The role of deliberate practice and play in career progression in sport: the early engagement hypothesis

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Experts acquire domain-specific skills as a result of the activities in which they participate throughout their development. We examine the domain-specific activities in which two groups of elite youth soccer players participated between six and 12 years of age. Our goal was to examine early participation differences between those who progressed to professional status at 16 years of age and those who did not. Data were contrasted to a control group of recreational-level players and examined in the context of the Developmental Model of Sport Participation, which supports the importance of late specialization and early diversity between six and 12 years of age. The elite players who went on to attain professional status accumulated more hours per year in soccer play activities, but not in soccer practice, competition or other sports, between six and 12 years of age, compared with those who did not progress. The two elite groups averaged more hours per year in soccer practice compared with recreational-level players, but not soccer play, competition or other sports. We propose the “early engagement hypothesis” to explain our results. Accordingly, practice and play in the primary sport between six and 12 years of age contributes to the development of expert performance in English soccer.

Keywords: expert performance; skill acquisition

Introduction

The deliberate practice theory proposed by Ericsson, Krampe, and Tesch-Römer (1993) has been used as a guiding framework for tracing the development of expert performers. The main proposition that expert performance is closely related to the amount of domain-specific deliberate practice accumulated by performers during their careers has withstood several tests across diverse fields, including sport (e.g., Helsen, Starkes, & Hodges, 1998; Ward, Hodges, Williams, & Starkes, 2007), music (Ericsson et al., 1993), medicine (Ericsson, 2004), and academia (Simonton, 1999, 2000) (for reviews, see Ericsson, 2006; Ericsson, 2007; Ericsson, Roring, & Nandagopal, 2007). Deliberate practice has been characterized as structured activity with the primary goal of improving an important aspect of current performance. Such activity includes immediate access to useful feedback, the opportunity for repetition, error detection, and correction, and requires full attention, maximal effort, and complete concentration (Ericsson et al., 1993).

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In the original deliberate practice theory, Ericsson et al. (1993) explicitly differentiated deliberate practice activities from play, competition, and work (for a review, see Ward, Hodges, Williams, & Starkes, 2004). However, in the context of both perceptual–cognitive and perceptual–motor skill development in sport, researchers have shown that time spent in what has been termed deliberate play (e.g., street soccer, backyard cricket) across a diverse range of physical activities during childhood (e.g., 6–12 years of age) is important (for a review, see Côté, Baker, & Abernethy, 2007; also Côté & Hay, 2002). Deliberate play is engaged in by individuals for the purposes of enjoyment and has rules adapted from adult norms that are set-up and monitored by the children themselves or an adult involved in the activity (Côté et al., 2007). In the present study, we examine whether the type of developmental activities in which youth soccer players engage during early childhood can differentiate those who subsequently progress to professional status in adulthood from those who do not achieve this status.

Based on the findings from a number of studies (Baker, 2003; Baker, Côté, & Abernethy, 2003a, 2003b; Côté, 1999; Law, Côté, & Ericsson, 2007), Côté et al. (2007) proposed the Developmental Model of Sport Participation (DMS). The DMS contains two pathways to skill acquisition that describe the trajectory from entry into sport to expert performance in adulthood: the early diversification and early specialization pathways. In the early diversification pathway, which was influenced by Bloom’s (1985) conception of the development of expert performance in sport, expert adult athletes are predicted to pass through three consecutive developmental stages. These stages are termed the sampling years (6–12 years of age), the specializing years (13–15 years of age), and the investment years (16+ years of age). During the sampling years, children who later became elite athletes participate in a large number of hours of deliberate play activity across a number of sports, but a low number of hours in deliberate practice. For example, expert ice hockey players reported engaging in 6.0 other sports during this period (Soberlak & Côté, 2003), whereas experts from other team sports participated in 8.6 other sports (Baker et al., 2003a). In the early diversification model, children typically refrain from specializing in their primary sport until later in development (Baker, 2003). During the specializing years, these same individuals participate in a comparable number of hours in deliberate play and deliberate practice in one or two sports, including their primary sport. In the investment years, they participate in a large number of hours of deliberate practice in their primary sport, but a low amount of deliberate play across other sports. This progression from play to practice and from diversity to specificity has been supported in studies in which researchers have used structured interviews (Côté, Ericsson, & Law, 2005) to trace the development of elite and sub-elite Australian team sport players (e.g., Baker et al., 2003a, 2003b).

