

Longevity in Athletics: How Early Sport Specialization Can Change the Game

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ABSTRACT

Sport specialization is defined as intense, year-round training in a single sport with the exclusion of others (Jayanthi et al., 2012). Current research has shown that there has been a dramatic increase in youth sport participation over recent years, with a coexisting increase of early sport specialization (ESS). The overall effect of ESS on longevity in athletics is not yet fully understood. Studies in current academic literature have not definitively established that ESS is either beneficial or detrimental to an athlete's physiological and psychological health (LaPrade et al., 2016; Mattson and Richards, 2010). However, some available evidence suggests active participation in ESS may lead to higher rates of physiological and psychological issues, including: overuse injuries, burnout, and emotional distress (DiFiori et al., 2014; Jayanthi et al., 2012; LaPrade et al., 2016). The objective of this research project is to provide an understanding of the factors that influence an athlete's appeal to specialize (coaches, parents, school size, choice of sport, etc.) and to determine the effect ESS has on longevity in athletic participation. A survey was developed utilizing Qualtrics (2015, Provo, UT), and participants of the study included current students and student-athletes at a Midwest Division III college. This survey employed the use of multiple choice and open-ended questions. Results showed that a majority of participants specialized in sport (68.03%), with a majority beginning to specialize at age 11 or younger (23.49%). Participants who specialized reported high numbers of chronic injuries, yet they argue that specializing in sport was beneficial to their athletic success. With this information, recommendations can be made to the sporting public regarding early sport specialization.

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CHAPTER 1

INTRODUCTION

The activity levels of America's youth have been declining at a rapid, increasing rate for the past decade. A third of U.S. children fall into the overweight category, six times more than that in 1980, while another third are riding the border (Ratey, 2012). In today's technology-driven world, the effort needed to move children from their iPad screens and out onto bikes is becoming a challenge for parents and teachers alike. Researchers and physicians have been aggressively searching for a clear solution to this widespread issue, but it seems the problem has become considerably greater than many could have imagined. Yet, while some youth are becoming less and less active, the number of children who are participating in organized athletics is steadily on the rise (Ferguson & Stern, 2014). The drastic differences seen between the athletic experiences of the youth today beckons a deeper look into why this change has occurred.

Most significantly, the age in which children are beginning to engage in organized athletics has lowered tremendously. Between 1987 and 2008, the number of athletes under the age of six participating in organized sports rose from 9% to 14% of all youth athletes participating, underlining the earlier entrance of youth into organized sport (National Council of Youth Sports, 2008). By these statistics and simple observation, it may be easy to see that youth sport participation has made the drastic change from backyard, youth-driven, pickup games into an adult-driven, high-intensity, and highly structured activity focusing on developing sport specific skills at a young age (Jayanthi, Pinkham, Dugas, Patrick, & LaBella, 2012). The question remains—what factors have contributed to this drastic change? Jayanthi et al. (2012) attribute this evolution of youth sport towards a more intensive activity to society's heightened regard for successful elite athletes. Consequently, this heightened regard influences young athletes to devote a greater amount of focus on achieving the same levels of elite competitive success. Among this

particular influence for children to begin competing in organized sport are other factors, including: parental and coach influences, the development of socialization skills, hope at achieving greater accomplishments, and improving general fitness (Ferguson & Stern, 2014; Feeley, Agel, & LaPrade, 2016).

Overall, there is evidence that both the amount of children who are exhibiting extremely unhealthy lifestyles and children who are participating in organized sport are both growing in number (Ratey, 2012; Jayanthi et al., 2012; LaPrade et al., 2016). There is little doubt that health professionals, parents, coaches, and physical education teachers need to improve upon their effort to maximize healthy physical lifestyles for our country's youth, but there is substantial controversy as to when a child should become specialize in a single sport.

Sport specialization is most commonly defined as intense, year-round training in a single sport with the exclusion of others (Jayanthi et al., 2012; Ferguson & Stern, 2014; DiFiori et al., 2014). Sport specialization has become a hot topic in modern sport society, as it appears more children are choosing to specialize in one sport early in their athletic careers. Little data in the literature, however, is available to confirm that early sport specialization is increasingly more common than it was in the past, mostly because ESS is a relatively new topic in research (Ferguson & Stern, 2014).

When examining the current evidence presented in the literature, however, it appears as if early sport specialization has seen a dramatic growth in youth athletics (Ferguson & Stern, 2014; National Council of Youth Sports, 2008; Jayanthi et al., 2012). A recent study performed by Bell et al. (2016) reported that the prevalence of sport specialization in high school athletes was between 22-48% of total number of athletes, depending on whether the athletes self-classified or were classified based on a 3-point classification scale. This study was the first to report the prevalence

of sport specialization in athletes recruited in high schools instead of clinic-based settings. This simple difference in study participants helps to provide the public with more relatable and generalizable information. The rise in popularity of early sport specialization has been attributed to various factors, including: the media's increased coverage of successful elite athletes, parental and coach encouragements, increasing opportunities to compete in tournaments and leagues, and the lure of college scholarships and potential professional careers (DiFiori et al., 2014; LaPrade et al., 2016).

In order to be highly successful and competitive on the elite athletic stage, athletes must endure extensive and exclusive training regimens in their particular sport. This requires hours of practices and individualized training, competing against the best of the best. For many young athletes, this may present a multitude of physiological and psychological consequences. The constant desire to be at the top level and outperforming fellow competitors may drive young athletes to become more prone to overuse injury, skill developmental issues, loss of interest in sport altogether, mental exhaustion, and even complete sports withdraw. However, the claims supporting early sport specialization state that specializing could lead to improved competitive edge, early talent recognition, quicker skill development, and an increased opportunity for collegiate scholarships or achieving elite status (LaPrade et al., 2016; DiFiori et al., 2014; Ferguson & Stern, 2014).

Statement of Problem

Presently, scientific evidence tying early sport specialization to an increased rate of injuries, burnout, and other potential deterrents, is significantly lacking. Likewise, there is very little evidence available regarding the potential benefits to participating in early sport specialization (DiFiori et al., 2014; Jayanthi et al., 2012; LaPrade et al., 2016). The objective of this research

project is to provide an understanding of the factors that influence an athlete's appeal to specialize (coaches, parents, school size, choice of sport, etc.) in relation to the claims made in the literature, and to then explore the effect early sport specialization has on longevity in athletic participation through a study of current and former athletes.

The Current Study

Building from the interpretations of early sport specialization in current academic literature, the current study will focus on determining the implications of sport specialization by surveying both students and student athletes at North Central College, a Division III college located in Naperville, IL. The goal of this research project is to determine early sport specialization's effect on longevity in athletic participation of current students and student-athletes at North Central College. This research project is part of an Honors Thesis through North Central College's College Scholars Honors Program.

A survey was constructed utilizing the online survey system, Qualtrics (Qualtrics, Provo, Utah). Survey questions included demographic questions, questions about sport participation in youth, middle school and high school, and motives or influences for choosing to specialize in sport. The survey included both open and close-ended questions. The survey attempted to uncover both the benefits and consequences that athletes experienced following their decision to specialize in sport or remain multisport athletes, as well as to provide parents, coaches, and athletes with recommendations regarding early sport specialization.

Research Hypotheses

- 1) Parents and coaches are the greatest influences on an athlete's decision to specialize in sport.

- 2) Individuals from larger high schools (> 1,500 students) will be more likely to specialize in sport due to increased competition for team positions.
- 3) Athletes who specialize early during their athletic careers will experience higher rates of overuse injuries, psychological issues, and burnout than their multi-sport counterparts.

Operational Definitions

- **Sport Specialization:** Sport specialization is most commonly defined as intense, year-round training in a single sport with the exclusion of others (Jayanthi et al., 2012; Ferguson & Stern, 2014; DiFiori et al., 2014).
- **Early Specialization Sports:** Sports that require a child to specialize and commit to a year-round training regimen before the age of twelve. Examples of early specialization sports include gymnastics, swimming, diving, and figure skating. (LaPrade et al., 2016)
- **Late Specialization Sports:** Sports that do not necessitate an athlete to specialize earlier than the age of twelve (LaPrade et al., 2016).
- **Overuse Injury:** Injury that occurs over time because of repetitive motion and inadequate rest, which leads to microtrauma to the musculoskeletal system (DiFiori et al., 2014).

Limitations

- 1) Students from one, Midwestern, Division III institution were surveyed in this study. This may limit the generalizability of the findings.
- 2) The study did not compare the prevalence of specialization in its entirety or injury rates following specialization across specific sports.

