

Pediatric Sports Specialization in Elite Ice Hockey Players

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Background: Pediatric sports specialization, defined as intense year-round training in a single sport as a result of excluding other sports for more than 8 months per year, is common in the United States. There are demonstrated physical and social risks to early pediatric sports specialization (defined as before age 12 years). While thought to be needed to acquire appropriate experience and excel in a given sport, there remains little information on when athletes at the highest levels of their sport specialized. This study aimed to define when professional and collegiate ice hockey players specialized.

Hypothesis: Early sports specialization before age 12 years will not be common among elite-level (professional and collegiate) ice hockey players.

Study Design: Retrospective cross-sectional survey study.

Level of Evidence: Level 3.

Methods: Male professional and collegiate ice hockey players within 1 National Hockey League organization and 2 National Collegiate Athletic Association (NCAA) organizations who were 18 years of age or older completed a survey at training camp detailing their history of sports participation and specialization.

Results: A total of 91 athletes participated in the study (mean age, 22.8 years; range, 18-39 years). The mean age at the start of any sports participation was 4.5 years, and the mean age of sports specialization was 14.3 years. The mean age of specialization in the professional group, the NCAA Division I group, and the NCAA Division III group was 14.1, 14.5, and 14.6 years, respectively.

Conclusion: Early pediatric sports specialization is not common in elite-level (professional and collegiate) ice hockey players.

Clinical Relevance: Early pediatric sports specialization before age 12 years is not necessary for athletic success in professional and collegiate ice hockey. This study provides further evidence supporting the recommendations of the American Medical Society for Sports Medicine, American Academy of Pediatrics, and American Orthopaedic Society for Sports Medicine against early sports specialization.

Keywords: sports specialization; pediatrics; ice hockey

Youth sports offer a multitude of benefits, such as the development of physical activity skills, socialization with peers, knowledge of teamwork and leadership skills, an increase in self-esteem, and of course, fun.⁴ In the past few decades, the number of youth between ages 6 and 18 years participating in sports has increased from 45 million to 60 million, and of the 60 million, 27% participate in only 1 sport.⁴ The number of children younger than 6 years participating in

organized sports increased from 6% to 12% during this time frame. Despite the increase in the number of youths participating in sports, 70% of them drop out of organized sports by age 13 years.⁴ In a study investigating factors of youth specialization, Padaki et al¹² found that one-third of athletes between ages 7 and 18 years had specialized, and that the mean age of specialization was 8.1 years. The population in their study included athletes presenting to the sports medicine clinic.

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Fifty-eight percent of athletes were multisport athletes, and 70% of the athletes had collegiate or professional aspirations.¹² In another study investigating the driving forces behind specialization, of the athletes surveyed between ages 7 and 18 years, one-third were told by a coach not to participate in other sports. Half of these athletes also reported that their sports participation interfered with their academic performance.¹³

Early sports specialization is becoming increasingly popular among youth.⁴ Although the definition of early sports specialization varies among experts, it can be intense training in 1 sport for greater than 8 months per year while excluding other sports at or before age 12 years.⁸ The time frame and age at which an elite athlete needs to focus on a single sport to progress remains controversial. In the United States, sport specialization in early childhood is driven by a multitude of factors, such as a parent's desire to give an athlete an extra edge, the pursuit of college scholarships and professional contracts, the labeling of a child as talented at a young age, and the sporting goods and service industry, such as sponsors like Nike and Under Armour and media coverage from large networks.⁴ Early sports specialization may increase risk for burnout, social isolation, overdependence, overuse injury, fear of reinjury, and missing talent in late-blooming children or children from disadvantaged families.¹¹

In 2016, a total of 365,489 youth athletes participated in ice hockey in the United States.¹⁵ This includes participation in age brackets from under-8 to under-18. USA Hockey's development model entitled *Hockey for Life* guides athletes, parents, and coaches on age-appropriate ice hockey participation. In this model, the focus throughout childhood is on developing fundamental movement and acquiring sports-specific skills. USA Hockey states that a reduction in the number of sports played and an emphasis on hockey-specific skills should be delayed until ages 12 to 16 years. The importance of competition is not stressed until ages 16 to 18 years.¹⁶

The current study surveyed a population of professional and collegiate-level ice hockey players as a model to investigate early sports specialization. Ice hockey players at the collegiate and professional level have had some level of athletic success. While the physical and social concerns of early sports specialization have been well demonstrated, it remains unclear how many elite-level athletes chose to specialize in their sport of choice at an early age. The purpose of this study was to describe when professional and collegiate hockey players specialized exclusively in ice hockey. It is hypothesized that early sports specialization before age 12 years would not be common among elite-level (professional and collegiate) ice hockey players.

