By far, this is the area that has garnered the most research in sport. This section of the book provides answers to many of the most pressing questions that arise with regard to the training of high-level performers. What follows are examples of the kinds of questions we hope to address in this section of the book (with the respective chapters for each).

- Is it better for aspiring young athletes to focus on one sport or to experience many sports before they concentrate their training on just one? Côté, Baker, and Abernethy (chapter 4) provide interesting data to suggest that varied sport experiences may be of benefit.

- How do the best coaches teach, critique, support, and motivate athletes? How much and what combination of training techniques should athletes engage in for various sports? Deakin and Cobley (chapter 5) provide intriguing and unexpected findings with regard to how the best athletes practice and what role the coaches play.

- How does one’s motor skill development interact with the development of strategies and tactics in a sport? McPherson and Kernodle (chapter 6) examine how motor skills develop in conjunction with strategy and tactical skills in tennis.

- Do coaches, sport referees, and judges exhibit domain-specific expertise in the same way athletes do? Ste-Marie (chapter 7) makes the case that the development of skill in referees and judges is similar to the development of skill in athletes and that they too must circumvent the normal information-processing limits to consistently perform at a high level.

- What aspects of performance (anticipation, perceptual accuracy, decision speed, attentional focus, response selection, response consistency, strategy, etc.) best reflect expert behaviors in a particular sport? Why is it that athletes seem to have all the time in the world to respond and do not seem to be limited by the speed of the game? Tenenbaum presents a model that suggests how the best athletes make decisions and avoid the normal pitfalls associated with physiological fatigue and competitive pressures (chapter 8).

- Can we improve perceptual accuracy or decision speed through the use of perceptual- and decision-training programs? How best can we assess the value of these training programs and whether the learning they impart actually transfers to real-world game situations? If perceptual- and decision-training programs are proven useful, then at what age and skill levels could athletes potentially benefit from them and what proportion of overall practice time should be devoted to
them? Each of these questions are of practical interest to coaches and athletes. Williams and Ward (chapter 9) provide extensive background on perceptual training, and they illustrate details on how to assess the efficacy of training. An important addition to this chapter is their description of the implementation of perceptual-training programs for soccer players of varying ages and skills.

- How much and what sort of training activities are best for Master athletes, who hope to retain their former high levels of performance? Starkes, Weir, and Young (chapter 10) provide an optimistic view of what can be retained with continued practice. This is a must-read chapter for older athletes who continue to train.
Chapter 4

From Play to Practice

A Developmental Framework for the Acquisition of Expertise in Team Sports

Jean Côté • Joseph Baker
Bruce Abernethy
The objective of this chapter is to highlight changes in athletes' behaviors and environment that promote the optimal development of sport skills and the maintenance of motivation at each level of growth. This developmental approach to expertise is discussed with respect to the following:

- Stages of sport development
- General categories of activities that athletes can engage in throughout the course of their development
- Empirical findings that regard changes in the type of activities that expert athletes engage in at different stages of their development
- Changes in the social influences of athletes at different stages of their involvement in sport

**Stages in Sport Development and Commitment**

In their pioneering research, Bloom and colleagues (1985) interviewed 120 participants who were at the top of their respective professions in science, art, and athletics. Their study identified similar phases of learning for all domains of expertise: the early years, the middle years, and the later years. In a review of these phases of learning, Sosniak (1985) suggested that although time engagement in the actual domain of expertise was a crucial factor to learning for those involved in the study, it alone was not sufficient to ensure high levels of performance in the domain. Sosniak stated: “What a learner does, how he or she does it, and how things change as the years pass, are certainly more important variables than the absolute amount of time spent at an activity” (p. 409).

The sport development of two athletes can vary because of different learning opportunities, the instructional methods experienced, and the emotional environment in which learning takes place. Differences in unique environmental experiences during childhood may also lead to differences among elite and less elite athletes in motivation to practice, in the type of skills acquired, and in how and when exceptional abilities are developed. Issues of motivation and learning become important when one tries to understand the types of experience athletes should have and what should be taught at various stages of participation in sport. In the development of expertise, sensitive periods appear to exist where important decisions about participation have to be made, which include a reduction of playing activities and an increase...
of more serious training activities (Kalinowski, 1985; Monsaas, 1985). These periods of transition seem to concur with certain developmental factors that influence the acquisition of expertise during childhood and adolescence.