CHAPTER II

REVIEW OF LITERATURE

Sport and the participation in sport has been a staple in childhood and adolescence for countless years. The Sports and Fitness Industry Association (SFIA) reports that 21.5 million children between the ages of 6 and 17 participate in organized sports (SFIA, 2016). The health and social benefit of sport participation is masked by the focus to become an elite athlete (Malina, 2010). However, the amount of intensive training needed to gain elite level status has been long disputed. The 10,000-hour rule, which has been recently popularized by Malcolm Gladwell (2008), supports that in order to become a specialist or professional at a specific skill, one must invest over 10,000 hours of practice, focusing solely on perfecting the skills necessary to succeed (Ericsson, Krampe, & Tesch-Romer, 1993). Although this concept was originally popularized for musicians, the same notion has been extrapolated to sport. While experts agree that sport specialization, to some degree, is beneficial in elevating skill level, it is widely debated as to when this should begin (Jayanthi et al., 2012).

Sport specialization is most commonly defined by researchers as intense, year-round training in a single sport with the exclusion of others (Jayanthi et al., 2012; Ferguson and Stern, 2014; DiFiori et al., 2014). There are two subcategories of sport specialization: early and late specialization. Early specialization sports can be defined as those that require a child to specialize and commit to a year-round training regimen before the age of twelve. Examples of early specialization sports include gymnastics, swimming, diving, and figure skating (LaPrade et al., 2016). Athletes in these early specialization sports may benefit from specializing early “because their peak competitive levels generally occur before full maturity” (LaPrade et al., 2016, p. 3). Comparatively, late specialization sports are those that do not necessitate an athlete to specialize

earlier than the age of twelve. This essentially encompasses the sports that are not listed above, sports such as: football, soccer, basketball, track and field, and multiple more. These sports all have peaks in performance that occur later on in adulthood so specialization is not as necessary.

Procuring a strong definition for early sport specialization has been difficult due to the intricate nature of sport. Even though the topic is being discussed more in the literature, categorizing and defining it is difficult due to the differences in sport specialization requirements, as mentioned above. Because of this, the study of risks pertaining to sport specialized athletes has been hampered simply by the current lack of precise definitions. Some researchers even suggest that there is currently such variation between sports, individual athletes, and training regimens, that a proper definition for sports specialization may not begin to solve the methodological problems that remain (“Intensive Training and Sports Specialization in Young Athletes”, 2000).

Even with all the problems researchers potentially encounter when trying to uphold a working definition of early sport specialization, numerous medical professionals have succeeded in forming various definitions. Some provide simple definitions of early sport specialization, including, “intense, year-round training in a single sport with the exclusion of other sports” (Jayanthi et al., 2012, p. 252; DiFiori et al., 2014, p. 287). Conversely, more complex definitions exist, like one given from a recent roundtable discussion of medical professionals from the American Orthopaedic Society for Sports Medicine (AOSSM). This particular group of AOSSM professionals define sports specialization by the following three criteria: 1) participation in intensive training and/or competition in organized sports greater than 8 months per year; 2) participation in 1 sport to the exclusion of participation in other sports (limited free play overall);

and 3) the participation of prepubescent children (seventh grade or roughly 12 years old) in the sport (LaPrade et al., 2016).

Factors Influencing the Appeal to Specialize in Sport

As previously mentioned, there has been a dramatic shift in youth sport from an emphasis on recreational free play to one of precise skill development, with the furthered hope to achieve high levels of success in one sport. There are multiple different factors leading an athlete to specialize in sport. The most prevalent influences may come from previous theories on success in skill, personal encouragements from parents and coaches, the potential for collegiate scholarships and professional contracts, and the ever-growing media coverage of athletics (Table 1, adapted from Ferguson & Stern, 2014).

Table 1: Main Factors Influencing the Appeal to Specialize in Sport (adapted from Ferguson & Stern, 2014)

Parental influences	Coach influences
Potential for collegiate scholarships	Potential for professional contracts
Increased media coverage of successful collegiate and elite athletes	Misinterpretation of theories relating to success in sport

Coaches and parents who support and encourage early sport specialization often refer back to the 10,000 hour theory proposed by Ericsson in 1993, which describes that in order to attain a high level of success one must devote at least 10,000 hours to practicing and perfecting the skill. Even though Ericsson's research was focused primarily on musicians, not athletes, many frequently apply his findings to the world of sport (Gladwell, 2008). Such beliefs of what is required of an athlete to have success in sport, along with the acceptance of certain athlete development models that will be discussed later on, may persuade coaches and parents to encourage children to specialize in sport at a younger age.

One of the most prominent factors impelling a young athlete to first participate in sport is the influence from parents. Later, parental pressure is also a leading factor in urging children to transition from a multisport approach into specializing in only one sport. The reasons behind why parents may encourage early sport specialization may include increased costs of higher education, a desire to see their child selected to play on high-level travel teams, and even gain professional contracts in the future (DiFiori et al., 2014; “Intensive Training and Sports Specialization in Young Athletes”, 2000). As the cost of higher education has increased at an unprecedented rate over recent years, parents are essentially exploring all avenues that may ease the financial burden of sending a child to college. One of these avenues is the area of sport. The potential for a college scholarship may be a significant appeal for parents to encourage their children to specialize. In the present day, those in the world of sport are seeing youth athletes committed to colleges based on their performance at ages 14 and 15 (LaPrade et al., 2012). This early commitment period is attractive to parents, because this means the anxiety about how they will fund their child’s education could potentially be relieved early in their child’s high school athletic career. Additionally, modern-day parents might often believe that their value or worth as parents comes directly from the athletic successes of their children. Therefore, parents may encourage their children to specialize early since sport is a visible activity in the public eye that easily provides objective measures for success (Gould, 2010).

Although parents are often the primary influence on initiating sport, some studies suggest that coaches have a sizeable influence on a child’s decision to specialize in sport (Feeley, 2015; Jayanthi et al., 2012). This is mostly because coaches are typically the first to see the potential for greatness in a child athlete. As Jayanthi et al. (2012) describe, the parent and the child may have goals in sport that become drastically different than those of the coach’s—goals that are rooted in

success in a single sport. It intuitively makes sense that a coach would want their athlete to succeed in sport, and it also makes sense that they want to be the ones help them achieve such success. The parent may not fully agree with the coach's encouragement of specialized training, but does not argue for two possible reasons: 1) the parents does not want to disturb the relationship their child has built with his/her coach, and/or 2) the parent truly believes specialization is necessary in order to continue to have success in the sport (Jayanthi et al., 2012). For these reasons, the child is greatly influenced to specialize by the coach, and the coach receives no backlash from the parent.

The last noticeable factor that influences the appeal for young athletes to specialize in sport is the ever-growing media coverage of athletics. In particular, the televised coverage of young elite athletes has dramatically increased over recent years, including events such as the Little League World Series and the Youth Olympic Games. The encouragement from older elite athletes to 'start young' has also been amplified nationwide, as the media has continued to market this as well as training programs being targeted a youth athletes (Ferguson & Stern, 2014). The media frequently highlights success stories of professional athletes, such as: Michael Phelps who started swimming at the age of seven and finished his career as the most decorated Olympic athlete in history, Lindsey Vohn who began skiing at two years old and became a highly competitive alpine skier by the age of 10, and Tiger Woods who started driving golf balls nearly before he could run and became one of the most dominant athletes in the history of sport (Gould, 2010; Malina, 2010). The success of athletes who started participating in their respective sports at a young age serves as a powerful enticement for others to follow. This is mostly because a dangerous message is sent to young athletes that in order to win and to have success at higher levels of sport, an athlete must have a mentality that promotes excessive training, doing 'whatever it takes' to get to that next level (Gould, 2010).

Does Early Sport Specialization Increase the Potential to Become a Collegiate or Professional Athlete?

The hope of a promising future in collegiate or professional athletics is one of the greatest influences on a child's decision to specialize in sport at an early age. Many of these athletes who specialize fall under the assumption that a high volume, deliberate, and specialized training regimen in their chosen sport will increase their potential to become a collegiate or professional athlete. Ericsson et al. (1993) supported this assumption, indicating that anyone who begins such deliberate practice early will benefit to a greater extent than those who choose to begin deliberate practice later. Despite the scientific evidence behind the necessity of specializing in order for the athlete to develop, the literature does not support the idea that specialization must happen during an athlete's youth in order to gain elite status in adulthood (LaPrade et al., 2016).

A recent roundtable discussion consisting of tens of sport science professionals concluded that ESS is not beneficial for athletes at the highest caliber (e.g., national, Olympic and professional athletics) (LaPrade et al., 2016). In fact, LaPrade et al. (2016) found that ESS may even be detrimental for this population. The results of many studies in the literature have strongly supported this belief. For example, Gullich and Emrich (2006) assessed more than 1500 German Olympic athletes and discovered that these elite athletes participated in multiple sports after the age of 11, and specialized in one sport later on in their athletic careers. Moreover, Carlson (1998) evaluated elite and near-elite tennis players and found that those who began intense training and specialized after the age of 13 gained elite status more often than those who specialized before the age of 11. Lidor and Lavyan (2002) also evaluated elite and near-elite athletes who compete in a variety of different sports and reported that the elite athletes were more likely to begin intensive training after the age of 12 and compete across a multitude of different sports during their

developmental years (<11 years of age) (Feeley et al., 2015). Similarly, Moesch, Elbe, Hauge, and Wikman (2011) studied 148 elite Danish athletes and 95 near-elite Danish athletes who previously participated in multiple sports to determine when they specialized in sport. They found that the elite group of athletes had spent less time in intense, specialized training prior to the age of 15 compared to the near-elite group. By the age of 18, the two groups expressed similar numbers of specialized training hours, but by the age of 21 elite athletes had accumulated more specialized training hours. Researchers concluded that this was most likely due to the demands of being an elite athlete (Moesch et al., 2011).

