Patterns of Specialization in Professional Baseball Players

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Patterns of Specialization in Professional Baseball Players

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Two developmental pathways to sport excellence have been described: early specialization and early sampling (Côté, Lidor, & Hackfort, 2009). Despite a common assumption that early specialization (defined as playing one sport exclusively and intensely before age 12) is a necessary precursor to success at the collegiate or professional levels, research to support this assumption remains unclear. To add to this literature, the current study was a survey of 708 minor league professional baseball players on the ages at which they began to specialize in their sport. Results indicated that most players sampled a diversity of sports up through late adolescence. Only 25% of players specialized before the age of 12 and the mean age of specialization was 15 years. Furthermore, those who specialized later were more likely to receive college scholarships. Finally, we examined patterns of specialization as a function of athletes' home climate and culture. At least in this sample of professional minor league baseball players, an early sampling pathway seems to have fortified success at both the collegiate and professional levels.

Keywords: athletic development, early specialization, early sport sampling, childhood

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The dream of college scholarships, professional careers, or even Olympic gold entices many young children to get involved and find success in sports. Similarly, parents might feel pressure to encourage their children to achieve early success. To reach these elite levels of sporting expertise, the common assumption has been that it requires years of hard work and an intensely dedicated focus starting well before adolescence. However, recent evidence suggests that immersion in a single sport may not be the only road to professional sport development (Côté, Lidor, and Hackfort (2009). In their Developmental Model of Sport Performance, Côté, Lidor, and Hackfort (2009) propose that there are actually two early pathways that can lead to elite performance in a sport. The first pathway is one of early specialization, which necessitates a high volume of deliberate practice (Ericsson, Krampe, & Tesch-Romer, 1993) in a single sport as early as six or seven years of age and a purposeful focus on training and skill development (Baker, 2003; Côté et al., 2009). The second pathway is early sampling. Researchers have found that the early sampling pathway can result in similar levels of expert performance in adulthood, supporting the claim that early specialization in childhood is not a requirement for professional performance in adulthood (Côté, 1999; Hill, 1993).

According to Balyi and Hamilton (2004), sports can be classified as either early specialization or late specialization sports. These authors suggest that early specialization might be appropriate for some individualistic sports where peak performance is achieved before puberty (e.g., gymnastics, figure skating, diving), whereas late specialization might be appropriate for track and field, cycling, rowing, and most of the team-oriented sports. It is likely that specialization may be a requirement for athletes to excel at a professional level in the early specialization sports, whereas others may not demand such an exclusive focus at a young age. In fact, for competitors involved in those sports that fall under the classification of late specialization, Balyi and Hamilton (2004) cautioned against specialization before age 10 due to the possibility of early burnout that could lead to withdrawal from training and competition. Patel, Pratt, and Greydanus (2002) similarly advised that athletes need to have reached late adolescence to have the psychological, social, emotional, and physical maturity to meet the demands of competitive sports and make informed decisions about their participation (Patel, Pratt, & Greydanus, 2002). Despite recently published data that points to the dangers of intensive training at an early age, an increasing number of young athletes in team sports appear to be limiting their participation to one sport exclusively (Maffulli, Longo, Gougoulias, et al., 2010; Mountjoy, Andersen, Armstrong, et al., 2011).

**Early Specialization**

The essential feature of specialization programs is a high volume of deliberate practice. Ericsson et al. (1993) defined deliberate practice as any training activity undertaken with the specific purpose of increasing performance and promoting positive skill development while lacking in inherent enjoyment (Ericsson, Krampe, & Tesch-Romer, 1993). Furthermore, Starkes (2000) and Baker (2003) have described deliberate practice activities as those that are primarily extrinsically motivated, focused on outcomes, performed in a daily, work-like manner, and are frequently not enjoyable to perform. One of the biggest concerns regarding early specialization
programs, with their strict emphasis on early selection, skill acquisition, and intense training regimens, is that they tend to have high rates of dropout (Côté et al., 2009; Wall & Côté, 2007), are less fun, and cause more frequent injuries and illnesses (American Academy of Pediatrics, 2000).