METHODS

This study was submitted to and approved by the university's institutional review board. Study participants were recruited at training camps. Inclusion criteria included male athletes older than 18 years who were active roster members of a professional

ice hockey team in the National Hockey League (NHL), American Hockey League (AHL), or East Coast Hockey League (ECHL) or an active roster member of a National Collegiate Athletic Association (NCAA) Division I or Division III team. Exclusion criteria included age younger than 18 years and not being an active roster member of a team specified above.

Professional, NCAA Division I, and NCAA Division III ice hockey players were administered a cross-sectional survey at training camp assessing their participation in athletics from youth to present. The survey included 13 questions and is included in the Appendix (see Table A1 in the Appendix, available in the online version of this article). Early sports specialization was defined as participation in ice hockey at the exclusion of other sports at or before the age of 12 years.⁹ A study team member was available to answer questions. The questionnaire was designed to provide basic demographic information and investigate patterns of youth sports participation, family history of elite sports participation, age of specialization, motivation behind the decision to specialize, and information about self-reported injuries. The survey was written at a middle school level to ensure comprehension because of the wide variety of educational backgrounds. Questions were constructed predominately in an open-ended format and asked players to identify ages at which events occurred, provide relevant information regarding family member elite sports participation, and explain injury history. Players were also asked to use a Likert-type scale to rank the motivation behind their choice to specialize in ice hockey. The questions were not factual in nature, but rather asked the athletes to share information about their personal participation in athletics and their family. Questionnaires were numbered, administered, collected, and stored in accordance with institutional review board specifications. Prior to administration, the survey was reviewed for accuracy by 3 fellowship-trained sports medicine physicians, 3 athletic trainers, and the coaching staff for accuracy. Data were analyzed using descriptive statistics.

RESULTS

A total of 91 athletes participated in the study. The mean age across all 3 groups was 22.8 years, with a range from 18 to 39 years. The median age was 21 years. The mean age at the start of sports participation was 4.5 years, and the mean age of specialization was 14.3 years. Eleven (12%) athletes specialized before age 12 years. The majority of athletes participated in 2 to 4 sports in their youth, with soccer and baseball the most commonly reported. There was no statistically significant difference in age of specialization between the 3 groups ($P = 0.807$). Eighty-five (93%) of the 91 athletes reported self as the motivation behind their choice to specialize in ice hockey.

Professional

Forty-four athletes played professional ice hockey. The mean age of professional ice hockey players was 23.9 years, with a range of 18 to 39 years. In the professional group, the mean age

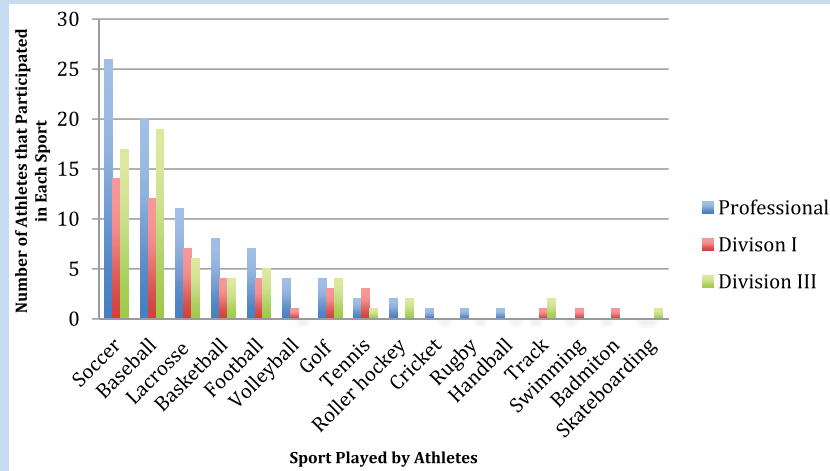


Figure 1. Sports participation of elite male hockey players (N = 91) who participated in multiple sports during childhood. Soccer was most common among professional and Division I athletes, while baseball was most common among Division III athletes.