In the early specialization pathway, expert adult athletes enter the sport at an early age (e.g., six years old) and participate in a large number of hours in deliberate practice in their primary sport into adulthood, but a low amount of play across other sports. Evidence supporting this early specialization pathway was shown by Law et al. (2007) among gymnasts who had made it to an elite level. Olympic gymnasts participated in fewer than two other sports between six and 12 years of age, whereas lower-skilled international gymnasts participated in three other sports. Although both the Olympic and international gymnasts started gymnastics practice at around six years of age, by 16 years of age the Olympic gymnasts had accumulated almost three times the amount of deliberate practice in gymnastics compared with the international gymnasts.
However, Olympic gymnasts reported reduced enjoyment, poorer physical health, and more injuries compared with the international gymnasts. In gymnastics, where expert performance is typically required before puberty, early specialization appears a necessary prerequisite (Côté et al., 2007).

Other evidence supporting the early specialization pathway was shown by Ward et al. (2007), who examined English elite youth soccer players. They compared over 200 participation histories from nine age-matched groups of elite youth soccer players playing in England with those of recreational-level players in the same country. Only the amount of time spent in soccer team practice consistently differentiated the skill groups across the different age ranges. Hours accumulated between six and 12 years of age in other sports, the number of sports, and the year of specialization in soccer did not differentiate between skill groups. Moreover, hours accumulated in soccer play activities (i.e., fun games and/or unstructured soccer activities, which were undertaken primarily for enjoyment) did not differentiate groups. English elite youth soccer players did not demonstrate greater sporting diversity during the sampling years, did not appear to engage in more playful activities, and did not delay specialization. Researchers have typically used retrospective methodologies to examine the participation history profiles of expert athletes. Ward et al. (2007) used a quasi-longitudinal design. This latter design enabled the collection of both concurrent and retrospective practice data from athletes at each age of involvement (e.g., from 9 to 18 years). Retrospective methodologies are used to study individuals already considered expert. However, the retrospective recall of these participants is prone to memory error, inference, and generalization on the part of participants. In comparison, data collected using quasi-longitudinal methods are less prone to such memory errors because data are collected from the current year of participation. The disadvantage of this methodology, however, is that the authors are less certain that their elite youth participants would ultimately become expert in adulthood. Although we do not know of any objective data to support this claim, the available anecdotal evidence suggests that only a small percentage of elite youth soccer players in England actually progress to full-time professional status in adulthood. The majority attains semi-professional or amateur status only, or ceases participation entirely (Monk & Russell, 2000).

In the present study, we directly address this issue by re-examining the data reported by Ward et al. (2007) four years after it was collected. It is now possible to revisit this data to examine the factors that contributed to the attainment of expert performance in adulthood. We have defined expert performance in adulthood as attaining full-time professional status at an English Premier League soccer club at 16 years of age. Thirty-three part-time elite youth players were aged between 12 and 14 years at the time of the original Ward et al. study. Eleven of those part-time elite youth players have subsequently progressed to full-time professional status. We distinguish these 11 players from the original elite group (Ward et al., 2007) by referring to them as still-elite players. The remaining 22 elite youth players left the elite youth training program between the age of 13 and 16 years. We create an ex-elite group by selecting 11 out of these 22 players based on two criteria. First, ex-elite players must have been de-selected from the elite youth training program of the soccer club, rather than leaving through injury or voluntarily. Second, in England, elite youth players generally only participate in soccer practice and competition within the elite youth training program and are precluded from participating in these activities elsewhere. For this reason, and in order to test the predictions of the DMSP, we control the age of entry into the elite youth training program between the two elite groups by
matching the age of entry of each ex-elite player with that of a partner in the still-elite group. Therefore, we did not expect differences between the still-elite and ex-elite players in terms of the hours spent in soccer practice (originally “individual practice” and “team practice” in Ward et al., 2007) and competition (originally “match-play” in Ward et al., 2007) between the ages of 6 and 12 years of age, as these activities would mostly be determined by the elite youth training program staff.