Despite the conclusions made from these specific studies, there is little evidence that specializing early will either hinder or ensure the chances of gaining elite evidence. However, many studies suggest that early diversification is more likely to lead to success later in an individual's athletic career (Carlson, 1998; Gullich & Emrich, 2006; Lidor & Lavyan, 2002; Moesch et al., 2011; Jayanthi et al., 2012). Similarly, it appears as if the costs from specializing early may outweigh the benefits one hopes to gain.

For most sports, there is no significant evidence that increasing the intensity of training and specializing early (before puberty) will lead to success in achieving elite level status. Exceptions to this include highly technical sports that require early peak performance, including: gymnastics, figure skating, swimming, and diving (LaPrade et al., 2016). But, it is important to keep in mind that research on this topic is not conclusive. It is also important to keep in mind the objective reality of competitive sport. It is a fact that very few athletes achieve playing in such high levels of sport, as less than one percent of young athletes achieve elite success in sports like basketball, baseball and football (Jayanthi et al., 2012; Malina, 2010). Of course, an ideal age to specialize and the

chances of achieving elite status may vary from sport to sport (Figure 1). Even though these statistics may not favor specializing in sport at a young age, youth athletes remain convinced that they could have a shot at a lucrative, professional career if they train hard enough in the particular sport. This is simply because the aspiration to play professionally does not seem so far-fetched to children, as they mostly have been positively encouraged thus far in their athletic experiences.

Figure 1: Evidence For and Against Early Sport Specialization to Achieve Elite Status (adopted from Jayanthi et al., 2012, pp. 253-254)

Table 1. Evidence for and against early sports specialization to achieve elite status

Study	Sport	Athletes	Before Age 12 Years ^a		After Age 12 Years ^a		Study Conclusions
			Begin ^b	Specialize ^c	Begin ^b	Diversify / Specialize ^d	
Hume et al ²⁹	Rhythmic gymnastics	106 across all levels	+			+	Amount of gymnastic training during development is related to level of attainment. All gymnasts participated in other sports, with no difference between elites and subelites. Enjoyment of gymnastics was strong predictor of attainment.
Law et al ³⁰	Rhythmic gymnastics	6 elite, 6 subelite	+	+			Elites and subelites began intense training at similar ages, but elites were involved in fewer other activities from age 4-16 years and accumulated more hours of training by age 16 years.
Helsen et al ³²	Men's soccer, men's field hockey	33 intl, 39 natl, 52 provincial				+	Soccer began practicing at age 5 years, field hockey at age 9 years. Hours spent in practice were similar among levels until age 12 years. After age 12 years, international players spent more time in practice than national players, and national players spent more than provincial players.
Hodges and Starkes ²⁴	Wrestling	21 elite, 21 club level				+	Elite wrestlers spent more time training after age 16 years compared with club-level wrestlers. However, since all subjects began intense training at 13.2 ± 0.6 years, comparison to early intense training (before age 12 years) was not possible.
Soberlak and Côté ⁴²	Men's ice hockey	4 elite				+	Elite players intensified their deliberate hockey training in late adolescence and played other sports during developmental years.
Carlson ¹³	Men's, women's tennis	10 elite, 10 near-elite				+	Elite players began intense training and specialized later (after age 13-15 years) than near-elites (age 11 years).
Lidor and Lavyan ²⁷	Various men's, women's sports	63 elite, 78 near-elite				+	Elite more likely than near-elite athletes to begin intense training after age 12 years and to have played > 1 sport during developmental years.
Gulich and Emrich ²¹	Olympic sports	1558 German athletes (Olympic promotion programs)				+	Elite athletes began intense training and competition in their sport later than near-elites (11.4 vs 10.2 years and 13.1 vs 12.0 years). More elites participated in > 1 sport from age 11 years than near-elites (64% vs 50%).
Moesch et al ³⁸	Sports measured in cm, g, or s ^e	148 elite, 95 near-elite				+	Elite athletes began intense training at a later age compared with near-elites. Near-elites accumulated more hours of training by ages 9, 12, and 15 years than elites, while elites accumulated more training by age 21 years than near-elites.
Baker et al ³	Men's, women's field hockey; men's basketball; women's netball	15 elite, 13 near-elite				+	Elites accumulated more hours of sport-specific practice from age 12 years onward. However, all subjects began intense training at about age 12 years, so unable to compare to an early intense training group. Elites had broader range of sports experiences throughout their careers compared with near-elites.
Barynina and Vaitsekhovskii ⁶	Men's, women's swimming	Elite Russian swimmers (number not reported)				+	Swimmers who began specializing before 11 years of age spent less time on a national team and retired earlier than later specialists.
Wall and Côté ⁴³	Boys' ice hockey	Parents of 8 minor league players (mean age, 13.9 y) and 4 ex-minor league players (mean age, 14.5 y)				+	Dropouts began off-ice training earlier than non-dropouts (11.75 vs 13.8 years) and spent more hours in off-ice training (107 vs 6.8 per year). Both groups participated in a similar number of other sports (4.75) from 6 to 13 years of age.

^aPlus sign (+) indicates "evidence for."

^bBegin intense training.

^cSpecialize in sport.

^dDiversify early, specialize in sport.

^eCanoeing/kayak, cycling, orienteering, rowing, sailing, skiing, swimming, track and field, triathlon, weight lifting.

Benefits of Early Sport Specialization

Albeit there are fewer believed physiological and psychological benefits to early sport specialization, it appears as if some sport professionals, athletes, coaches, and parents contend that the benefits to specializing early may counterbalance the potential deterrents. Some sports simply require a young athlete to specialize depending upon the “specificity of the performance requirement for the particular sport” (Landers, Carson & Blankenship, 2010, p. 15). These sports are the early specialization sports that were discussed previously. Aside from these particular sports, some researchers suggest that the benefits to specializing in any sport are greater than any possibility of risk (Mattson & Richards, 2013).

Some benefits of sport specialization often discussed include: better coaching and skill instruction, enhanced/quicker skill acquisition through deliberate practice, early talent recognition, an increased opportunity for collegiate scholarships or professional contracts, improved time management skills, and increased enjoyment of sport and talent development (Gould, 2010; Ferguson & Stern, 2014). Better coaching and skill instruction will usually result from specializing early in sport simply because “most experienced coaches usually work with players who specialize” (Gould, 2010, p. 35). Due to the extra hours spent on deliberately practicing the sport, many also assert that early sport specialization leads to enhanced skill acquisition and an improved ability to manage one’s time. Proponents of early sport specialization also argue that children simply enjoy the sport more as they commit more time to developing their talents. Lastly, and possibly most significantly, it is argued that children who specialize have a greater opportunity for college scholarships or professional contracts down the line than their multisport counterparts.

Detriments of Early Sport Specialization

As early sport specialization is becoming more popular in today's sporting world, sport professionals are beginning to broaden the discussion revolving around the benefits and detriments of specialization. Given the trend towards early and complex training, which typically includes frequent and demanding competition, it is no surprise to many that these young athletes reportedly experience more difficulties in remaining healthy than those athletes who choose to participate in multiple sports. Therefore, it is reasoned that adverse physiological and psychological effects of early sport specialization are seemingly more complex and of a higher quantity than the various benefits to specializing in sport at a young age. Particular detriments of early specialization may include the risk of overuse injury, burnout, social isolation, psychological stress, and overdependence (Malina, 2010; Jayanthi et al., 2012).

Though the scientific evidence that early sport specialization is detrimental to psychological health (e.g., high burnout rates, social isolation) is much more abundant, evidence linking specialization to negative physiological effects still persists. Physiological risks, such as overuse injury, have been heavily reported in those who specialize early across multiple sports due to increased and repeated physical demands and training volumes (DiFiori et al., 2014; Landers, Carson & Blankenship, 2010; Jayanthi et al., 2012). Most particularly, the risk of overuse injuries coincides with an increased exposure to the sport. Therefore, athletes who are specializing in sport and devoting a significant amount of time to that sport will have a greater risk of injury (Jayanthi et al., 2012). In addition, match or competition exposure may also carry a significant risk to obtaining injuries. For example, in a 10-year prospective analysis of 481 youth baseball pitchers (9-14 years old), researchers "found that those who pitched more than 100 innings per year were 3.5 times more likely to be injured" (Fleisig et al., 2011, p. 255). Such overuse injuries are shown to be extremely likely to occur even in sports that require the athlete to specialize at a younger age,

including: baseball, gymnastics, ice hockey, and swimming (Feeley, 2015; LaPrade et al., 2016). However, the risk of injury from intense training and specialization may most be affected by “age, competitive level, growth rate, and pubertal maturation stage” (Jayanthi et al., 2012).