**Early Sampling**

Whereas early specialization programs are designed with the explicit aim of producing elite level athletes, early sampling focuses on first serving the developmental needs of children through enjoyment and participation in various activities (Côté et al., 2009). Instead of deliberate practice, early diversification is characterized by another type of physical activity called deliberate play. This term was coined by Côté (1999) to describe a form of sporting activity that is intrinsically motivating, provides immediate gratification, and is meant to be enjoyable. In deliberate play, children learn to play by the rules of the game while experimenting with strategy and problem-solving. In many cases, adults are not present, leaving children with the complex tasks of social exchange. In short, an example of deliberate practice would be batting practice; deliberate play would be a game of backyard baseball.

The benefits of such activity are numerous. Deliberate play allows a child the opportunity to experiment with different movements and tactics while learning to improvise and respond strategically in athletic situations (Côté, Baker, & Abernethy, 2007; Gould & Carson, 2004; Pellegrini & Smith, 1998). In a retrospective examination of baseball players' training patterns, the amount of deliberate play reported from ages 6–12 correlated positively with the amount of specific baseball training after age 13, suggesting that deliberate play activities were beneficial in the development of motivation to pursue intense training later on (Côté et al., 2007; Gilbert, Côté, Harada, Marchbanks, & Gilbert, 2002).

Furthermore, evidence suggests that players who specialized later not only achieved similar levels of expertise to athletes who specialized early, but had greater athletic success. Baker (2003) found that high-level athletes characteristically engaged in a wide range of sports in their developing years and that participation in other sports similar to the athlete’s primary one augmented the cognitive and physical skills relevant to their expert sport. A theory gaining traction is that exposure to additional sport experiences in childhood can reduce the amount of deliberate, sport-specific training necessary to acquire expertise later (Leite, Baker, & Sampaio, 2009). This theory incorporates a phenomenon known as transfer of perceptual learning; a process by which beneficial learning can occur in other sport settings than a player’s primary one through the crossover of commonalities between sports (Abernethy, Baker, & Côté 2005). Child athletes who participate in a variety of sports and specialize after reaching adolescence tend to be more consistent performers, experience fewer injuries, and be involved in sports longer than their counterparts who specialize early. Not only does sampling hold benefits for athletic development, evidence suggests that it may result in improved long-term outcomes in areas aside from athletics including better socialization (Busseri et al., 2006; Wiersma, 2000; Wright and Côté, 2003).

The present study was designed to explore patterns of specialization in a sample of professional minor league baseball players. We chose to explore this
issue among baseball players for several reasons. First, as a team sport, baseball might be considered a “late specialization” sport where expertise is achieved in late adolescents or early adulthood (Balyi and Hamilton, 2004). Second, players are often recruited into the professional ranks at very young ages (e.g., in high school), reflecting a very long-term course for professional-level play. Finally, baseball is increasingly played internationally, lending a unique cultural aspect to the question of specialization. Based on prior research and theory, our primary hypothesis was that professional minor league baseball players specialize in mid to late adolescence in keeping with the Developmental Model of Sport Performance proposed by Côté, Lidor, and Hackfort (2009). In addition, our data allowed us to examine several exploratory hypotheses:

1) Patterns of specialization would differ based on ethnicity and climate of home region. That is, given that baseball is an outdoor/summer sport, we expected those from warmer climates would specialize earlier than those from colder locations. Given that data on ethnic patterns of specialization are not available, we made no directional hypotheses related to ethnicity.

2) Professional baseball players who were left alone to choose the age at which they specialized would specialize later than those who were influenced by others (e.g., family and/or coaches).

3) Athletes who specialized later would be more successful in attending college and receiving scholarships.

Method

Participants

Male professional minor league baseball players (N = 708) from teams in six states and the District of Columbia participated in this survey study. At the time of the study, participants were minor league baseball players trying out for a major league team at their spring training site in Florida. Institutional review board (IRB) approval to administer this survey was received in August 2008. The study authors received permission to work with these minor league players from the major league team medical director and trainer, the head of the minor league program (under the major league team), and, ultimately, the head administration of the major league team. None of the authors were affiliated with the teams in any professional capacity. All participants trying out for a major league team during the time of the survey administration were eligible to participate in the study as long as they were at least 18 years of age. Completion of the survey was entirely voluntary, and all participants were assured that they would not experience any disadvantage in their training if they chose not to complete the survey.