The early diversification pathway in the DMSP predicts that during the sampling years (i.e., 6–12 years of age) the still-elite players would have a more diverse profile of participation in other sports indicated by a higher number of other sports and more hours participating in those other sports compared with ex-elite and recreational players (Baker, 2003). A second prediction of this pathway is that the still-elite players would spend more hours in soccer play activity compared with ex-elite (Ford, Le Gall, Carling, & Williams, 2008). The early specialization pathway, on the other hand, predicts that still-elite players engage in less diversity (i.e., less time in fewer other sports) and accrue less time in playful activities in soccer during the sampling years compared to ex-elite and recreational players. As per the findings of Ward et al. (2007), the elite youth soccer players in this study when combined were expected to differ from a control group of recreational players (originally defined as “sub-elite” by Ward et al., 2007) primarily on the hours spent in soccer practice between 6 and 12 years. We only analyze data for the age range 6 to 12 years, which coincides with the sampling years in the DMSP. We are unable to present data for when the participants were aged 13 to 16 years because all of the ex-elite players left the program sometime between 13 and 16 years of age. We acknowledge that the activities participated in during this period may have also contributed to differences in attainment between the elite players.

Methods
Participants
Three groups were created for the analysis from a subset of the data in Ward et al. (2007). The still-elite group comprised players in an English Premier League youth soccer academy accredited by The Football Association who were part-time elite youth players at the time of the Ward et al. study but had subsequently received a full-time professional scholarship at 16 years of age (n = 11). The ex-elite group comprised individuals who were also part-time youth players at the same youth academy at the time of the Ward et al. study but had subsequently not been selected for a full-time professional scholarship at the academy. These individuals were deselected from the academy between the ages of 13 and 16 years, which is after Ward et al. collected the data, and they were no longer playing at the elite level (n = 11). Participants in the ex-elite group were selected so that the age at which they entered the elite youth training program was matched with that of a partner in the still-elite group, although in four cases this was not possible. In these cases, four participants were selected from the ex-elite group who had a start age for entry into the elite youth training program that was one year younger than that of their partner in the still-elite group. An independent t-test revealed that the start age for participation in the elite youth training program (M = 9.2 years, SD = 2.5 years) did not differentiate the still-elite from the ex-elite players, t(20) = 0.67, p > .05, d = 0.3 (Table 1). Any elite youth soccer players from the original study who ceased participation because of injury or left the club voluntarily were excluded.
The third group (recreational) comprised a control group of recreational-level players who had participated in Ward et al. (2007; n = 11). Participants in the recreational and ex-elite groups were selected so that the age at which they began playing soccer was matched to within a maximum of one year with that of a participant in the still-elite group, although this was not possible in two cases. In these two cases, one participant was selected from the recreational group who had a start age in soccer two years younger than that of their partner in the still-elite group, whilst a participant was selected from the ex-elite group who had a start age two years older. A one-way analysis of variance (ANOVA) revealed that start age in soccer ($M = 5.3$ years, $SD = 1.7$) did not differentiate the three groups, $F(2, 30) = 0.26, p > .05, f = 0.1$ (Table 1).

At the time of the original data collection, the elite players competed at the highest national level for their respective age groups, whereas the recreational-level players participated at a local amateur club or school. All participants were aged 12 to 14 years of age at the time of the original study ($M = 13.70$ years, $SD = 0.89$ years), and were aged 16 to 18 years at the time of this analysis. A one-way ANOVA revealed that chronological age did not differentiate the three groups, $F(2, 30) = 0.71, p > .05, f = 0.2$ (Table 1).