Monsaas (1985) and Kalinowski (1985) described the development of expertise from early childhood to adulthood using a sample of tennis players and swimmers (respectively). Data from the tennis players showed that during the early years, only 4 of the 18 players focused solely on tennis. The 14 players that did not specialize exclusively on tennis at an early age participated in a number of other sports, including football, basketball, baseball, soccer, and track. Monsaas (1985) stated that “in these early years only a few of the tennis players played tennis in the winter” (p. 223). Although Monsaas highlighted a great deal of variation in the amount of time that the players had spent on tennis during the early years, the players did experience a gradual increase in the amount of practice until the end of this phase of learning.

The next stage of tennis development, the middle years, are from approximately age 13 through the end of high school. Monsaas highlighted three major changes that characterize the transition from the early years to the middle years. First, the young athletes “began to view themselves as tennis players” (p. 236). Second, the players needed a new type of coaching that put more emphasis on technique and strategy. Finally, the transition from the early to the middle years was marked by an increase in time invested in tennis practice. The decision to play tennis full-time marked the transition from the middle to the later years, and this decision was typically made during college. Additionally, the later years were characterized by another important increase in the number of hours spent in tennis practice.

The development of the swimmers, although chronologically different from the tennis players, was also marked by an initial involvement that focused on interest, excitement, and inherent enjoyment through playing activities (Kalinowski, 1985). Kalinowski described the early years of the 21 swimmers in the following terms:

These are crucial years, even more crucial than those that follow, because it is during this period that our subjects became interested and caught up in the sport of swimming. In time that interest became self-motivating. Had there been no excitement during the early years, and no sense that the young swimmer was very successful, there would never have been a middle or later period. (p. 141)
The early years lasted about two and a half years for half of the swimmers whereas it covered a longer period of time for the other half of the sample (Kalinowski, 1985). Between the ages of four and five, all the swimmers had started swimming. Until at least age seven, lessons included various types of games that were primarily designed to provide excitement and fun. At age seven or eight, about half of the sample moved directly from summer programs to more competitive and demanding year-round swimming programs while the other half remained in the less intense summer programs. Involvement in year-round swimming programs marked the beginning of the middle years and specialization on the sport of swimming. The transition from the middle years to the later years was then characterized by an increase in intensity and in time committed to swimming. Kalinowski did not suggest an age that generally marked the transition from the middle years to the later years.

In sum, although there were differences in chronological age as to when the tennis players and swimmers reached the middle and later years of their development, most of the athletes studied by Kalinowski (1985) and Monsaas (1985) started their involvement in sport by “trying” out different sports in a playful and fun environment. As the athlete moved from the early years to the middle and later years, this type of environment gradually changed and soon included specialization in the main sport with more practice time. Further, throughout their development, the athletes were provided with stimulating educational environments at home and with coaches that guided the improvement of their performance. Perhaps the most important finding concerned how athlete involvement and supporting conditions such as parental involvement changed as the athletes progressed in sport.

Côté (1999) extended Bloom’s (1985) research through qualitative interviews with elite junior athletes in rowing and tennis. Similar to Bloom, he identified three stages of development (specific to sport) from childhood to late adolescence; namely, the sampling years (ages 7-12), the specializing years (ages 13-15), and the investment years (age 16+). In the sampling years, parents were responsible for initially getting their children involved in sport. Children were given the chance to sample a range of different sports and develop fundamental motor skills, such as running, jumping, and throwing. The main purpose was to experience fun and excitement through sport. In the specializing years, the child focused on one or two specific sporting activities. While fun and excitement remained central elements of the sporting experience, sport-specific development emerged as an important characteristic of the child’s sport involvement. Critical incidents that
made a child pursue one activity over others included positive experiences with a coach, encouragement from an older sibling, success, and simple enjoyment of the activity. The specializing years marked a transition in which athletes gradually decreased their involvement in various extracurricular activities and focused on one or two specific sporting activities. Finally, the child moved into the investment years, during which the child became committed to achieving an elite level of performance in a single activity. The strategic, competitive, and skill development characteristics of sport emerged as being the most important elements of the investment years. Côté (Côté, 1999; Côté & Hay, 2002) differentiated the notion of play in the development of sport expertise and suggested the concept of “deliberate play.” Transitions between the sampling, specializing, and investment years were then operationalized by significant changes in athletes’ engagement in deliberate play, deliberate practice, and other sporting activities.