Measures

Respondents completed a questionnaire designed to collect information on patterns of sport participation and assess whether professional minor league baseball players were more likely to specialize in baseball at a young age than they were to
play multiple sports through their teen years. The questionnaire had two parallel versions, one for English-speaking players and one for Spanish-speaking players.

Both versions of the survey were comprised of a demographic section, fourteen questions about specialization and training patterns, and one open-ended question. In the demographic section, participants were asked to identify their age, ethnic background, home state or country if from outside of the U.S., type of high school attended, highest level of education, and specific division of collegiate athletics and position played, if applicable.

Each additional item on the survey was a descriptor of an age, sport, or person relevant to the participant’s formative sport experiences. To facilitate athletes’ recall of retrospective information, players used an ordinal scale to report the ages at which they started to play organized sports, organized baseball, and a single sport competitively. Players were then asked to name the number of sports they played competitively throughout various age ranges: 6–10 years, 11–14 years, 15–18 years, and 19 years and beyond. Because we were curious about what influenced the specialization decision and the consequences of that decision, we included several additional questions including: 1) Who had the greatest influence on your decision to specialize in baseball?, 2) Did athletic participation help you get admitted to the college of your choice?, 3) Did you receive an athletic scholarship or financial assistance in college?, and 4) If so, in what sport did you receive a scholarship or financial assistance? The final open-ended question asked participants to share their thoughts about their decision to specialize or play multiple sports.

Procedure

Before data collection, the questionnaire was developed by a team comprised of staff clinicians in the sports psychology program at Massachusetts General Hospital in Boston, MA. A preliminary version of the questionnaire was designed based on findings of prior research and the authors’ clinical experiences working with professional and high-level athletes. These questions were formulated and finalized through a series of team meetings with study researchers. Following the development of the questionnaire by researchers, a Spanish version of the survey was translated from English by a Spanish-speaking psychologist. This survey was then back-translated by a second Spanish-speaking source to assure accuracy in meaning.

After appropriate permissions were received to conduct this study from the IRB and the administration of the major league baseball teams, the authors sent the survey via mail to a team administrator at the Florida site. The team administrator was instructed to inform participants that the study was designed to gather information about training patterns for young athletes, that participation was not required, and that their survey responses would be entirely anonymous. A Spanish-speaking team employee was made available to translate these instructions to Spanish-speaking players.

Survey completion required less than 10 min. Information regarding participants’ demographics, their sport involvement at various ages, and their training patterns were recorded by the participant on the survey. No identifying information was obtained. Data collection was completed during an afternoon meeting, after which the surveys were collected and mailed directly to the study authors.
Results

A total of 711 respondents completed the survey; 20% of which were the Spanish language version. Three surveys were excluded from the final sample because players’ ages exceeded the age cut-off of 39 years; therefore all analyses were performed on sample of 708 surveys. Given the large number of analyses, alpha for significance was set at $p < .001$. Effect size estimates (ES) were calculated and presented as Cohen’s $d$ (Cohen, 1988).

Table 1 shows the demographic profile of the participants. Players ranged in age from 18–39 years, with a mean age of 22.85 years ($SD = 2.69$). Of the 693 participants who opted to include race, 63% ($n = 438$) were White American, 6% ($n = 44$) were Hispanic from the U.S., 20% ($n = 140$) were Hispanic from outside the U.S., 5% ($n = 34$) were African American, 1% ($n = 10$) were Asian, and 4% ($n = 27$) identified themselves in the category ‘Other.’