Another potential physiological detriment to early sport specialization may include the inability to obtain a broad range of fundamental athletic motor skills. As a child or adolescent who specializes in one sport participates excessively in sport-specific training for a significant number of hours a week, it is likely that the child cannot develop proper fundamental motor skills—motor skills that would otherwise be obtained through unstructured play and participation in other sports (Landers, Carson, Blankenship, 2010). As a result, researchers argue that children often receive more benefits from participation in a variety of different activities and sports. In fact, some studies suggest that athletes will gain better athletic achievements in a particular sport if they choose to wait to specialize until after the age of 12, instead of specializing in the sport early (Feeley, 2015).

Researchers have suggested that increased pressures for extraordinary performances, isolation from their peers, and chronic stress caused by the constant and extreme physical and mental demands of sport specialization may impact athletes very negatively. This increased pressure to perform to a parent’s or coach’s expectations may expand into a loss of intrinsic motivation, lack of enjoyment, and a potential for injury—subsequently leading to burnout or withdrawal from the sport altogether (DiFiori et al., 2014; Gould, 2010; Jayanthi et al., 2012, LaPrade et al., 2016). However, not all athletes who choose to quit participating in sport are burned out. For example, some athletes simply discontinue sport as a result of various time conflicts or because they have a stronger interest in other non-athletic activities. It is quite possible that these

athletes may choose to participate in the same sport or in a different sport in the future (DiFiori et al., 2014).

Other deterrents to early sport specialization may include the higher cost of participation, increased time demands, and a loss of a ‘typical’ childhood experience (Gould, 2010). As sport becomes more privatized and commercialized, the cost to participate also goes up. Many athletes who specialize in one sport year round may do so through multiple different organizations, including their school system, competitive travel teams, or club teams. The ramification of this is that the cost to participate in all club or travel team is typically very pricey. Secondly, as the child specializes, the requirement to spend multiple hours a week in the gym or on the field intensifies. This increase in time demands on a child may end up resulting in the loss of a ‘typical’ childhood experience—one that is focused more heavily on unstructured play and overall enjoyment.

National and International Sport Organization Recommendations on Early Sport Specialization

Several sport science professionals and organizations are beginning to form conclusions about the impact of early sport specialization on young athletes. These organizations include the American Orthopedic Society for Sports Medicine, the National Athletic Trainers’ Association, and the American Academy of Pediatrics, among others (Ferguson and Stern, 2014). Since more and more athletes are beginning to participate in youth organized sport (and later, early sport specialization), these position statements are necessary as a source of information for coaches and parents of athletes, and also the general public. Even as many professional organizations have published position statements on sport specialization and subsequent intense training in youth, there is limited evidence available in the literature on which to base their recommendations.

Therefore, these organizations mainly rely upon the expert opinion of the organization's leaders and members.

The American Orthopedic Society for Sports Medicine (AOSSM) recently came out with a position statement from a roundtable discussion of its members held in the fall of 2015. Tens of sports professionals discussed the ever-growing topic of early sport specialization and offered an extensive list of recommendations for athletes who are involved in specialization. These recommendations included topics such as: when competitive events should occur, what level of difficulty of skill expected at each age level, and in what conditions "sport activities should be closely monitored for indicators of burnout, overuse injury, or potential decrements in performance due to overtraining" (LaPrade et al., 2016, p. 6). They also concluded that early sport specialization has been recognized as damaging for future physical and mental health of athletes, so further precautions must be taken by sports researchers, parents, and coaches to ensure the safety of the athlete. Overall, researchers present at this discussion determined that multisport participation may be more favorable, as athletes who specialize are more subject to overuse injuries and burnout due to concentrated activity. This is in juxtaposition with other athletes who play multiple sports who typically have "better long-term performance and an increase in lifetime enjoyment of physical activity and recreational sports participation" (LaPrade et al., 2016, p. 1).

Similarly, the National Athletic Trainers' Association (NATA) published a position statement in 2011 regarding intensive training and sports specialization in young athletes, contending that the best way to prevent overuse injuries in youth and adolescent athletics is to encourage sport diversification as apposed to sport specialization (Valovich et al., 2011). The Committee on Sports Medicine and Fitness (CSMF) of the American Academy of Pediatrics (AAP, 2000) coincided

with this argument, viewing such “overuse injuries from high-intensity training as a biomechanical pitfall of early specialization” (Mattson and Richards, 2010). Although they, along with other sport science researchers, argue that the physical and mental consequences of early sport specialization need to be further investigated. Researchers mention that a great challenge to studying such risks of ESS include the variation that exists between sports, individuals, and specific levels of training. However, they contend that pediatricians should be a primary resource for young athletes considering early sport specialization, as they are most often the primary medical contact. Such individuals could provide athletes and their parents with information regarding the issues surrounding specialization at a young age.

The American Medical Society for Sports Medicine (AMSSM) also contends that overuse injuries and burnout in youth sport could be attributed to early sport specialization. They provide recommendations to athletes, coaches, and parents in regards to preventing injury and burnout, including: avoiding excess time commitments, using a valid and/or reliable tool to monitor and avoid burnout, emphasizing skill development and fun over excess pressure on success, and emphasizing the importance of establishing lifelong skills to encourage physical activity (LaPrade et al., 2016).

CHAPTER III METHODOLOGY

Subject Characteristics

Eight hundred and seventeen recruitment emails were sent to students within the Kinesiology department and student athletes from North Central College. In total, 244 individuals chose to participate in the research study, with an overall response rate of 30%. There were 122 female participants and 122 male participants. The age of participants ranged from ages 18 to 32, with an average age of 20.22 years old. Of the current student athletes surveyed, sixteen different sports at North Central College were represented with a majority of the 191 student athlete participants participating in track and field (36.65%), football (15.18%), and cross country (13.61%). Other sports that participants indicated they participated in include: volleyball, soccer, basketball, lacrosse, softball, baseball, triathlon, golf, swimming and diving, tennis, wrestling, bowling, and other (Figure 1). Consent for participation was given within the survey instrument.

Instrumentation

Approval from the Institutional Review Board (IRB) at North Central College was required in order for research to begin because this research involves the use of human participants. An Application for Research with Human Participants was sent to the IRB in November 2016, and approval was granted in December 2016. Immediately following approval, emails were sent to the Athletic Director and the Department Chair of Kinesiology at North Central College to receive the emails of potential participants. Access to the names and emails of all student athletes on campus, as well as all students within the Kinesiology department for use in the online survey was granted. In total, 817 recruitment emails were sent out to individuals and 244 students agreed to participate in the research following the initial email recruitment. The survey was made and distributed through Qualtrics (2015, Provo, Utah), a password protected research database. Only the primary investigator and student researcher had access to the collected data. Data was also kept in a password protected Box folder. No identifying information was collected, other than sex and age.

Following the completion of data collection, two \$25 Downtown Naperville gift cards were collected and raffled off to two randomly selected participants of the survey who chose to provide an e-mail address.

Testing Procedures

Upon IRB approval, an email with the survey link was sent to student athletes and non-student athletes recruiting their participation in this research study. Data collection spanned the course of three weeks during Winter term of North Central College's trimester year (1/2/2017-1/22/2017). Informed consent was provided in the recruitment email as well as in the first question on the survey (see appendices). Debriefing was not required for this research. Questions in the survey were asked regarding basic demographic information, previous experiences with sport, influences on the decision to specialize in sport, and the psychological and physiological impacts of early sport specialization (see appendices).

While there were no perceived risks by participating in this research study, a study by Labott, Johnson, Fendrich and Feeny (2013) discussed that there may be potential harm in participants with pre-existing emotional vulnerabilities. Their study concluded that surveys that ask questions on distressing topics may cause a negative mood or stress, these surveys do not cause harm to the participants (Labott et al., 2013). Therefore, in the recruitment letter, participants were provided with the contact information for the primary investigator if they had any questions or concerns. If any participant described potential emotional harm/distress, the primary investigator provided the participant with the contact information for the Dyson Wellness Center at North Central College and could potentially write an Early Alert Referral as needed.

Data was compiled after the survey window closed using Qualtrics (2015, Provo, Utah). The data was then analyzed using Microsoft Excel (2013, Redmond, WA). Descriptive statistics

were gathered and analyzed for questions about personal influences, influence of the size of the high school attended, belief of sport specialization and success and the prevalence of overuse injuries in those who specialized.

CHAPTER IV

RESULTS

It was hypothesized that in relation to early sport specialization, 1) parents and coaches are the greatest influences on an athlete's decision to specialize in sport, 2) individuals coming from larger high schools (> 1,500 students) will be more likely to specialize in sport due to increased

competition for team positions, and 3) athletes who specialize early during their athletic careers will experience higher rates of overuse injuries, psychological issues, and burnout than their multi-sport. All 244 participants responded that they had participated in organized sport at the youth, middle school, high school, or collegiate level. In total, 95.05% participated at the youth or middle school level, 99.59% participated at the high school level, and 78.28% are current intercollegiate athletes at North Central College.