Although the sampling, specializing, and investment years are similar to Bloom’s (1985) three phases of learning (the early years, the middle years, and the later years), they are also different on two important aspects. First, the stages of sport participation are specific to sport and are anchored in the theoretical concepts of deliberate play and deliberate practice. The sampling, specializing, and investment years are therefore differentiated by and based on the amount of a participant’s deliberate practice and deliberate play. Côté and Hay (2002) suggested that the sampling years are characterized by a low frequency of deliberate practice and a high frequency of deliberate play; the specializing years are marked by similar amounts of each; and the investment years are characterized by a high frequency of deliberate practice and a low frequency of deliberate play. The second difference between the two models is that the sampling, specializing, and investment years are identified by an age range that is consistent with general theories of child development, such as those identified by Piaget (1962) and Vygotsky (1978). In sum, the stages of sport participation are consistent with Bloom’s original work, but they add sport-specific dimensions that can be tested for their scientific validity.

From Play to Practice: Definition of Terms

In a comprehensive review of studies regarding learning and skill acquisition, Ericsson, Krampe and Tesch-Römer (1993) concluded that the most effective learning occurs through involvement in a highly structured activity defined as deliberate practice. According to Ericsson et al., engagement in deliberate practice requires effort, generates
no immediate rewards, and is motivated by the goal of improving performance rather than inherent enjoyment. Ericsson et al. demonstrated that expert performance in music was the product of extensive deliberate practice rather than being the result of innate abilities. They suggested that to achieve expert performance, deliberate practice has to be sustained over a period of at least 10 years.

Aspects of the Ericsson et al. (1993) theory of deliberate practice have been verified in the sport domain (Helsen, Starkes, & Hodges, 1998; Hodge & Deakin, 1998; Hodges & Starkes, 1996; Starkes, Deakin, Allard, Hodges, & Hayes, 1996). However, developmental analyses of children’s involvement in sport have not yet determined what makes certain children engage in deliberate practice whereas other children turn away from the effort and persistence that is inherent to these activities. Côté (1999) has proposed that the structure of deliberate practice and playful activities changes as a function of the child’s age. Further, the optimal learning and motivational activities in the later years are probably different than the activities associated with the best learning and motivational environment in the early years of an athlete’s development in sport.

In fact, in attempts to define play, researchers have come up with criteria that differ considerably from the criteria of deliberate practice. Smith, Takhvar, Gore, and Vollstedt (1986) reviewed different definitions of play and suggested the following five criteria. First, intrinsic motivation: Play behavior is done for its own sake and not brought about by basic bodily needs or by external rules or social demands. Second, positive affect: The behavior is pleasurable and enjoyable to the child. Third, nonliteral: The behavior is not carried out seriously, but it does have an “as if” or pretend-like quality. Four, means/ends: The child is more interested in the performance of the behavior itself than in the results or outcome of the behavior. Five, flexibility: The behavior shows some amount of variation in form of context.

Although studies in sport may support the fact that deliberate practice activities can result in pleasurable or enjoyable affect (Starkes, 2000), deliberate practice activities are generally defined as being extrinsically motivated, being literal, focusing on outcomes rather than processes, and having somewhat rigid rules. Developmental psychologists and educators (Piaget, 1962; Wiersma, 2000) would argue that involving young children in such structured activities could have detrimental effects on learning and motivation. Just as Piaget (1962) suggested continuity between children’s play and work, we suggest continuity between playing sport and participating in deliberate sport-specific practice activities.
Côté and Hay (2002) discussed the importance of athletes’ playing games with rules during their early development. This type of play was described as *deliberate play*, a term that was chosen to contrast with three types of activities: the free-play activities of infancy and early childhood (Denzin, 1975; Piaget, 1962); the “structured practice” activities typical of organized sport; and deliberate practice activities (Ericsson, 2001; Ericsson et al., 1993). Contrary to the practice activities that are generally designed to improve performance, deliberate play activities are designed to maximize inherent enjoyment. Deliberate play activities are regulated by rules adapted from standardized sports rules, and they are set up and monitored by the children or by an adult involved in the activity. The concepts of free play, deliberate play, structured practice, and deliberate practice may be placed on a continuum of activities that are characterized by different dimensions (table 4.1).