Seventy-eight percent ($n = 552$) of respondents attended public high school, while 16% ($n = 110$) attended private high school, and 2% ($n = 13$) attended parochial high school. Five hundred and forty-three players reported attending college (77% of total respondents), and, of these, the majority (75%) played some level of collegiate baseball: 60% ($n = 322$) were Division I; 7%, ($n = 40$) were Division II; and 3% ($n = 16$) were Division III. A one-way ANOVA showed that athletes who attended college specialized at a significantly later age ($M = 16.18$, $SD = 3.56$) than players who did not ($M = 12.83$, $SD = 4.55$); $F(1,657) = 77.54$, $p < .001$. The difference showed a large effect size at $d = - .83$.

Virtually all participants played competitive baseball in every age range sampled (6–10, 11–14, 15–18, and 19+ years). Basketball, football, and soccer were popular additional sports. Many other sports were played, albeit each represented a small percentage of participants. The number of sports played across the age ranges is summarized in Table 2. As shown, participation in additional sporting activities declined slightly as athletes progressed to specialization in their chosen sport. Nevertheless, up to age 18, a sizable and statistically significant majority of participants played more than one sport competitively. Even in the 15–18 year age range, 64% of participants reported competing in more than one sport. However, by age 19, specialization in baseball was nearly universal (94%). Further analysis revealed that participation in competitive sports peaked in the 6–10 year age range, during which time the average number of competitive sports played was 2.57 ($SD = 1.26$). In the 15–18 year age range, the average number of competitive sports played remained at 2.02 ($SD = 0.95$). Paired $t$ test showed that players were playing significantly fewer sports in the 19+ age range ($M = 1.07$, $SD = .28$) at $p < .001$.

The mean age in which players first began playing organized baseball and specialized in the sport is shown in the first row of Table 3. The age at which participants first began playing organized sports ranged from 3–21 years, with a mean age of 5.99 years ($SD = 2.61$). Players also reported that they first began to play baseball between ages 3–21, with a mean age of 6.16 years ($SD = 2.80$). Although the mean age of first participation in organized sports was rather young, the mean age of specialization was much later at 15.52 years ($SD = 3.98$). Seventy percent of participants specialized between 15–19 years and only 25% of players specialized before age 15. In fact, a majority of players (52%) did not specialize until at least 17 years of age.
Table 1  Player Demographics (N = 708)

<table>
<thead>
<tr>
<th>Survey language</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>571</td>
<td>80%</td>
</tr>
<tr>
<td>Spanish</td>
<td>140</td>
<td>20%</td>
</tr>
<tr>
<td>Mean age</td>
<td>22.85 (18–39 years)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Background/ethnicity</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>White American</td>
<td>438</td>
<td>63%</td>
</tr>
<tr>
<td>African-American</td>
<td>34</td>
<td>5%</td>
</tr>
<tr>
<td>Asian</td>
<td>10</td>
<td>1%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>140</td>
<td>20%</td>
</tr>
<tr>
<td>Hispanic American</td>
<td>44</td>
<td>6%</td>
</tr>
<tr>
<td>Other</td>
<td>27</td>
<td>4%</td>
</tr>
<tr>
<td>Missing</td>
<td>15</td>
<td>2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highest level of education</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>128</td>
<td>18%</td>
</tr>
<tr>
<td>College</td>
<td>543</td>
<td>77%</td>
</tr>
<tr>
<td>Missing</td>
<td>33</td>
<td>5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High school type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>552</td>
<td>78%</td>
</tr>
<tr>
<td>Parochial</td>
<td>13</td>
<td>2%</td>
</tr>
<tr>
<td>Private</td>
<td>110</td>
<td>16%</td>
</tr>
<tr>
<td>Missing</td>
<td>33</td>
<td>5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>College division</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>323</td>
<td>60%</td>
</tr>
<tr>
<td>II</td>
<td>40</td>
<td>7%</td>
</tr>
<tr>
<td>III</td>
<td>16</td>
<td>3%</td>
</tr>
<tr>
<td>N/A</td>
<td>128</td>
<td>24%</td>
</tr>
<tr>
<td>Missing</td>
<td>36</td>
<td>6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position played</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitcher</td>
<td>345</td>
<td>51%</td>
</tr>
<tr>
<td>Catcher</td>
<td>67</td>
<td>10%</td>
</tr>
<tr>
<td>Infield</td>
<td>168</td>
<td>25%</td>
</tr>
<tr>
<td>Outfield</td>
<td>103</td>
<td>15%</td>
</tr>
<tr>
<td>Missing</td>
<td>25</td>
<td>4%</td>
</tr>
</tbody>
</table>