### Procedure

In the Ward et al. (2007) study, participants completed a sports and physical activity participation questionnaire that was adapted from previous research (e.g. Helsen et al., 1998; Hodges & Starkes, 1996). Recall of competition, practice and play were deemed to be reliable, based on test-retest values, with correlations ranging from $r = .952$ to .914. Validity was demonstrated on the basis of comparisons between age groups within skill groups and a lack of difference in the retrospective estimates of the older and younger players (Ward et al., 2007).

For the purposes of the current study, these questionnaire data were re-examined. Specifically, participation history data for 33 of the original participants were examined for the average hours per year between six and 12 years of age in three soccer activities. The three soccer activities examined were practice, competition, and play. Practice activities were defined as those deliberately designed to improve performance, either engaged in alone or with others (in the Ward et al. study we differentiated team practice from individual practice). Competition was defined as time spent playing competitive matches against another team. Play was defined as fun games, or unstructured soccer activities (e.g., “kick-around” with friends) that were undertaken primarily for enjoyment. The number of other sports in which individuals had participated and the average hours per year in those sports between six and 12 years of age were also examined.
Data analysis

The average hours per year between six and 12 years of age in each of the three soccer activities (practice, competition, play) by each group was the primary dependent measure. The predictions for these data were specific to the soccer activity condition and we were not interested in interaction differences between groups and activities. We made no predictions about any interactions between group and activity type because these were not predicted in the DMSP or in the alternative models of the DMSP. Consequently, we conducted pre-planned orthogonal contrasts using separate univariate ANOVA tests to compare groups on each of the three soccer activities. The first contrast allowed comparisons of the two elite groups combined (i.e., still-elite and ex-elite, n = 22) to the control group of recreational players (n = 11) in order to confirm the original findings of Ward et al. (2007) with this select sample. The second contrast was of greater relevance to this study, whereby the control group was excluded and the still-elite players (n = 11) were compared with the ex-elite (n = 11).

One-way ANOVA tests were used to examine the start age for participating in other sports and the number of other sports between 6 and 12 years old as a function of group. Three players in the recreational group and four players in each of the still-elite and ex-elite groups had not participated in any other sport between the ages of 6 and 12 years. These participants were removed from the analysis of other sports. The average hours per year in other sports for one participant in both the recreational and ex-elite groups were five times larger than the mean for all other participants in the group. Consequently, we conducted pre-planned orthogonal contrasts using nonparametric Mann–Whitney tests. Average hours per year in other sports for the two elite groups combined (n = 14) were compared with those for recreational players (n = 8). Average hours per year in other sports for still-elite players (n = 7) were then compared with those for ex-elite players (n = 7).

For all analyses the alpha required for significance was set at \( p < .05 \). Effect size measures involving two means were calculated using the Cohen’s \( d \) formula (Cohen, 1988). These measures were calculated using pooled standard deviation. Effect size measures involving more than two means were calculated using the Cohen’s \( f \) formula (Cohen, 1988).

Results

Soccer activity

The average hours per year between six and 12 years of age in each of the three soccer activities as a function of group are presented in Figure 1.

Practice

The overall group effect for soccer practice was significant, \( F(2, 30) = 7.87, p<.05, f = 0.7 \). The first contrast revealed that the two elite groups combined (\( M = 235 \) hours, \( SD = 118 \)) had higher average hours per year in soccer practice between the ages of six and 12 years compared with the control group of recreational players (\( M = 87 \) hours, \( SD = 71 \)), \( p<.05, d = 1.5 \). The second contrast revealed that average hours per year in soccer practice during this period did not differentiate the still-elite (\( M = 212 \) hours, \( SD = 121 \)) from the ex-elite group (\( M = 259 \) hours, \( SD = 115 \)), \( p > .05, d = 0.4 \).
Competition

The average hours per year between the ages of 6 and 12 years old in soccer competition did not differentiate the three groups in the omnibus ANOVA, $F(2, 30) = 1.95$, $p < .05$, $f = 0.4$. Average hours per year between the ages of six and 12 years in soccer competition did not differentiate the two elite groups combined ($M = 42$ hours, $SD = 15$) from the control group of recreational players ($M = 29$ hours, $SD = 23$), $p > .05$, $d = 0.7$. Average hours per year in competition during this period also did not differentiate the still-elite ($M = 40$ hours, $SD = 13$) from the ex-elite group ($M = 44$ hours, $SD = 18$), $p > .05$, $d = 0.3$.