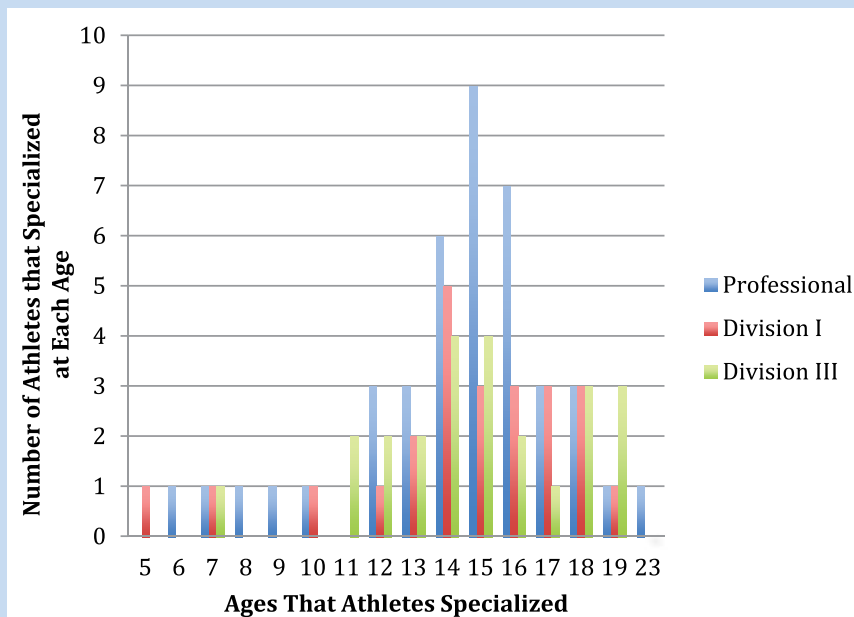


Figure 2. Age of specialization in each group (N = 91). Professional, Division I, and Division III athletes most commonly specialized at 15, 14, and 14 or 15 years, respectively.

at start of sports participation in any sport was 4.7 years, with 42 athletes (95%) participating in at least 1 other sport as a child, with the most common sport being soccer (Figure 1). The mean age of specialization was 14.1 years. At the professional level, 24% of athletes specialized before age 14 years; 5 athletes (11%) specialized before age 12 years (Figure 2). The players combined for 77.5 seasons of experience in the NHL, 4 years in the Kontinental Hockey League, 86 years in the AHL, 17 years in the ECHL, 3 years in the Swiss League, 1 year in the Canadian Hockey League, 9 years in NCAA Division I leagues, and 13

years in other leagues. Nine players at the professional level had a sibling who also played a professional sport. Eight players reported having a parent who played a professional sport. Forty-two (95%) of the 44 athletes reported self as the motivation behind their decision to specialize in ice hockey. Other reasons listed included parent and wife.

NCAA Division I

Twenty-five athletes played NCAA Division I ice hockey. The mean age of NCAA Division I athletes was 21.3 years, with a

range of 18 to 25 years. The mean age at start of sports participation was 4.4 years, and 24 of the 25 athletes (96%) participated in more than 1 sport as a child, with the most common sport being soccer (Figure 1). The mean age of specialization was 14.5 years. Twenty-four percent of athletes specialized before age 14 years; 3 (12%) athletes specialized before age 12 years (Figure 2). At the NCAA Division I level, there were 2 players who had a sibling who played professional sports, and 4 players had a parent who played a professional sport. Twenty-four (96%) of the 25 athletes reported self as the motivation behind their decision to specialize. The other reason listed was parent.