To evaluate differences in age of specialization by ethnic background, a one-way ANOVA was run between ethnicities. Overall, a significant difference was found between ethnicities in regard to the age at which players chose to focus exclusively on a single sport; $F(5,674) = 28.47, p < .001$. Although White (non-Hispanic) American and African American players specialized late in adolescence (means of 16.52 and 17.16 years respectively), Asian, Latin and South American,
Table 2  Sports Played Competitively Across Age Ranges

<table>
<thead>
<tr>
<th>Sports</th>
<th># of players (ages 6-10)</th>
<th>% of players (ages 6-10)</th>
<th># of players (ages 11-14)</th>
<th>% of players (ages 11-14)</th>
<th># of players (ages 15-18)</th>
<th>% of players (ages 15-18)</th>
<th># of players (ages 19+)</th>
<th>% of players (ages 19+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean no. of sports</td>
<td>2.57 (0-8)</td>
<td>-</td>
<td>2.48 (0-7)</td>
<td>-</td>
<td>2.02 (0-6)</td>
<td>-</td>
<td>1.07 (1-3)</td>
<td>-</td>
</tr>
<tr>
<td>Baseball</td>
<td>665</td>
<td>94%</td>
<td>692</td>
<td>98%</td>
<td>699</td>
<td>99%</td>
<td>690</td>
<td>97%</td>
</tr>
<tr>
<td>Basketball</td>
<td>430</td>
<td>61%</td>
<td>433</td>
<td>61%</td>
<td>298</td>
<td>42%</td>
<td>22</td>
<td>3%</td>
</tr>
<tr>
<td>Soccer</td>
<td>300</td>
<td>42%</td>
<td>155</td>
<td>22%</td>
<td>51</td>
<td>7%</td>
<td>3</td>
<td>0.4%</td>
</tr>
<tr>
<td>Hockey</td>
<td>42</td>
<td>6%</td>
<td>30</td>
<td>4%</td>
<td>16</td>
<td>2%</td>
<td>1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Football</td>
<td>211</td>
<td>30%</td>
<td>291</td>
<td>41%</td>
<td>243</td>
<td>34%</td>
<td>13</td>
<td>2%</td>
</tr>
<tr>
<td>Swimming/diving</td>
<td>53</td>
<td>7%</td>
<td>27</td>
<td>3%</td>
<td>9</td>
<td>1%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Track</td>
<td>34</td>
<td>5%</td>
<td>53</td>
<td>8%</td>
<td>35</td>
<td>5%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Other</td>
<td>51</td>
<td>7%</td>
<td>58</td>
<td>8%</td>
<td>61</td>
<td>9%</td>
<td>11</td>
<td>1%</td>
</tr>
</tbody>
</table>

Note. Percentages were calculated based on the entire sample n = 708, although four players of the 708 surveyed did not complete any of the "sports played competitively" questions.
Table 3 Age of Specialization by Ethnicity

<table>
<thead>
<tr>
<th></th>
<th>Age players began playing baseball:</th>
<th>Age players specialized in baseball:</th>
<th>Percentage of players who specialized:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>After age 16</td>
</tr>
<tr>
<td>Total sample</td>
<td>6.16 (2.80)</td>
<td>15.52 (3.98)</td>
<td>64%</td>
</tr>
<tr>
<td>White American</td>
<td>5.26 (2.67)</td>
<td>16.52 (3.27)</td>
<td>75%</td>
</tr>
<tr>
<td>African American</td>
<td>10.50 (1.35)</td>
<td>17.16 (2.49)</td>
<td>79%</td>
</tr>
<tr>
<td>Asian</td>
<td>8.88 (4.26)</td>
<td>10.90 (1.73)</td>
<td>0%</td>
</tr>
<tr>
<td>Hispanic non-American</td>
<td>6.13 (2.94)</td>
<td>12.71 (4.53)</td>
<td>39%</td>
</tr>
<tr>
<td>Hispanic American</td>
<td>6.13 (2.94)</td>
<td>14.06 (4.52)</td>
<td>43%</td>
</tr>
<tr>
<td>Other</td>
<td>6.59 (2.76)</td>
<td>14.48 (4.35)</td>
<td>42%</td>
</tr>
</tbody>
</table>