Play

The overall group effect for soccer play was significant, $F(2, 30) = 3.18$, $p = .05$, $f = 0.5$. The average hours per year between six and 12 years of age in soccer play activity did not differentiate the two elite groups combined ($M = 243$ hours, $SD = 247$) from the recreational players ($M = 158$ hours, $SD = 104$), $p > .05$, $d = 0.4$. However, the still-elite group ($M = 338$ hours, $SD = 308$) had higher average hours per year in soccer play activity during this period compared with the ex-elite group ($M = 148$ hours, $SD = 114$), $p < .05$, $d = 0.8$.

Other sports

The start age for participating in other sports ($M = 9.3$ years, $SD = 2.2$ years) did not differentiate groups, $F(2, 47) = 1.42$, $p > .05$, $f = 0.1$, neither did the number of other
sports engaged between six and 12 years old, \( F(2, 30) = 3.76, p > .05, f = 0.1 \). Players participated in 1.5 sports other than soccer \((SD = 1.3)\) during this period. The nonparametric analysis of average hours per year in other sports between the ages of six and 12 years old did not differentiate the two elite groups combined \((M = 183 \text{ hours}, SD = 155)\) from the control group of recreational players \((M = 403 \text{ hours}, SD = 413)\), \(p > .05, d = 0.7\), or the still-elite players \((M = 161 \text{ hours}, SD = 90)\) from the ex-elite players \((M = 204 \text{ hours}, SD = 210)\), \(p > .05, d = 0.3\).

**Discussion**

We tested opposing sets of predictions that reflected the two alternative skill acquisition pathways within the DMSP. The early diversification pathway predicts that the still-elite players would participate in more other sports, spend more time in those other sports, and more time in playful activities than ex-elite and recreational players. The early specialization pathway, essentially, makes the opposite predictions: still-elite players would participate in fewer other sports, spend fewer hours in other sports, and less time in play.

Our data did not support the early diversification pathway of the DMSP in which children who later become expert athletes are predicted to sample a relatively large number of sports between six and 12 years of age. The number of other sports and average hours per year in other sports between the ages of six and 12 years did not differentiate the groups. On average, all groups participated in 1.5 sports other than soccer. The number of sports was lower than the number of other sports reported previously by Soberlak and Côté (2003, \(M = 6.0\)) and Baker et al. (2003a, \(M = 8.6\)). The lower number of other sports compared with the research of others may be a by-product of the dominance of soccer in English culture or of differences in the procedures used between studies. Baker et al. (2003a) used a semi-structured interview procedure and asked their participants to recall “any type of sport activity that they engaged in on a regular basis before specializing in their primary sport” (p. 16). In comparison, we used a questionnaire in which participants were asked to enter the names of every sport they had played at the start of the questionnaire before answering a number of questions on that sport.

There was a difference between the groups of still-elite and ex-elite players in the average number of hours per year in soccer play activity between six and 12 years of age. Still-elite players had twice as many average hours per year in soccer play activity during this period compared with the ex-elite. This finding supports a modified version of the early diversification pathway in the DMSP (Côté et al., 2007): that children who later became expert athletes engage in more play activity in their main sport between six and 12 years of age compared with less-skilled athletes. While the early diversification pathway predicts more play, it does not specifically predict more play solely in the athlete’s primary sport. The current data suggest that this is an important variable in the development of expert performance, at least in soccer. There is some evidence to suggest that play is important in the development of soccer game intelligence, such as anticipation and decision-making, as well as creative tactical responses (Bell-Walker & Williams, 2008; Sternberg & Lubart, 1995). Moreover, this type of early involvement in sport and the perceived enjoyment is thought to have a positive effect on an individual’s general motivation and willingness to engage in further domain-related activities (Côté et al., 2007).