Additionally, 166 of the 244 participants (68.03%) responded that they specialized in one sport at some point during their athletic careers. Of the 166 student participants who specialized in one sport, 39 participants (23.49%) indicated they had specialized at the age of 11 or younger (Figure 1).

One hundred and fifteen of the 166 participants who specialized responded that they had quit other sport(s) to specialize in that one sport, and 160 of the 166 participants indicated that they trained more than 8 months out of the year in that one sport. Of the current student athletes at North Central College, fifteen different sports were represented with the majority of the 191 student athletes participants participating in track and field (36.65%), football (15.18%), and cross country (13.61%) (Figure 2).

Personal Influences

Within the survey, the question “Who had the most influence on your decision to specialize in one sport?” was asked and 4 multiple choices responses including “Yourself”, “Coach”, “Parent/Guardian”, and “Other” were given as answer options. A vast majority (55.92%) of participants responded “Yourself” to this question, indicating that their own selves were the greatest influence in their decision to specialize in sport, with their “Parent/Guardian” (20.38%) and “Coach” (19.43%) the next greatest influences, respectively (Figure 3).

Influence of Size of High School and Choice of Sport

A total of 67.49% of participants indicated that they graduated from high schools with student populations greater than 1,001 students. However, 67.47% of those who did specialize in sport responded that the size of their high school influenced their decision to specialize “a little” (18.07%) to “none at all” (49.40%) (Figure 4). In comparison, 77.11% of the 166 survey participants who specialized in sport indicated that their choice of sport influenced their decision to specialize in sport “a lot” (36.75%) to “a great deal” (40.36%).

Issues with Sport Specialization Participants Reported

Following specializing in one specific sport, 56.02% of survey participants reported that they suffered an overuse/chronic injury. Additionally, 74 out of the 244 students and student-athletes reported that they had stopped participating in the sport that they had previously specialized in.

Belief of Sport Specialization and Success

In terms of whether or not athletes believe specialization was beneficial to their overall athletic successes, 46.99% strongly agree, 30.72% agree, and 16.27% somewhat agree that specializing in sport was beneficial (Figure 3). In open-ended responses, 54 participants commented on their belief that specializing in sport made them a “better player” or an overall “better athlete”. For example, one respondent stated, “If you specialize in multiple sports then you have to split your time between them. Specializing in one sport means you dedicate all your time to bettering yourself in that sport.” Similarly, another respondent said, “I trained more than my peers and that helped me to excel,”

On the other hand, 90.50% of participants who reported being current or previous multi-sport athletes believe that being a multi-sport athlete was beneficial to their personal athletic successes (Figure 5). One respondent stated,

I learned so much from all of the sports that I played, and I believe those lessons continue to help me now. I learned how to cope with all different types of stresses, competitions, being a good teammate, and developing character and who I am as a person. Specializing definitely makes training easier and benefits the one sport eventually, but early on I think experiencing different sports is important.

Another respondent stated, “I think if athletes enjoy playing more than one sport, it is much more beneficial to play multiple sports rather than specializing in one in particular. As in my case, specialization in a sport can burn an athlete out.” Additionally, one respondent said that while “it allowed [him/her] to become a better volleyball player...it also led to more overuse injuries down the road.”

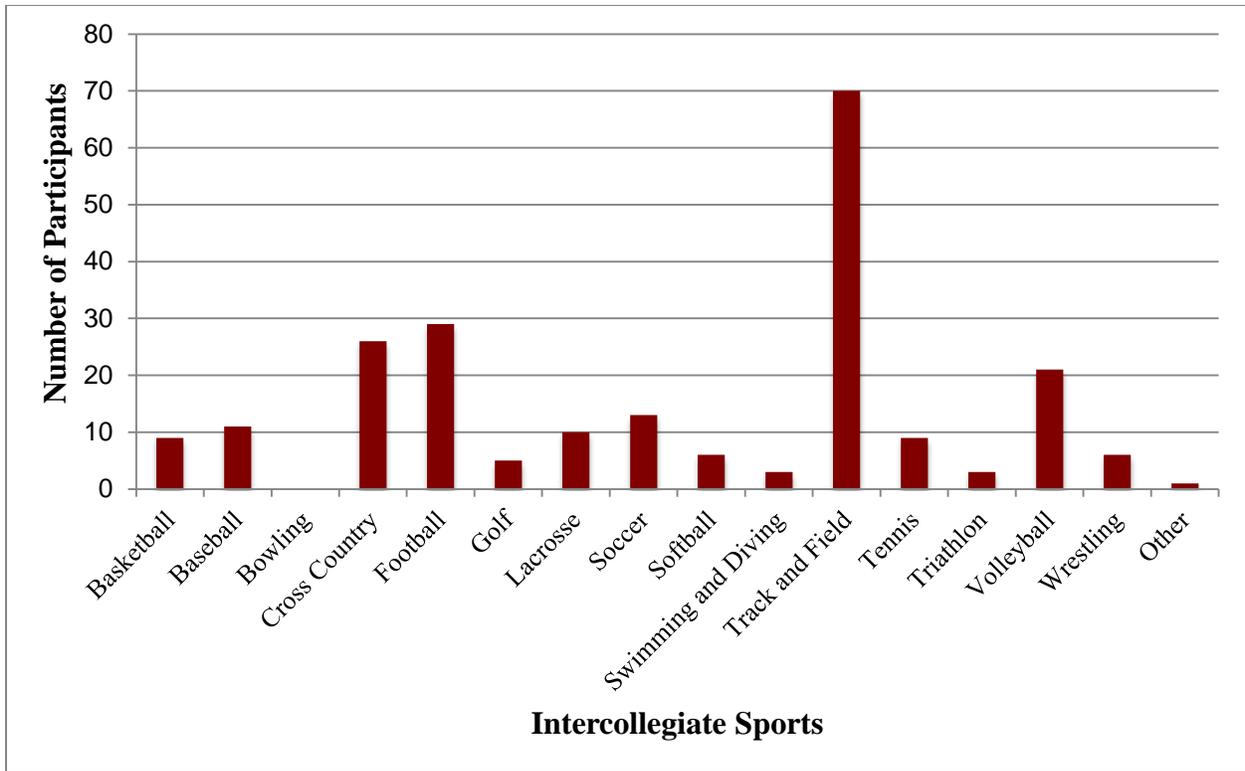


Figure 1: The number of survey participants currently active across various intercollegiate sports.

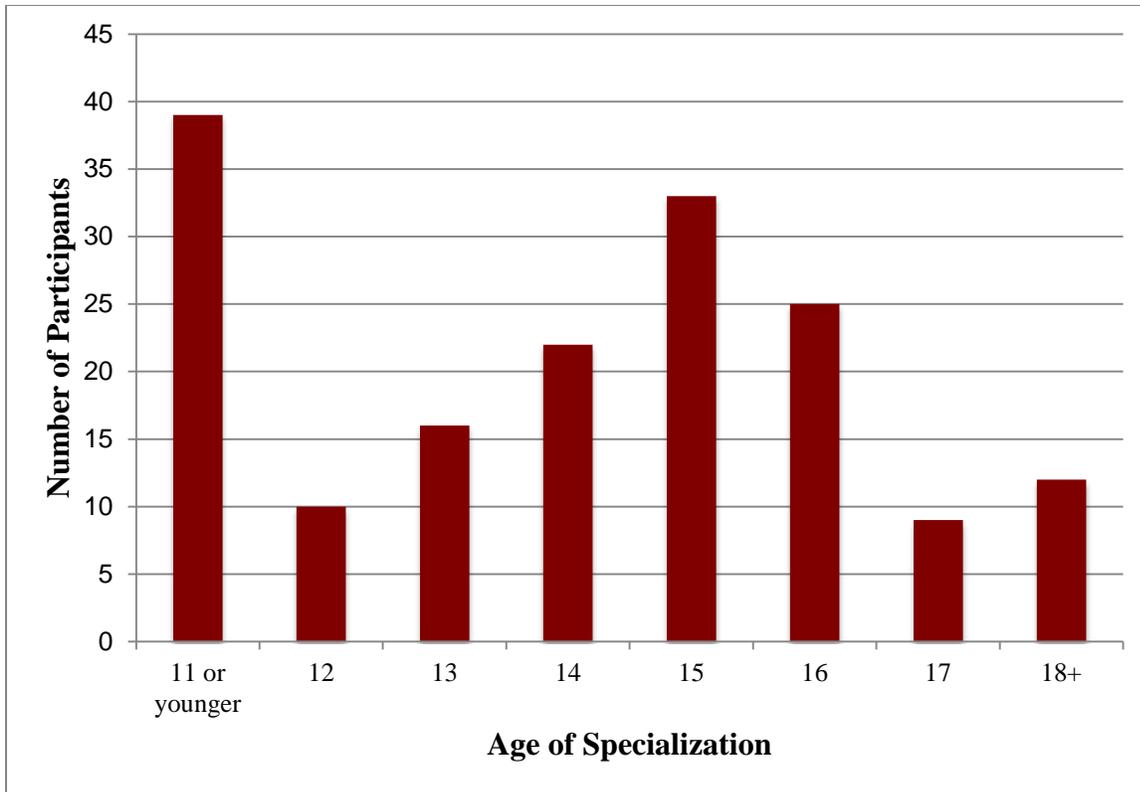


Figure 2: The age of reported specialization in sport of survey participants.