The dimensions most likely to differentiate between free play, deliberate play, structured practice, and deliberate practice include the following: the goal of the activity, the perspective taken while engaged in the activity, the structure of the activity, the monitoring during the activity, and the sources of gratification.

| Table 4.1 | Comparison of Free Play, Deliberate Play, Structured Practice, and Deliberate Practice Activities |
| Dimensions | Free play | Deliberate play | Structured practice | Deliberate practice |
| Goal | Fun | Fun | Improve performance | Improve performance |
| Perspective | Process (means) | Process-experimentation | Outcome (ends) | Outcome (ends) |
| Monitored | Not monitored | Loosely monitored | Monitored | Carefully monitored |
| Correction | No correction | No focus on immediate correction | Focus on correction (often through discovery learning) | Focus on immediate correction |
| Gratification | Immediate | Immediate | Immediate and delayed | Delayed |
| Sources of enjoyment | Inherent | Predominantly inherent | Predominantly extrinsic | Extrinsic |
the activity, corrections made during the activity, the immediacy of gratification, and the sources of enjoyment. The dimensions qualifying deliberate practice activities were derived from the original study of deliberate practice (Ericsson et al., 1993) and studies conducted in sport (Helsen, et al., 1998; Hodge & Deakin, 1998; Hodges & Starkes, 1996; Starkes, et al. 1996).

Between the Ericsson et al. original study and the studies conducted in sport, one source of discrepancy relates to the concept of enjoyment. In the original study of deliberate practice, Ericsson et al. (1993) asked subjects to ignore the consequences of the activity and to focus on the inherent enjoyment of the activity itself. They then used interview questions to document the subjects’ experiences. The questionnaires that were used in the sport research instructed participants to evaluate “the enjoyment derived from the actual activity” (Helsen et al., 1998, p. 18). This type of instruction might measure a different construct: Participants might confuse the enjoyment of the results of the activity with the enjoyment of the activity itself (Ericsson, 1996). Regardless, neither instruction would have allowed an external observer to assess an athlete’s level of enjoyment, since no observable indicators of enjoyment were used to measure the concept (Côté, Ericsson, & Beamer, 2001). Despite the overall findings of the sport studies (Helsen, et al., 1998; Hodge & Deakin, 1998; Hodges & Starkes, 1996; Starkes, et al. 1996), we contend that play activities are more inherently enjoyable than deliberate practice activities—a view consistent with Ericsson and colleagues’ original definition of deliberate practice (Ericsson, 1996; Ericsson et al., 1993).

### Sport Involvement of Expert Athletes Throughout Their Development

To date, sport studies using the Ericsson et al. (1993) theoretical framework have focused on experts’ descriptions of various practice activities and the ratings of these activities in terms of enjoyment, relevance, effort, and concentration. Few studies in sport, however, have been conducted with the purpose of tracing the development of expertise by assessing experts’ performance at various stages of sport participation and the variables that could have affected their performance and motivation. A new methodology (Côté, et al., 2001) has recently been developed to specifically assess the types of play and practice activities that are necessary to achieve expertise and the additional environmental conditions that are critical to the attainment of expertise throughout
development. This methodology (or an adaptation of it) has been used with elite Australian team sport athletes (Abernethy, Côté, & Baker, 1999; Baker, Côté, & Abernethy, in press a; in press b) and Canadian ice hockey players (Soberlak & Côté, in press). It has provided reliable and valid longitudinal findings with important implications for the design of practice and the structuring of junior sport development systems.

Abernethy, Côté, and Baker (1999) used the new interview technique (Côté, et al., 2001) to study a group of 15 Australian national team athletes (3 female netball players, 4 male field hockey players, 4 female field hockey players, and 4 male basketball players) and a comparative sample of nonexpert decision makers drawn from the same sports. Both groups completed the structured interview that was designed to elicit information regarding their sporting development from its initiation to the present day. In addition, researchers asked each subject qualitative questions regarding psychosocial events that marked each athlete’s development. Collectively, the quantitative and qualitative questions focused on athletes’ psychosocial development, involvement in various activities, and the performance milestones that occurred throughout their progress toward sport expertise.