NCAA Division III

Twenty-four athletes played NCAA Division III ice hockey. The mean age of NCAA Division III athletes was 22.2 years, with a range of 18 to 25 years. In the NCAA Division III group, the mean age at start of sports participation was 4.3 years. Twenty-three of the 24 athletes participated in more than 1 sport as a child, and the most common sport was baseball (Figure 1). The mean age of specialization was 14.6 years. Twenty-eight percent of athletes specialized before age 14 years; 3 (12.5%) athletes specialized before age 12 years (Figure 2). Three players had a parent who played a professional sport, and there were no athletes who had a sibling who played a professional sport. Twenty-one (87.5%) of the 24 athletes reported self as their primary reason behind their choice to specialize. Other reasons listed included peer, parent, and coach.

DISCUSSION

Professional and elite-level collegiate ice hockey players specialized on average after 14 years of age, and many participated in multiple sports as a child. Early sports specialization does not appear necessary to play ice hockey at an elite level. The data did not show a correlation between athletes with family members who played professional sports and early specialization. These data support our hypothesis that early sports specialization may not be common among elite-level ice hockey players, in agreement with recent literature investigating patterns of specialization in various athlete populations.^{6,7,8,14} Ninety-three percent of elite athletes surveyed reported self-motivation behind their choice to specialize. This is in contrast to the developing trend in youth sports where parents and coaches are encouraging young children to specialize.^{12,13} This could represent an important indicator that internal motivation is a key predictor of success.

A total of 296 NCAA Division I athletes at the University of California, Los Angeles, were surveyed in a 2013 study² showing that 88% participated in an average of 2 to 3 sports as a child and that 70% did not specialize until after the age of 12 years. Sports specialization increased throughout high school, with 16.9% specializing by 9th grade and 41.4% by 12th grade. Differences in the degree of specialization between sexes were not found.

There is no evidence to support intense training and specialization before puberty to achieve elite-level athletic success, with early sports specialization increasing the risk of injury, psychological stress, and quitting sports at a young age.⁸ Some level of specialization is required to achieve elite-level athletic success, but for most sports, specialization should be delayed until late adolescence to minimize the adverse effects of overtraining.⁸ Additionally, early sports specialization has been shown to be an independent risk factor for injury and serious overuse injury.⁸ Youth athletes who participated in more hours of sport per week than their age or whose ratio of sports to free play was greater than 2:1 have an increased risk of suffering an overuse injury.⁶ Certain sports such as figure skating, gymnastics, and diving, where peak performance occurs before physical maturation, may require early specialization.^{3,10,11} The effects of early specialization on long-term health and well-being are not well known.⁵

In 2014, the American Medical Society for Sports Medicine noted that history of prior injury is an established risk factor for overuse injuries. Educating parents and coaches on sport readiness while considering variable cognitive and motor skill development when setting goals is important. Female athletes should be assessed for menstrual dysfunction.⁶

Similarly, in 2016, the American Academy of Pediatrics recommended delaying sports specialization until age 15 to 16 years to minimize risk of overuse injury. They also advised that youth athletes take off at least 3 nonconsecutive months a year from their sport, and 1 to 2 days off per week, to decrease the chance of injury.¹ The American Orthopaedic Society for Sports Medicine has stated that early sports specialization is not required for success at the highest levels, may be unhealthy physically and mentally for youth athletes, and discourages free play.⁹

The 2 main tenants of early diversification are involvement in multiple sports and participation in deliberate play.⁴ Early diversification offers the athlete the opportunity to experience a variety of physical, cognitive, and psychosocial environments while foundation skills are developed.⁴ These foundation skills and athleticism can be translated across sports and aid in the development of multiple muscle groups. Deliberate play can consist of pick-up basketball or baseball in the backyard.⁴

There are several limitations of our study. The only sport investigated was ice hockey, and only 1 NHL franchise and 2 collegiate teams were analyzed. This study was also limited by the retrospective nature of the data collection, the dependence on the athlete's recall, and the application to male athletes only.

CONCLUSION

Clinicians should encourage youth athletes to participate in a multitude of sports to enhance overall development of athletic skills. Early sports specialization is not common in professional and collegiate ice hockey players. On average, players did not specialize until age 14 years. These findings imply that early pediatric sports specialization before age 12 years is not necessary for athletic success in professional and collegiate ice hockey.

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