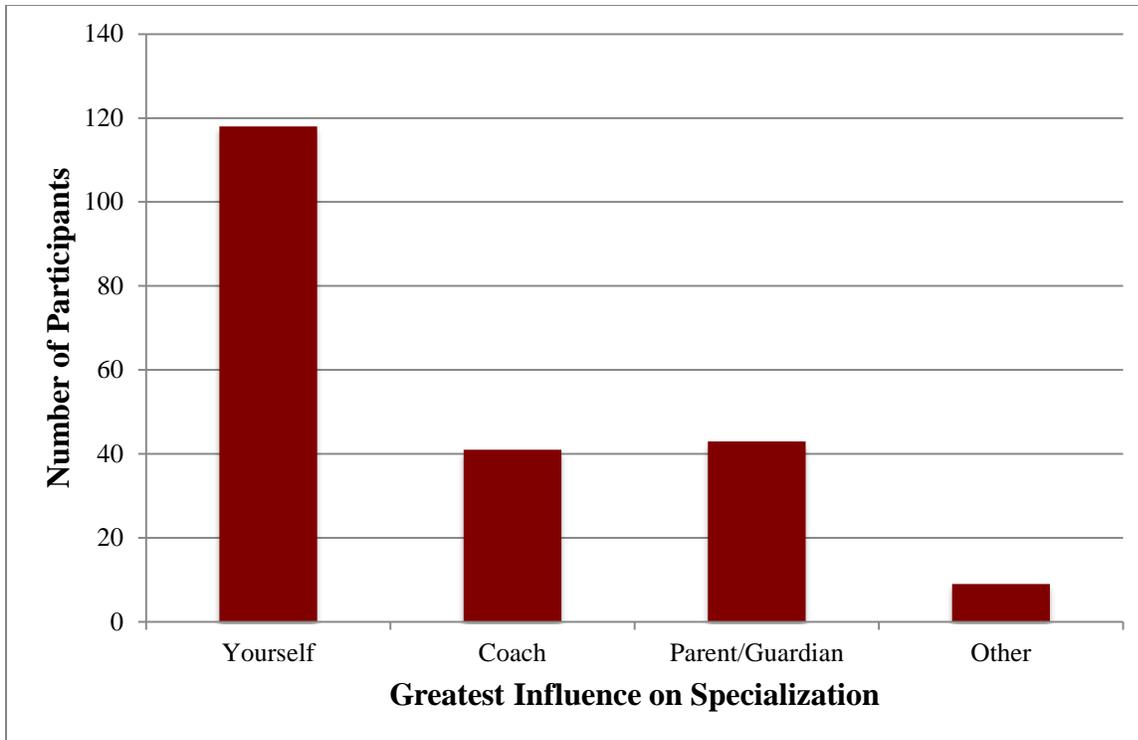


Figure 3. Overall participant response on who was the greatest influence on their decision to specialize in sport.

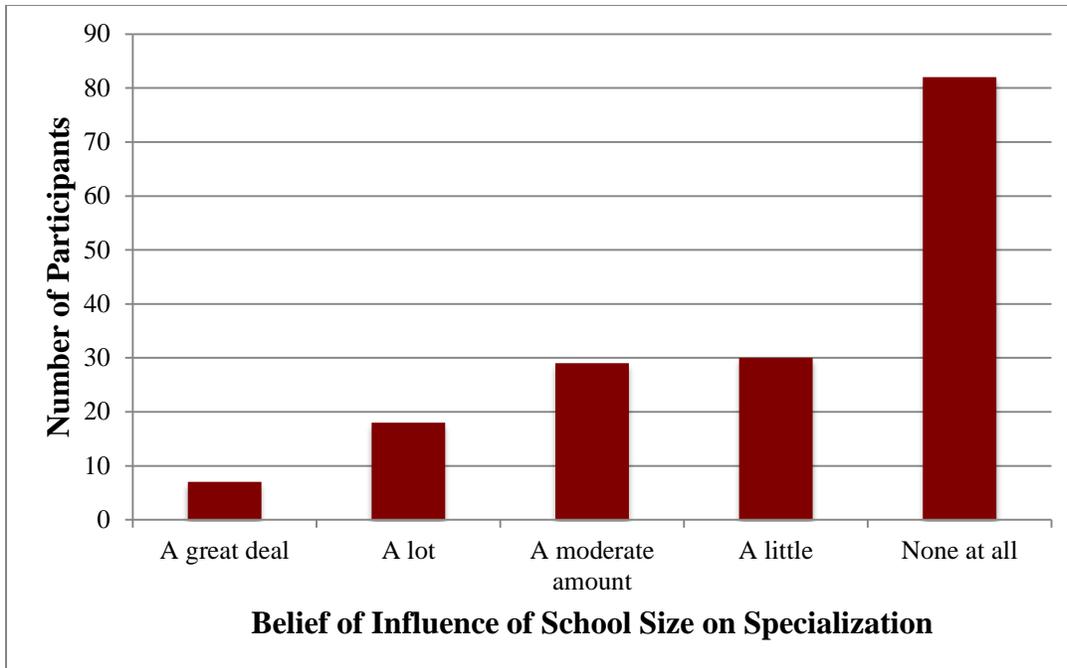


Figure 4. Overall participant belief of how much size of high school influenced their decision to specialize in sport.

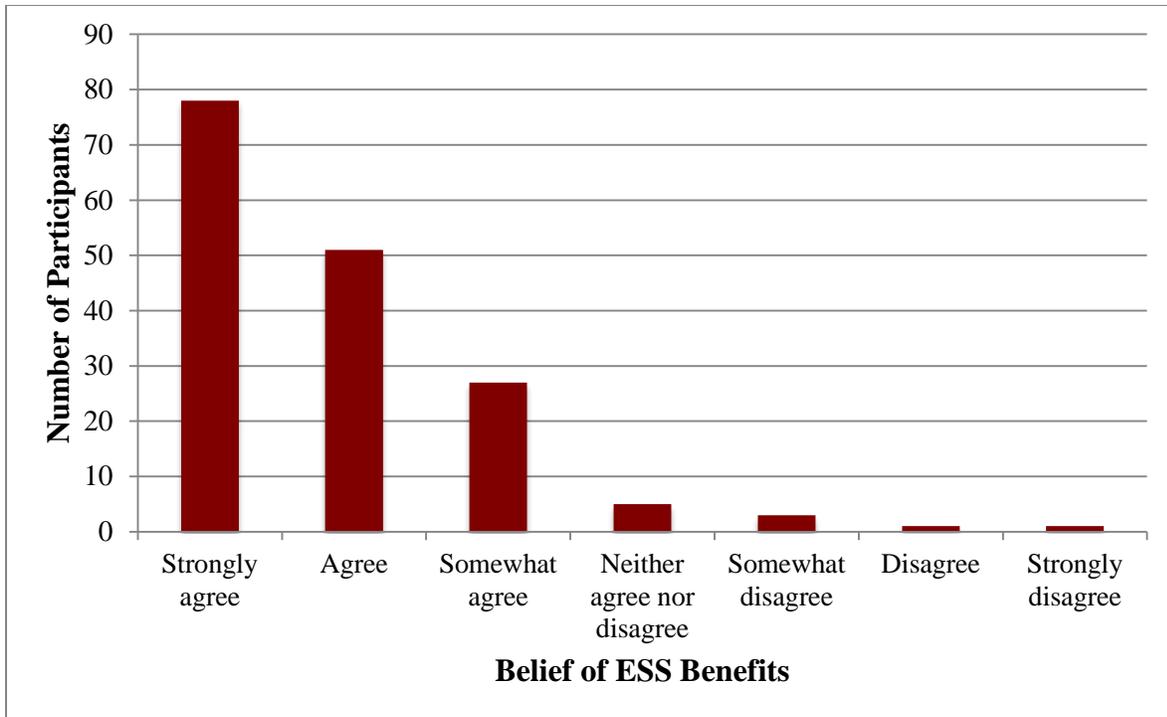


Figure 5: Overall participant belief on if specialization was beneficial to athletic success.

CHAPTER V

DISCUSSION AND CONCLUSION

With the increased participation in youth athletics and the lack of clarity on the benefits of early sport specialization, further research is needed on the topic to properly examine its effectiveness and/or detrimental effects on athletes. The results of this survey-based research study could be a notable addition to the present literature available on the topic of early sport specialization (ESS).