Hispanic American, and Other players all specialized before 15 years. More specifically, chi-square showed that significantly more Caucasian and African American players started playing baseball exclusively after age 17 compared with all other ethnicities, \( p < .001 \). The age of specialization within each of these six ethnicities is shown in Table 3.

North American participants were further classified on the basis of climate in the part of the country where they grew up to test the hypothesis that warmer climates, more conducive to year-round practice, would produce a greater proportion of players who specialized early. Fifty-nine percent of athletes from North America (308/523) came from a location that was relatively warm all year. Warm climate players specialized in baseball significantly earlier (\( M = 15.75, SD = 3.62 \)) than did their counterparts from regions with more temperate climates (\( M = 17.56, SD = 2.37 \); \( F(1,485) = 36.25, p < .001 \), with a moderate effect size of .61).

Given the positive finding related to ethnicity and geography, we chose to conduct a few post hoc analyses. Because ethnic population proportions are not the same nationally, we explored the relationship between specialization, ethnicity, and geography with two additional ANCOVAS. First, when controlling for climate, we continued to find differences by ethnicity on age of baseball specialization (\( F(1,591) = 74.67, p < .001 \)). Conversely, after controlling for ethnicity, there was a significant effect of climate (\( F(1,591) = 30.11, p < .001 \)). Although one might predict that ethnicity and climate might be confounding or modifying variables in the prediction of specialization age, this series of analyses revealed that these two variables were both related to specialization age, irrespective of the other.

Because players from Latin and South America constitute a proportionally high number of players to MLB teams in the United States (Lapchick, 2013), a two-way ANOVA was run between North American and non-American, Hispanic players to compare specialization age and training patterns. Results showed that players from Latin and South America specialized in one sport significantly younger (\( M = 12.71, SD = 4.53 \)) than did North American players (\( M = 16.33, SD = 3.41 \); \( F(1,648) = 101.19, p < .001 \)). The effect size was large at 0.91. Chi square revealed that significantly more North American players specialized after age 16 (72%) compared
with 36% of players from Latin America and 52% of players from other countries ($\chi^2(2, N = 680) = 58.52, p < .001$).

A comparison of the number of sports played by Latin American and North American players in each age range was also conducted. Independent sample $t$ tests showed that Latin American players played significantly fewer sports in each age range up to age 19 than did other players (ages 6–10: $t(258) = 13.79, p < .001$; ages 11–14: $t(282) = 15.63, p < .001$; ages 15–18: $t(372) = 14.78, p < .001$), suggesting that the range of sports played by Latin American players was notably narrower than the range played by North American athletes.

Despite their later age of specialization, once North American players began playing baseball exclusively, they devoted significantly more hours per week to skills training than did the players from South American nations ($M = 12.64$ hr, $SD = 9.24$ vs. $M = 5.81$ hr, $SD = 5.25$; $t(234) = 10.17, p < .001$). Similarly, North American players also reported engaging in significantly more hours of weight lifting ($M = 5.92$, $SD = 3.84$ vs. $M = 4.27$, $SD = 4.70$; $t(594) = 3.77$, $p < .001$); and training with a parent ($M = 3.58$, $SD = 6.24$ vs. $M = 1.79$, $SD = 3.01$; $t(79) = -6.47$, $p < .001$), after specialization.