The developmental changes that marked the careers of the expert players are in agreement with the sampling, specializing, and investment years as distinct stages of sport participation. An important transition point occurred at approximately age 13 when expert athletes began secondary school, reduced their involvement in other sports, and began to compete at the state or provincial level in their primary sport. Another transition point occurred at approximately age 16, when athletes made the decision to become elite athletes and consequently invested all their leisure time into training.

Figure 4.1 outlines important training factors that change throughout the development of expert athletes, including the number of sporting activities they are involved in and the number of hours invested in both deliberate practice and deliberate play.

As well, social influences such as the roles of coaches, parents, and peers change as the child progresses from the sampling to the investment years. These changes in training factors and social influences are discussed in the next section.

**Number of Sporting Activities**

Figure 4.2 outlines the number of activities expert and nonexpert Australian athletes (Baker et al., in press a) were involved in as a function of their age. From age 5 to 12, both experts and nonexperts increased
Figure 4.1 Changes in social influences and training factors during the sampling, specializing, and investment stages.

- Training factors:
  - Number of activities\(^{a,b,c}\)
  - Deliberate play\(^c\)
  - Deliberate practice\(^{a,c}\)
  - Coach's role\(^d\)

- Social influences:
  - Coach as sport specialist
  - Indirect involvement (spectator)
  - Fulfill emotional needs (spectator)
  - Coach as sport helper (child-centered)
  - Direct involvement (organizer, driver, spectator)
  - Fulfill stimulation needs (playing partner)


From Play to Practice

their participation in extracurricular activities; however for the expert athletes, this is followed by a rapid decrease in other activities from approximately age 13 onward, which would mark their entry into the specializing years. A comparable reduction of involvement in various activities after age 13 does not occur for the nonexpert athletes. The reduction in the number of activities in which expert athletes were involved continues until approximately age 17, the beginning of the investment years. After age 17, the expert decision makers were involved in an average of three sporting activities. An examination of these activities suggests that the athletes stayed involved in other sports for relaxation (e.g., golf) or for cross-training during the off-season (e.g., soccer). Data from the nonexpert athletes suggest that they never experienced the pronounced specializing and investment as experienced by the experts.

Figure 4.2  Expert and non-expert involvement in other activities.

During the qualitative interviews, the athletes were asked to regroup the years for which their training remained consistent, and they were also asked to identify specific years at which their training changed in terms of quality and quantity. The periods of sport participation identified by the expert athletes, as illustrated in the following quotations, are consistent with the previously presented data and with the distinction among the sampling, specializing, and investment years made by Côté (Côté, 1999; Côté & Hay, 2002).
I had had different activities in my life (referring to the ages 6-12) at that time. I was still playing squash and still playing footy and doing other stuff as well. I had no idea I would focus on basketball at that stage. Between 12 and 16 . . . basketball was my main sport, I had cancelled out the other sports. But I wasn’t 100% focused on basketball at that time. I still had my school and other stuff but it was definitely my number one sport. Pretty much basketball was everything from 16 on. It was pretty much all that I was concentrating on.

—Male basketball player

At around age 13, I was mostly playing and training once a week. From age 14-17 I did more training in terms of more times a week. I was training with the NSW [state] team and stuff like that. I didn’t do much in terms of weights, sprints or endurance. The practice was more intense and regular. Then 18-19 I got the shock of my life when I started doing weights, sprints and endurance. At age 20-23 I really worked hard for endurance training.

—Female netball player

Baker et al. (in press a) found a strong negative correlation (r = –.74, \( p < .01 \)) between athletes’ involvement in additional sporting activities and the amount of sport-specific training needed to achieve expertise. More specific, as the number of additional sporting activities that athletes were involved in increased, the number of hours of sport-specific training before national team selection decreased. This relationship suggests that the diverse experiences of the sampling years may be of functional significance for the development of expert decision making.

The retrospective data reviewed in this section on sport-specific training of elite athletes in team sports suggest that early specialized, single-sport training is not necessarily a prerequisite for the development of expertise in that sport. Indeed, it may actually be wise to delay sport specialization to maximize choice for the child and thus enhance the range of motoric experiences the child can ultimately bring to the principal sport of interest.