It was first hypothesized that parents and coaches are the greatest influences on an athlete's decision to specialize in sport, in accordance with previous studies in the literature. However, the results of this study concluded that for participants who specialized at some point during their athletic careers, the athletes, themselves, were the primary influence. This is conflicting with available literature on sport specialization, which argues that the primary influences on an athlete's decision to specialize are the coaches and the parents (DiFiori et al., 2014; Feeley, 2015; Jayanthi et al., 2012).

Second, it was hypothesized that individuals coming from larger high schools (> 1,500 students) will be more likely to specialize in sport due to increased competition for team positions. It could be assumed that with a larger school size there will be a larger number of individuals competing for team positions, so athletes may have to specialize earlier in a specific sport in order to progress sport-specific skills quickly enough to make team rosters. However, the participants in this study who specialized in sport seemed to do so without attention to school size, as a majority responded that the size of school influenced their decision "a little" to "none at all". Most respondents came from high schools with a student enrollment greater than 1,000 students, so it is counterintuitive to see that size did not play a part in an athlete's decision to specialize.

Third, it was hypothesized that athletes who specialize early during their athletic careers will experience higher rates of overuse injuries, psychological issues, and burnout than their multi-sport counterparts. Although burnout and psychological issues could not be quantified, the results of this research-based survey concluded that over 56% of athletes who specialized at some point during their athletic careers experienced some form of overuse/chronic injury. This is consistent with the literature available on injury rates, which says that physiological risks, such as overuse injury, have been heavily reported in those who specialize early across multiple sports due to increased and repeated physical demands and training volumes (DiFiori et al., 2014; Landers et al., 2010; Jayanthi et al., 2012).

Results from this current study conclude that the proper time to specialize may rely heavily upon an athlete's individual physical and biological factors, as well as sport specific factors. Each sport is drastically different in the sense that different areas of the body are being stressed, and the ideal age in which to specialize varies due to differences in when peak performance should be achieved. Overall, however, multisport participation is a better option for young athletes than early sport specialization, as it may increase lifetime enjoyment of sport and duration of participation.

One limitation to this particular study is the number of schools that were surveyed. In this research study, only students from one, Midwestern, Division III institution were surveyed. This may limit the generalizability of the findings, as the athletic abilities of athletes from the elite levels and Division I and II levels are drastically different compared to the abilities of Division III athletes. With such differences in ability levels, it is possible that the ages of specialization and injury rates may also be different. Similarly, it may be beneficial to survey high school athletes, as they may not have specialized in sport yet. Surveying athletes at this level would allow researchers to get an individual's true opinion of specialization prior to him/her partaking in specialization.

Surveying athletes and non-athletes from high schools, larger institutions, and elite levels was not possible in this study, but would be beneficial to explore in future study to better generalize data. Secondly, the study did not compare the prevalence of specialization in its entirety or injury rates following specialization across specific sports. Looking at the age of specialization across different sports could be a positive addition to the literature to determine the age in which certain sports are seeing specialization of athletes occur. Additionally, comparing types of injury and injury rates across sports would have provided further insight into which sports are seeing greater levels of injury rates, what types of injuries are occurring across various sports, and given insight into the ideal age to specialize based off of when injury typically occurs in that specific sport following specialization.

Future studies should look at a greater number of athletes across all skill levels (high school, collegiate, elite) and geographical regions should be sampled in order to better generalize data. Additionally, the prevalence of specialization across multiple sports and the injuries that most frequently occur as a result within those sports should be analyzed to properly determine the best age in which athletes should begin to specialize in their specific sport. Lastly, it would also be advantageous to evaluate both multisport athletes and specialized athletes longitudinally across different sports and stages of development in order to effectively compare sport diversification and specialization effects. Currently, much of the conclusions made about the benefits and detriments of sport specialization have been drawn from literature about general intensive youth sport competition, instead of youth specialization studies. Additionally, conclusions are taken directly from research in which a variety of coaches and athletic administrators were surveyed regarding the topic, and this is not ideal because it is solely opinion-based. Factors such as the athlete's relationship to injury, burnout, and other psychological issues should be considered across both

sport specialization and sport diversification groups to make a general, research-driven recommendation on whether or not early sport specialization is beneficial.

Overall, the importance of maintaining healthy, lifelong exercise habits needs to be the most important factor to consider when determining the appropriateness of early sport specialization. Since the percentage of adults over the age of twenty-four who play team sports as a form of exercise is extremely low (less than 3%), it is clear that team sport performance is not the most important factor in ensuring individuals are maintaining lasting exercise habits throughout a lifetime (Ratey, 2012). However, the more consistent exercise an individual partakes in, no matter the form, the greater chance of that person continuing those good habits into the rest of adulthood. Therefore, with acknowledged detriments of early sport specialization such as increased injury rates and burnout, a multisport approach is the most ideal way to ensure a healthy and enduring understanding of the benefits of fitness is attained.

Currently, the benefits of early sport specialization are based on a number of flawed assumptions. These assumptions include ideas such as: early sport specialization will lead to advanced success in sport, an extremely competitive sporting experience is much more important than developing well-rounded skills in a fun environment, and highly athletic talent cannot be developed in environments that do not focus primarily on winning. The importance of well-rounded health and fitness needs be discussed to a greater extent in a child's life—starting with the physical education curriculum and extending to pediatricians, parents, and coaches. These individuals need to be better educated on the potential risks of early sport specialization and the early signs of injury in order to keep athletes in the competition for longer periods of time. This education must quickly begin with sport scientists putting forth greater effort towards publicizing findings and making recommendations for the general public.

REFERENCES

- Bell, D.R., Post, E.G., Trigsted, S.M., Hetzel, S., McGuine, T.A., & Brooks, M.A. (2016). Prevalence of sport specialization in high school athletics: A 1-year observational study. *American Journal of Sports Medicine*, 44(6), 1469-1474. doi: 10.1177/0363546516629943
- Carlson, R. (1998). The socialization of elite tennis players in Sweden: an analysis of the players' backgrounds and development. *Social Sport Journal*, 5, 241-256.
- DiFiori, J.P., Benjamin, H.J., Brenner, J.S., Gregory, A., Jayanthi, N., Landry, G., & Luke, A. (2014). Overuse injuries and burnout in youth sports: a position statement from the American Medical Society for Sports Medicine. *British Journal of Sports Medicine*, 48, 287-288. doi: 10.1136/bjsports-2013-093299
- Ericsson, K.D, Krampe, R.T., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychology Review*, 100(3), 363-406.
- Feeley, B. T., Agel, J., & LaPrade, R.F. (2016). When is it too early for single sport specialization? *American Journal of Sports Medicine*, 44(1), 234-241. doi: 10.1177/0363546515576899
- Ferguson, B., & Stern, P. J. (2014). A case of early sports specialization in an adolescent athlete. *Journal Of The Canadian Chiropractic Association*, 58(4), 377-383.
- Fleisig, G. S., Andrews, J. R., Cutter, G. R., Weber, A., Loftice, J., McMichael, C., & ... Lyman, S. (2011). Risk of serious injury for young baseball pitchers: A 10-year prospective study. *American Journal of Sports Medicine*, 39(2), 253-257.
- Gladwell, M. (2008). *The story of success*. New York, NY: Little, Brown & Company.
- Gould, D. (2010). Early sport specialization: A psychological perspective. *Journal of Physical Education, Recreation & Dance*, 81(8), 33-37.
- Gullich, A. & Emrich, E. (2006). Evaluation of the support of young athletes in the elite sports system. *European Journal of Sport Science*, 13(3), 85-108.

- Intensive training and sports specialization in young athletes. (2000). *American Academy of Pediatrics*, 106(1), 154.
- Jayanthi, N., Pinkham, C., Dugas, L., Patrick, C., & LaBella, C. (2012). Sports specialization in young athletes: Evidence-based recommendations. *Sports Health*, 5(3). doi: 10.1177/19417381113484130
- Labott, S. M., Johnson, T. P., Fendrich, M., & Feeny, N. C. (2013). Emotional risks to respondents in survey research: Some empirical evidence. *Journal Of Empirical Research On Human Research Ethics*, 8(4), 53-66. doi:10.1525/jer.2013.8.4.53
- Landers, R.Q., Carson, R.L., & Blankenship, B.T. (2013). The promises and pitfalls of sport specialization in youth sport. *Journal of Physical Education, Recreation & Dance*, 81(8), 14-15. doi: 10.1080/07303084.2010.10598519
- LaPrade, R.F., Agel, J., Baker, J., Brenner, J.S., Cordasco, F.A., Côté, J., Engebretsen, L., Feeley, B.T., Gould, D., Hainline, B., Hewett, T., Jayanthi, N., Kocher, M.S., Myer, G.D., Nissen, C.W., Philippon, M.J., & Provencher, M.T. (2016). AOSSM early sport specialization consensus statement. *The Orthopedic Journal of Sports Medicine*, 4(4), 1-8. doi: 10.1177/2325967116644241
- Lidor, R. & Lavyan, A. (2002). A retrospective picture of early sport experiences among elite and near-elite Israeli athletes: developmental and psychological perspectives. *International Journal of Sports Psychology*, 33, 269-289.
- Malina, R.M. (2010). Early sport specialization: roots, effectiveness, risks. *Current Sports Medicine Reports*, 9(6), 364-371.