Data from the recreational control group show that engagement in soccer play activity alone (with low amounts of soccer practice) between six and 12 years did not
lead to expert performance and, more specifically, selection to professional status. The recreational group was not differentiated from the two elite groups combined in terms of the average hours per year in soccer play and they engaged in fewer hours per year in soccer practice. The greater number of soccer practice hours by elite groups compared with recreational players is consistent with the early specialization pathway, and previous studies in which expert athletes have been shown to engage in more primary sport deliberate practice compared with less-skilled athletes (e.g., Law et al., 2007).

Since both the still-elite and ex-elite players were not differentiated on age of entry into the academy training environment, we did not predict any differences between these groups in soccer practice and competition between six and 12 years of age, as these activities would largely be determined by the academy staff. Both groups started playing soccer at five years of age, their age of entering the elite youth training program was nine years of age, and there was no difference between them in average hours between six and 12 years of age in soccer practice and competition. The specific combination of activities in which the still-elite players engaged appears to be responsible for their progression to professional status at 16 years of age. The still-elite group engaged in more soccer practice, but not play compared with recreational players, and more soccer play but not practice compared with ex-elite players who did not attain professional status. Although the accumulation of sufficient practice hours has previously been shown to be essential for the attainment of expert performance in soccer (e.g., Helsen et al., 1998, who did not measure soccer-specific deliberate play), only when this is coupled with engagement in soccer play does this lead to selection to professional status.

The current data do not wholly support either the early diversification or early specialization pathways. Accordingly, we propose an alternative hypothesis of skill acquisition during the sampling years, based on early engagement. Our data lead to the suggestion that early engagement is reflected by minimal diversity in other sports and high levels of play and practice in the primary domain.

This study had two main limitations. First, we have only analyzed data for the age range six to 12 years, whereas the still-elite players became professional at 16 years of age. The period we analyzed coincides with the sampling years in the DMSP, in which there are clear differences in predictions for the activities in which expert and lesser-skilled performers should have participated. We were unable to present data for when the participants were aged 13 to 15 years because all of the ex-elite players left the program sometime between 13 and 16 years of age. The activities participated in during this period will likely have contributed to the between-elite-group differences in attainment. Second, the sample size employed in this study was relatively low, and consequently there is scope to collect additional data to verify these findings. The relatively low sample size and the variability in the data mean that we may be committing errors in accepting or rejecting null hypotheses. Additional research is required to examine whether our findings are specific to the sport, culture, and nation.

In summary, although mixed support was found for both the early specialization and the early diversification pathways proposed by the DMSP (Côté et al., 2007), our data are consistent with an alternative hypothesis. Compared with the less-successful soccer players, successful soccer players spend more time in deliberate practice and play in their primary sport, and engage in minimal sporting diversity in other sports. We offer the early engagement hypothesis as an alternative means to explain the development of skill in sport. When supported by an extensive number of hours in
soccer practice, time spent in soccer play significantly contributed to success, as long as the majority of time was not spent in soccer play. Overall, the findings highlight the need to derive an appropriate balance between domain-specific deliberate practice (e.g., team practice) and participation in domain-specific play (e.g., fun activities that likely foster motivation and independent decision skills) in the development of expert performers in soccer.

**Note**

1. We were also interested in how participants having a high (or low) number of hours in one type of soccer-specific activity affected the number of hours they had in another activity. Therefore, we conducted a correlation analysis on the average hours per year in each soccer activity. Pearson’s correlation coefficients were calculated to examine the relationship between each activity. Significant medium-sized positive correlations were found between soccer practice and each of the other two soccer activities (competition, play). Participants who had a high average number of hours in soccer practice also had high average hours per year in each of the other two activities. No correlation was found between soccer play and competition. There was no significant correlation between average hours per year in soccer activity and those in other sports.

**References**