**Hours of Deliberate Practice**

Considerable evidence supports the monotonic relationship between accumulated amounts of deliberate practice and performance attained in team sport (Helsen et al., 1998; Helsen, Hodges, Van Winckel, &
Starkes, 2000). Ericsson et al. (1993) suggested that “the higher level of attained elite performance, the earlier the age of first exposure as well as the age of starting deliberate practice” (p. 389). Although findings from various studies showed that early exposure to sport is a strong predictor of performance, it remains to be confirmed whether the early exposure consisted mainly of deliberate practice activities. By tracing the development of expert performers in sport, Côté (1999) and Côté and Hay (2002) have emphasized the importance of deliberate play (as opposed to deliberate practice) in the early years of elite athletes—a view consistent with studies that investigated the early years of elite performers (Bloom, 1985; Carlson, 1988).

Helsen et al. (2000) showed that at about 10 years into their career, international field hockey players and soccer players greatly increased the amount of time spent in team practice. Similarly, Baker et al. (in press a) showed that expert Australian team sport athletes accumulated similar hours of sport-specific training versus nonexperts until approximately 10 years of involvement in their sport at around age 15, or the beginning of the investment years. After age 15, the rate of sport-specific practice accumulation by experts escalated dramatically beyond that accumulated by nonexperts. Nevertheless, Baker et al. found that the number of hours of reported sport-specific training by their expert athletes (being some 4,000 hours, on average) was far short of the 10,000 hours of deliberate practice reported for expert musicians by Ericsson et al. (1993). Further, the range of accumulated hours reported by the Australian expert athletes was highly variable, which suggests that additional factors (to the total hours of accumulated sport-specific practice) do indeed influence one’s attainment of expertise in the team sport domain.

Soberlak and Côté’s (in press) study of professional ice hockey players is consistent with Baker and colleague’s (in press a) study of Australian team sport athletes. Soberlak and Côté showed that the total accumulated hours of the ice hockey players’ deliberate practice from the age of 6 to 20 was only 3,072 hours, of which an average of 459 hours was accumulated during the sampling years. Conversely, an average of 2,215 hours of deliberate practice occurred during the investment years. These findings support evidence from previous studies (Baker et al., in press a; Bloom, 1985; Côté, 1999; Helsen et al., 1998) that identify the investment years as a period of elite athletes’ devotion to specialized training. In sum, the athletes’ development of expertise in team sport and subsequent progression to high levels of performance may be attributable to something other than a singular focus on deliberate practice activities from an early age.
Hours of Deliberate Play

Soberlak and Côté’s (in press) retrospective study of 20-year-old professional ice hockey players was the first study to quantify the number of hours spent in deliberate play activities throughout development. The number of hours per year that athletes engaged in deliberate play activities (e.g., street hockey, backyard ice rink, mini sticks), deliberate practice activities (e.g., organized practices, power skating, dryland/weight training), organized games, and other sports are shown in figure 4.3.

As figure 4.3 reveals, athletes were involved in high amounts of deliberate play activities during the sampling years (ages 6-12). In contrast, the specializing years (ages 13-15) were characterized by a significant decrease in the athletes’ involvement in deliberate play whereas in the investment years (ages 16+), athletes were involved in few deliberate play activities. Involvement in other sports followed a similar pattern to involvement in deliberate play activities. Converse-
ly, involvement in deliberate practice activities and organized games started at a low level of involvement at age 6 but increased gradually from the sampling to the investment years.

A playful environment during the early years of a child’s involvement in sport may explain the early learning and exceptional motivation of expert athletes because it appears to lead to subsequent learning and involvement in deliberate practice. Gould, Udry, Tuffey, and Loehr, (1996) showed that early specialization and highly structured training in which control is passed to an outside agent (parent or coach) reduce intrinsically motivated behavior and can ultimately lead to more dropout and burnout among youths in sport. On the other hand, children are motivated to participate in deliberate play because of their own interest in the activity. This type of early involvement in sport may actually help children to gain a better appreciation of their ability and subsequently affect their decision to stay involved in sport (Brustad, Babkes, & Smith, 2001).

