athletes over a long period of time and see how their attitudes and training change over time. This longitudinal study could collect practice logs to see exactly

how much time the athlete is spending on each sport. This will allow for real time monitoring of athletes and provide a more in-depth look at sport specialization from high school on to see what creates an elite athlete. These types of criteria will allow researchers to see positives and negatives of sport specialization, reasons athletes begin to specialize, the age they specialize and how this affects their ability to become an elite athlete.

## **Appendix A**

### **Article Grid**

## Article Grid

Authors (Year)	Purpose	Participants	Measures	Methods & Procedures	Analysis	Findings
Barreiros, A. N., & Fonseca, A. M. (2012)	This study looked at senior or elite athletes and determined whether or not they had international experience in their youth and how this affected them later in their careers.	532 senior athletes (soccer, volleyball, swimming, judo) 436 male 96 female Athletes born between 1974-1983	Retrospective data relative to sex, type of sport and level of success in the sport. Average age of debut was taken into account as well involvement in youth development	Mann-Whitney U test for difference in age of international debut, sex differences in team vs individual sport. Kruskal-Wallis test compare age across all sports. Descriptive test and chi square tests. Data was analyzed by PASW software.	Sex- females started involvement in international play significantly earlier than males but there was no significant difference in proportion of males/females that reached international status during youth Sport- no significant difference in age of international debut of athletes from different sports Success- large proportion of athlete who did not participate in international competition in their youth competed in major competitions later in life.	The author was able to show that an athlete will be able to make it to the international stage without early success in the sport.
Baxter-Jones, A., & Maffulli, N. (2003)	This study aimed to identify the parental influences on elite athletes participation in soccer gymnastics, tennis and swimming	282 male and female athletes 71 gymnasts 82 swimmers 96 tennis 33 soccer (only males)	Semi structured interviews used to identify routes into training Coded responses belonging to 1 of several categories	Mixed longitudinal interdisciplinary design that used 5 ages cohorts ages 8,10,12,14, 16 years of age	Age of participation soccer 7.7 Age started intensive training in soccer 11.2  No financial hardship soccer 87.9% Mild 9.1 Moderate 3.0	%. By looking at this study it was found that soccer players aren't as heavily influenced by their parents and have a higher

					Average cost of soccer 220	amount of self-motivation in moving on to the next step of their soccer careers on their own. The low cost of soccer as well as the later average age allows the athletes to make decisions based on their own motivation and parameters.
Curran, T., Appleton, P. R., Hill, A. P., & Hall, H. K. (2011).	The purpose of the study was to examine the relationship between forms of passion harmonious and obsessive; and its relation to athletic burnout motivation	149 elite male athletes average age of 16.2 Playing for an average of 9.1 years	Passion for sport 7 point Likert scale, Self-determined motivation used the sport motivation scale on a 7 point Likert scale, Path analysis, athletic burnout questionnaire	Athletes who attended united kingdom soccer academies completed the passion scale, sport motivation scale and athletic burnout questionnaire	Harmonious passion negatively related to latent athletic burnout Obsessive passion was unrelated	Harmonious passion can help to reduce burnout for athletes because of self-determined motivation
Ford, P. R., Ward, P., Hodges, N. J., & Williams, A. M. (2009)	This article aimed to examine early participation differences between athletes who progressed to the professional level and	11 still elite soccer players 11 ex elite soccer athletes 11 recreational soccer athletes	Participants filled out a sport and physical activity participation questionnaire Which had a recall of competition, practice and play	ANOVA tests were used to compare groups on each of the soccer activities One way anova was used to examine start age for participation	Average hours per year between ages 6-12 in practice, competition and play	There was a difference in the average number of hours per year in soccer activity where the still elite athletes participated in two times

	those who did not			in different sports		as many average hours in soccer as the ex-elite athletes in the same time frame. The recreational group participated in fewer hours per year in soccer practice. The still elite group participated in more hours of soccer practices or deliberate practice in soccer but not in regular play as opposed to the recreational group. This shows that
Goodman, M., & James, I. A. (2017).	This article aimed to compare the answers of athletes and parents on the aspect of parental involvement in soccer	34 soccer players 33 fathers 1 mother	P-PISQ: assessed the parents opinion of the parents involvement YA-PISQ: assessed the child's opinion of parental involvement YA-Help: assessed the helpfulness of the parent's involvement from the child's opinion.	Parental Involvement Sport Questionnaire was administered to the participants, and comparisons made between the parents and children.	The children' rated their parents as engaged in higher levels of parental involvement as opposed to the parents' own ratings	This study helps to show how parents and athletes perceptions differ on the aspect of influence or through directive behavior. Although athletes are not being forced into a sport, their parents are coaching them and adding outside

						factors to their enjoyment of the game.
Goodway, J. D., & Robinson, L. E. (2015)	This article reviewed the different trajectories of sport specialization and considers the positives and negatives of sport specialization	Review Article	The article looked at the developmental frameworks Mountain of Motor Development, Developmental Model of Sport Participation, Spirals of Engagement Trajectory model	N/A	The article gave the positives and negatives of each framework and how they correlate to sport specialization. The article also provided the positives and negatives of sports specialization and gave recommendations based on the information	The article gave a final summary and created a new framework based upon the information provided by the article.
Guth, L. M., & Roth, S. M. (2013).	The present review will provide an overview of the genetics of athletic performance and will focus on the relevance to young athletes.	Article Review	Two gene variants, ACE I/D and ACTN3 R577X, have been consistently associated with endurance (ACE I/I) and power-related (ACTN3 R/R) performance, though neither can be considered predictive.	N/A		A favorable genetic profile, when combined with an optimal training environment, is important for elite athletic performance; however, few genes are consistently associated with elite athletic performance, and none are linked strongly enough to warrant their use in predicting athletic success.
Livingston, J.,	Positives	Female 37	(1)	Sent surveys	looked at the	It was able