Table 4 summarizes the collegiate experiences of participants. Ninety percent ($n = 487$) of the 543 players who attended college felt that athletic participation helped with admission to the college of their choice and 87% ($n = 474$) reported receiving an athletic scholarship or financial assistance to attend school. Among college attendees, those who reported that athletic participation helped with college admission specialized at a later age ($M = 16.36$ years, $SD = 3.41$) than those who did not find it helpful in admission ($M = 14.43$ years, $SD = 4.61$). This difference was statistically significant ($F(1,519) = 10.37, p = .001, d = .48$). Likewise, players who received a baseball scholarship specialized at a significantly later age

Table 4  College Admissions and Scholarships ($N = 543$)

<table>
<thead>
<tr>
<th>Question</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did your athletic participation help you get admitted to the college of your choice?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>487</td>
<td>90%</td>
</tr>
<tr>
<td>No</td>
<td>37</td>
<td>7%</td>
</tr>
<tr>
<td>Missing</td>
<td>19</td>
<td>3%</td>
</tr>
<tr>
<td>Did you receive an athletic scholarship in college?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>474</td>
<td>87%</td>
</tr>
<tr>
<td>No</td>
<td>43</td>
<td>8%</td>
</tr>
<tr>
<td>Missing</td>
<td>26</td>
<td>5%</td>
</tr>
<tr>
<td>If so, in what sport did you receive the athletic scholarship? (only 1st response)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseball</td>
<td>463</td>
<td>98%</td>
</tr>
<tr>
<td>Football</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>Missing</td>
<td>6</td>
<td>1%</td>
</tr>
</tbody>
</table>
As shown in Table 5, 489 (69%) players answered the question asking them to rate the person who had the greatest influence on their decision to specialize in baseball (e.g., father, coach, themselves). The largest majority (44% of total respondents) reported that they made the decision to specialize, while 26% indicated that another person was more important in their decision to specialize. Among the players who specified that they had been influenced to play by another, the greatest number (n = 111; 16% of total respondents) attributed their motivation to their fathers, 3% (n = 22) to their mothers, 3% (n = 20) to their coaches, and the remaining 3% (n = 27) named a grandparent, a teacher, or another relative/friend. There was no difference in the age of specialization between players who were self-motivated and those who attributed their specialization in baseball to others, with both groups specializing at around 16.11 years (SD = .21–.26).

**Discussion**

The present study was an exploration of patterns of specialization in professional baseball players. Most athletes in the current sample began playing sports at approximately age six, but did not devote their time exclusively to a single sport until late into adolescence. This finding is consistent with prior studies showing that elite and professional athletes engaged in a wide range of sports during early development and most did not specialize until at least 15 years (Baker, 2003; Wall & Côté, 2007). Data indicated that the majority of athletes maintained involvement in other sports well into older ages, suggesting that early sampling was a viable and successful pathway to professional levels. This is consistent with research showing that when the sporting backgrounds of more highly skilled athletes are compared with lesser skilled athletes, the highly skilled athletes typically report participating in a greater number or a larger volume (in terms of total hours of participation) of other organized sports, possibly due to improvements in motor control and strategic thinking (Berry, Abernethy, & Côté, 2008). This same trend

<table>
<thead>
<tr>
<th>Influencer*</th>
<th>Rank #1 n (%)</th>
<th>Rank #2 n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Me</td>
<td>309 (44%)</td>
<td>60 (8%)</td>
</tr>
<tr>
<td>Mother</td>
<td>22 (3%)</td>
<td>97 (14%)</td>
</tr>
<tr>
<td>Father</td>
<td>111 (16%)</td>
<td>219 (31%)</td>
</tr>
<tr>
<td>Grandparent</td>
<td>10 (1%)</td>
<td>19 (3%)</td>
</tr>
<tr>
<td>Relative/friend</td>
<td>6 (1%)</td>
<td>29 (4%)</td>
</tr>
<tr>
<td>Coach</td>
<td>20 (3%)</td>
<td>43 (6%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>11 (2%)</td>
<td>4 (1%)</td>
</tr>
<tr>
<td>Missing</td>
<td>219 (31%)</td>
<td>237 (34%)</td>
</tr>
</tbody>
</table>

Note. *Ranks 3–7 are not included in this table.
was found in the current study, where most players participated in more than one sport throughout high school.