Mattson, J. & Richards, J. (2013). Early specialization in youth sport: A biomechanical perspective. *Journal of Physical Education, Recreation & Dance*, 81(8), 26-28. doi: 10.1080/07303084.2010.10598523

Moesch, K., Elbe, A.M., Hauge, M.L., & Wikman, J.M. (2011). Late specialization: the key to success in centimeters, grams, or seconds (CGS) sports. *Scandinavian Journal of Medicine & Science in Sports*, 21(6), 282-290.

National Council of Youth Sports. Report on trends and participation in organized youth sports 2008. Retrieved from: <http://www.ncys.org/pdfs/2008/2008-ncys-market-research-report.pdf>. Accessed August 29, 2016.

Ratey, J. J. (2012). *Spark: The revolutionary new science of exercise and the brain*. New York, NY: Little, Brown & Company.

“Sports, fitness, and leisure activities topline participation report.” (2016). Retrieved from:

https://www.sfia.org/reports/411_2016-Sports%2C-Fitness%2C-and-Leisure-Activities-Topline-Participation-Report

Valovich McLeod, T. C., Decoster, L. C., Loud, K. J., Micheli, L. J., Parker, J. T., Sandrey, M. A., & White, C. (2011). National Athletic Trainers' Association position statement: prevention of pediatric overuse injuries. *Journal Of Athletic Training*, 46(2), 206-220. doi:10.4085/1062-6050-46.2.206

APPENDICIES

Initial Recruitment E-mail

Dear SUBJECT NAME,

You are invited to participate in a **voluntary** research project regarding your experiences with sport, specifically looking at sport specialization. If you are **a current or former athlete (organized sports like middle school, club, travel, high school or collegiate)**, your participation in this survey is greatly appreciated and essential to the success of this research. This study is

being conducted by Morgan Mason, an exercise science major and College Scholar, as part of an Honors Thesis requirement and is overseen by Faculty Advisor Taylor Arman, Instructor of Kinesiology.

There are minimal risks if you decide to participate in this research study. The survey will take between 5-10 minutes to complete and all responses will remain confidential. The North Central College Institutional Review Board have reviewed and approved this study and may inspect these records. Should the data be published, no individual, identifying information will be disclosed.

To begin, click the link below or copy and paste it in your internet browser address area:

SURVEY LINK

Please complete the survey no later than January 22, 2017.

While participation in this study is voluntary, if you do choose to participate, you will be given the opportunity to be enter to win one of two \$25 Downtown Naperville gift cards. Participants will also be given the opportunity to receive the results of the study once the research has been completed. Your help with this study is greatly appreciated.

Any questions regarding the study or results should be directed towards Morgan Mason (mcmason@noctrl.edu) and Taylor Arman (tsarman@noctrl.edu).

If you have any questions about your rights as a research subject or if you feel you've been placed at risk, you may contact the North Central College Institutional Review Board (IRB) Chair, Dr. Ericka Adams at 630-637-5345.

Thank you for your time and participation.

Morgan Mason
Senior College Scholar
Exercise Science Major

Taylor Arman, MEd, ATC
Instructor of Kinesiology
Clinical Education Coordinator, Athletic Training
630-637-5575

Follow up Recruitment E-mail

Subject: Sport Specialization Participation Survey Reminder

Dear SUBJECT NAME,

First and foremost, thank you to all who have participated in this survey on sport specialization. If you have not yet completed the survey and wish to participate, please see the information below.

You are invited to participate in a *voluntary* research project regarding your experiences with sport, specifically sport specialization. If you are *a current or former athlete (organized sports like middle school, club, travel, high school or collegiate)*, your participation in this survey is greatly appreciated and essential to the success of this research. This study is being conducted by Morgan Mason, an exercise science major and College Scholar, as part of an Honors Thesis requirement and is overseen by Faculty Advisor Taylor Arman, Instructor of Kinesiology.

To begin, click the link below or copy and paste it in your internet browser address area:

SURVEY LINK

Please complete the survey no later than January 22, 2017.

Any questions regarding the study or results should be directed towards Morgan Mason (mcmason@noctrl.edu) and Taylor Arman (tsarman@noctrl.edu).

If you have any questions about your rights as a research subject or if you feel you've been placed at risk, you may contact the North Central College Institutional Review Board (IRB) Chair, Dr. Ericka Adams at 630-637-5345.

Thank you for your time and participation.

Morgan Mason
Senior College Scholar
Exercise Science Major

Taylor Arman, MEd, ATC
Instructor of Kinesiology
Clinical Education Coordinator, Athletic Training
630-637-5575

Qualtrics Online Survey Questions

“Thank you for your participation in this survey. This survey consists of both multiple choice and fill-in-the-blank questions. Please read all questions carefully and answer them to the best of your ability. All information will be kept confidential. Upon completion of each survey page, please press the NEXT arrow and the next page of questions will automatically appear.”

Q1: I AGREE to participate in this study.

Yes (1)

No (2)

If No Is Selected, Then Skip To End of Survey

Q2: What is your age?

Q3: What is your sex?

Male (1)

Female (2)

Prefer Not To Answer (3)

Q4: Have you participated in organized sport at the youth, middle school, high school or collegiate level (club, park district, school, or travel)?

Yes (1)

No (2)

If No Is Selected, Then Skip To End of Survey.

Q5: Are you currently an intercollegiate athlete at North Central College?

Yes (1)

No (2)

If No Is Selected, Then Skip To Did you participate in athletics at...

Q6: If yes, in which sport(s) do you participate? Please select all sports in which you participate.

Basketball (1)

Baseball (2)

Bowling (3)

Cross Country (4)

Football (5)

Golf (6)

Lacrosse (7)

Soccer (8)

- Softball (9)
- Swimming and Diving (10)
- Track and Field (11)
- Tennis (12)
- Triathlon (13)
- Volleyball (14)
- Wrestling (15)
- Other (16) _____

Q7-a: Did you participate in organized sport at the youth or middle school level (club, park district, school or travel)?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To Did you participate in athletics at t...

Q7-b: What sport(s) did you participate in?

Q8-a: Did you participate in organized sport at the high school level (club, park district, school or travel)?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To Did you specialize in one sport? Spec...

Q8-b: What sport(s) did you participate in?

Q9: What was the size of your high school?

- Less than 200 students (1)
- 201-500 students (2)
- 501-800 (3)
- 801-1,000 students (4)
- 1,001-1,500 (5)
- 1,501-2,000 students (6)
- 2,001 students or more (7)
- Unsure (8)

Q10-a: During your athletic career, did you specialize in one sport? Specialization is defined as "year-round intensive training in a single sport at the exclusion of other sports" (Jayanthi et al., 2012).

Yes (1)

No (2)

If No Is Selected, Then Skip To If you did not specialize in one spor...

Q10-b: What sport did you specialize in?

Q11: What age did you begin specializing in that one sport?

11 or younger (1)

12 (2)

13 (3)

14 (4)

15 (5)

16 (6)

17 (7)

18+ (8)

Q12: Did you quit other sport(s) to specialize in that one sport?

Yes (1)

No (2)

Q13: Did/Do you train more than 8 months a year in that one sport?

Yes (1)

No (2)

Q14-a: Who had the most influence on your decision to specialize in one sport?

Yourself (1)

Coach (2)

Parent/Guardian (3)

Other (4) _____

Q14-b: Please explain your answer here.

Q15: To what extent did this individual influence your decision to specialize in one sport?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q16: To what extent did your school size influence your decision to specialize in one sport?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q17: To what extent did your choice of sport influence your decision to specialize in one sport?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q18: To what extent did increased media coverage of professional, collegiate, high school, and youth sport influence your decision to specialize in one sport?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Q19: What other factor(s) influenced your decision to specialize in one sport?

Q20-a: I believe that specializing in one sport was beneficial to my athletic success.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)

- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q20-b: Please explain your answer here.

Q21-a: If you are currently NOT participating in the sport that you specialized in, what factors affected your decision to stop participating in that sport?

- Loss of Interest (1)
- Mental Burnout (2)
- Physical Burnout (3)
- Injury (4)
- Time Constraints (5)
- Other (6) _____

Q21-b: Please explain your answer here.

Q22: Have you ever suffered an overuse/chronic injury while participating in a sport that you specialized in? An overuse/chronic injury is defined as an injury with a long onset and long duration.

- Yes (1)
- No (2)
- Unsure (3)

Q23: If you did NOT specialize in one sport, what factor(s) contributed to that decision?

Q24-a: For current or previous multi-sport athletes (participating in two or more sports during one calendar year), do you believe being a multi-sport athlete was beneficial to your athletic success?

- Yes (1)
- No (2)

Q24-b: Please explain your answer here.

Q25: If you wish to be entered in the drawing of a \$25 Downtown Naperville Gift card, please provide your e-mail address. This information will not be utilized in any way except to contact winners.