Schmidt, C., & Lehman, S. (2016).	and negatives of sport specialization at an early age.	Male 22 U8- 7 U9- 10 U10- 12 U11- 3 U12- 27	Motivation to participate in sports (2) Perceptions of parents experience in the sport (3)How much do children specialize in one sport? (4) Is there a correlation in elite players specializing at an early age?	to 143 clubs analyzed143 club representative s Club distributed surveys to parents 59 complete surveys returned	correlation and differences between genders as well as age groups in relation to the survey questions	to show the positives such as intrinsic motivation for enjoyment and learning life skills. But it also shows the negatives such as community teams not being complete enough forcing them to specialize and school work taking its toll.
Haugaasen, M., Toering, T., & Jordet, G. (2014).	This article aimed to look at whether engagement in non-football activities contributed to future success in football.	745 male elite football players age 14 to 21 Reduced down to 558 players due to criteria 86 professional players 472 nonprofessional players	This article provides data about elite athletes based on a retrospective questionnaire where athletes rank their outside activities and how it relates to future success in football. The athlete ranked the activities they participated in and found that activities with skills related to football ranked higher than ones that did not. This article aimed to find a	Questionnaire Training diary The investigator analyzed the data and recorded the information.	Statistical analysis in SPSS Two level slopes model with longitudinal measurements to estimate overall means MANCOVA used to determine differences in activity ratings One sample t test	63% of players participated in one or more sports outside of football. Subsequently 37% participated in only football. The professional players stated that they started and finished their participation in sports outside football later than non-professionals. But only the age-difference at which they finished deemed to

			correlation between sport specialization and future success.			be significant. The results showed that it is possible to become a senior athlete by engaging in other sports during your youth.
Moesch, K., Elbe, A., Hauge, M. T., & Wikman, J. M. (2011).	Does early or late specialization in sport helps to produce elite athletes in cgs sports.	243 Danish athletes	Data collected was based on a questionnaire and further interview. The data was based off of biographical info, practice hours, involvement in other sport, career development , weekly training and athletic success	Athletes were chosen for the study Athletes were sent a web based questionnaire After 6 weeks a retest was sent to test validity Athletes participated in an interview study to further test validity Review of data	This study was used to show certain correlations between practice hours, involvement in other sport, career development, weekly training and athletic success.	Elite athletes specialize later in there sports career than near elite athletes. The near elite athletes pass through the three transitions at an earlier age.
Rodríguez Quijada, M. (2016).	Is being an elite athlete implicit in the genes or is it achieved through systematic training?	N/A	he documentation analyzed was selected using a Subject search in various library holdings (Table 1). The papers were chosen based on two criteria: the direct relationship of their subject with the field of study and that They are	Review of relevant data	two key elements in the formation of an elite athlete: first the athlete is born – they must possess certain genetic characteristics and conditions – and he or she is then made during sports training	The study shows that the professional growth of an athlete and their ability to become part of the sporting elite depend in identical measure on two elements of great importance: their genetic heritage and the sports training they do.

			current. As a result we only included documents published in the last 22 years			
Tucker R, Collins M. (2012).	It is not presently possible to ascertain the exact relative contribution of either genes or training to elite sporting performance, and it must be recognized that it is likely that the relative importance of training may differ for different sports, such that in some sports, genetic factors may be more significant.	N/A	Considering genetic and practice effects in isolation is unlikely to yield a satisfactory answer to a complex question. However, in order to develop a systematic understanding of the interaction between inherited and training-related factors, we separately evaluate the two opposing theories for performance, beginning with the model of deliberate practice, followed by a brief review of the key genetic factors that inform our understanding of elite sporting performance.	Review of relevant data	This model, where training maximizes the likelihood of obtaining a performance level with a genetically controlled 'ceiling', accounts for the observed dominance of certain populations in specific sporting disciplines.	The authors conclude that although deliberate training and other environmental factors are critical for elite performance, they cannot by themselves produce an elite athlete.
Ward, P., Hodges, N. J., Starkes, J. L., & Williams, M. A. (2007)	This article look to discuss the soccer	203 male soccer players between the	athlete's biographic information as well as	Two way ANOVA on biographic information	Elite players spent more time in decision	These results help to show a correlation

	specific and non-soccer specific activities effect on becoming an expert	ages of 8-18 were selected. The elite athletes were from 4 English soccer associations run by premier league clubs while the sub elite players were recruited from elementary and high schools in the area.	retrospective practice history in soccer and activity ratings for domain specific (soccer practice), domain related (watching soccer) and non-domain specific (homework)	Discriminant function analysis conducted for age groups on hours per week and accumulated hours	making activities, team practice and possessed higher motivation levels	between deliberate practice and the ability to become an elite athlete.
Moen, F., Myhre, K., Klöckner, C. A., Gausen, K., & Sandbakk, Ø. (2017)	This article used variables in order to predict athletic burnout in sports	358 Norwegian junior elite athletes	Athletes responded to general variables covering demographics, psychological variable, athlete burnout, and documented training loads over the past six months	Athlete satisfaction questionnaire Training data Illness/injury Athlete burnout questionnaire Positive and negative affect schedule Penn State worry questionnaire	There are three dimensions of athletic burnout Physical and emotional exhaustion, athletes not being able to reach goals, sport devaluation	In order to prevent athletic burnout there must be a focus on positive affect and limit the amount of negative affect as long term negative stress can lead to athletic burnout.

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