**Developmental Aspects of Motivation**

Self-determination theory and Vallerand’s recent hierarchical model of motivation in sport (Deci & Ryan, 1985; Ryan & Deci, 2000; Vallerand, 2001) support the notion that early intrinsically motivating behaviors (deliberate play) will have a positive effect over time on overall motivation and ultimately the one’s willingness to engage in more externally controlled activities (deliberate practice). Ryan and Deci (2000) suggested that what is paramount in the development of highly motivated, self-determined experts is the following: the building of a solid foundation of intrinsic motivation, through involvement in activities that promote intrinsic regulation that provide participants with the opportunity to make autonomous decisions, develop competence, and feel connected to others. Involvement in a high amount of deliberate play activity during the sampling years can provide young athletes with the opportunity to engage in activities that are intrinsically regulated, which can subsequently help them to become more self-determined and committed in their future participation in sport.

Data from the qualitative interviews with Australian team sport athletes (Abernethy et al., 1999) support the notion that deliberate play is the most important activity to keep young children motivated and to help them learn basic sport skills.

As a child we used to just get out and play against a wall, play various games involving ball. It could have been tennis balls, anything ball and bat oriented. I think as a netballer,
it was important to play a variety of games at an early age, because it did help with co-ordination. By the time I started playing netball I already had that base.

Female netball player

We used to play it [field hockey] down in the back yard quite a lot. Just for a bit of fun. Every afternoon we would get down in the back yard and play it. That is what was so fun about it. It was good playing against my brothers and sisters.

Female field hockey player

Although sports have become more organized and institutionalized in the last few years (De Knop, Engström, & Skirstad, 1996), expert team sport athletes’ first experience in sport is still connected with the importance of playing and experimenting with new or different means of executing skills rather than attaining a goal. As illustrated in this section, the involvement of expert athletes in deliberate play activities allowed them to try new or different combinations of behaviors that eventually enabled them to reach their goal. The expert athletes’ early involvement in deliberate play activities were preconditions to their motivation to pursue more specialized training and achieve exceptional performance.

Social Influences Throughout the Development of Expert Athletes

Children have three main sources of influence as they progress through their development of sport: coaches, parents, and peers. From the sampling years to the specializing years and on to the investment years, each group’s role of influence changes. Some evolve into more complex roles; others fade into more supportive roles. Each group’s influence throughout the stages is described as follows.

Role of Coaches in Developing Young Athletes

The important issue of how expert athletes spend their time during practice highlights the crucial role that coaches have in setting up optimal learning conditions (Côté, 2002; Côté, Salmela, Trudel, Baria, & Russell, 1995; Kalinowski, 1985; Salmela, 1996). Because of the changing cognitive, physical, and emotional needs of children at various stages of their sport participation, it is important that the role of coaches
changes accordingly. In general, expert coaches have been shown to provide both physical (e.g., training facilities and equipment) and social resources to overcome the effort and motivational constraints associated with deliberate practice (Salmela, 1996). However, few studies have assessed how coaches’ roles change from athletes’ early sport participation to athletes’ achievement of elite performance. Kalinowski (1985) and Monsaas (1985) describe coaches’ roles in the early years as being kind, cheerful, and caring. In the later years, coaches were described as being more qualified in the sport and respected for their knowledge. Monsaas (1985) made the following statement about the first coaches of world-class tennis players:

> While these were not exceptional coaches, they tended to be very good with young children. They were regarded by the tennis players as extremely nice people who sometimes took on the role of a father figure. (p.225)

In qualitative interviews, Australian expert team sport athletes (Abernethy et al., 1999) discussed the types of coaches they had in their first few years of involvement in sport. When the athletes were between the ages of 6 and 12, coaches’ intervention style and the teaching content was straightforward—they let children play and focused just on their basic skill development.

> My first coach, she was just a nice lady, we used to have a lot of fun.

Female netball player

> [When I started] I think I had some good coaching. They weren’t necessarily what people call brilliant coaches but they were enthusiastic and I think that was more important than anything.

Female field hockey player

From a coaching perspective, involving children in deliberate play activities without imposing a rigid structure on their experience during the sampling years may have a unique and vital role in the child’s development in sport. Deliberate play allows the child to experiment with various forms of movement in a stress-free environment that could be most conducive to learning. Deliberate play permits the development of social attitudes, encourages the child to be with others, and gives a child specific goals to work toward. Through play, the
child grows, and the growth acts as a stimulus to play-change and later involvement in more structured deliberate practice activities.