Once their priority turned to playing baseball exclusively however, players who waited to specialize until well into adolescence (> 17 years) devoted a greater number of hours per week to training. The comparison of Latin American and North American players supports the conclusion that the number of training hours postspecialization is perhaps a stronger predictor of athletic success than is age of sport specialization. This finding illustrates that players who sampled numerous activities easily overcame the fewer hours they spent playing their primary sport in childhood by investing greater hours in training after they made the decision to specialize. This is consistent with past studies that have shown that premature investment in a single sport can inspire injury, burnout, or withdrawal from sports altogether (Côté et al., 2009; Gould et al., 1996), whereas participation in a variety of different sports can result in a longer sporting career (Barynina & Vaitsekhovskii, 1992).

The relationship between climate and age of specialization highlights the importance of the early years of a child’s involvement in sport as a foundation for the development of motivation, skill, and talent. Warm weather locations offer more opportunity to be outdoors and presumably make it easier for a player to participate in summer sports all year. This may account for the fact that North American players in our sample who came from warm weather states reported a significantly younger age of sport specialization. Because baseball is a summer sport, the ability to continually play outdoors might mean that these players had shorter off-seasons to devote to other sports, allowing them to dedicate more training hours to their primary sport and specialize earlier.

Although research shows that elite athletes often started involvement in their sport at an early age, it also shows that most played a number of other sports when they were young. Indeed, some studies actually suggest that players who specialize at a later age have more success (Barynina & Vaitsekhovskii, 1992; Berry, Abernethy, & Côté, 2008; Moesch, Elbe, Hauge, & Wikman, 2011). The present results suggest that professional baseball players might also tend to specialize late in adolescence and that later specialization was associated with obtaining college scholarships.

Limitations

Despite the large sample, there are a few limitations of the study that limit its generalizability. First, it is important to note that the athletes in this study were minor league players, so it might be that major league players specialized earlier, leading to greater success. Furthermore, data related to college scholarships is obviously only relevant for those players who attended college; many talented players are drafted straight out of high school and their pattern of specialization might be quite different. Furthermore, it is important to note that all analyses described in this report present descriptive data; therefore, we are not able to draw any causal conclusions regarding the relationship between early training patterns and long-term athletic outcomes. There are no doubt many external variables that can impact at what age a player specializes and the success they later achieve. For example, it is possible
that individuals who specialized early were players with fewer available economic and scholastic opportunities and as a result chose to play baseball exclusively as a means of securing stable future employment. In contrast, players who specialized later may have had access to greater academic and financial options, and they would have been more likely to go to college regardless of if they played baseball. It will be important for future researchers to examine the relationship between sport specialization and economic opportunity.

Because this was a retrospective study design, players were asked to recall the ages at which they reached certain milestones in sport participation (e.g., began playing sports, began playing baseball, and specialized in a single sport exclusively) and the number and types of sports played at various points in their development. The fundamental concern with employing this kind of research is that it is reliant on memory and can never be guaranteed to be completely infallible.

Despite these limitations, the results of the current study add to the existing literature on sport specialization by describing patterns of specialization in a large sample of professional minor league baseball players. As a team sport with several paths to success, an international base of talent, and where athletes can play at a high level at a wide span of ages, baseball offers a unique focus of study for the study of sport specialization. Although two distinct pathways to success have been described (Côté, Lidor, & Hackfort, 2009), our results suggest that this sample of athletes was more likely to arrive at professional status through a sampling pathway. These results are consistent with the Developmental Model of Sport Performance proposed by Côté, et al. (2009), suggesting that early specialization increase a child’s likelihood of achieving success in baseball.

Ongoing research is needed to continue to explore patterns of specialization in elite athletes to better inform coaches, parents, and school administrators on best practices. Specifically, our results suggest that there are both ethnic and environmental contributors to the decision to specialize early in one sport. In addition to examining broad patterns of deliberate practice and play, research should explore economic, academic, psychological, and cultural factors that might influence a child’s decisions about sport engagement. It might be that children (or their parents) who feel that their options for future success are limited might be prone to early specialization. Such information will be helpful to clinicians who might be concerned about a young athlete’s decision to specialize or not.

References