Abernethy et al. (1999) noted that athletes started to develop a closer and more professional relationship with their coach at approximately age 13.

Knowledge of the game, good coaches have a passion for it. They impart that passion on players. Because of the way they feel about the game they motivate people around them . . . [a coach at this level] has sound knowledge of the game, puts in a lot of hours, really tries to get the best out of players, and train them at the highest intensity.

Female hockey player

In sum, athletes’ descriptions of their coaches’ intervention in the first stage of their career focused on opportunities to move, to be engaged in motor activities, and to learn fundamental movement skills that eventually became the foundation for learning more complex sport skills later in their development.

Athletes started to develop a closer relationship with their coaches at approximately age 13. At the same time, coaches became more technical and “serious” regarding their athletes’ involvement in practice and training. Such a transition in the coach’s role—from being identified as “sport-helper” and “child-centered” during the sampling years to “sport specialist” during the investment years—may strengthen athletes’ commitment to increasing the quantity and intensity of their training and to pursuing their sport to a higher level.

Role of Parents in Developing Young Athletes

Bloom (1985) highlighted the major influence of the family at the different stages of children’s talent development in science, art, and athletics. They reported that in the early years of a child’s involvement in an activity, parents tended to be supportive, which allowed their children freedom to decide whether to practice formally or not. This stage was followed by a period of dedication for both the performers and the parents. Finally, the later years were characterized by the participant’s full-time commitment to improving performance, and the parents’ role was more restricted, consisting mainly of financial support. Bloom’s study thus provided a developmental perspective on the influence of family on talent development.

More recent, Côté (1999) studied the family environment of elite junior athletes throughout their development. The role of the parents
changed from a leadership role in the sampling years to a follower/supporter role in the investment years. During the sampling years, the parental belief that sport is an important factor in a child’s overall development resulted in the parents’ assuming a leadership role and encouraging their children to be involved in various types of enjoyable sporting activities. During the specializing years, parents became committed supporters of their child-athlete’s decision to be involved in a limited number of sports. In all the families studied, parents did not put any kind of pressure on the children regarding what type of sport they should specialize in. This role of follower and supporter became more apparent in the investment years when parents made sacrifices in their personal lives and in their family’s lives to allow their child-athlete to have optimal training conditions. During the investment years, parents responded to the various demands and expectations put on their child-athlete by fostering an optimal learning environment, rather than creating new demands or pressure.

As a follow-up of Côté’s study, Soberlak (2001) used a structured interview technique to assess how the formal roles of parents of three professional ice hockey players changed as the athletes progressed from the sampling to the investment years. During the sampling years, parents’ involvement consisted of the following: coaching their child; helping to structure their child’s deliberate play activities (building a backyard rink); involvement without actual input on activities (driving the child to the practice site); observing and giving feedback; and participating with their child as a playing/training partner. During the specializing years, parents stopped coaching their children, and instead of helping them structure their deliberate play activities, they started helping them structure their deliberate practice activities. Parents’ involvement during the specializing years can be summarized as facilitating their child’s deliberate practice activities (setting up a weight room at home); becoming involved with them and their activities without giving them actual input; observing and giving feedback; and participating with their child as a playing/training partner. Finally, during the investment years, parents’ involvement consisted of helping to structure the child’s deliberate practice activities as well as observe and give feedback.

A common characteristic of the Côté (1999), Bloom (1985), and Soberlak (2001) studies is how the role of the parents changes from the sampling through to the investment years. Generally, parents have a direct involvement in their child’s sporting activities during the sampling years, which consists mainly of coaching and playing/training with their child. The direct involvement becomes indirect, however,
when the child moves from the sampling to the investment years. During the investment years, the role of the parents consists mainly of being a spectator at games and providing opportunities at home for their child to be involved in deliberate practice activities, such as by supplying a weight room.

**Role of Peers in Developing Young Athletes**

Reviews of the youth sport motivation literature have consistently listed peers as one of the main reasons why children participate in sport (e.g., Brustad, et al., 2001; Weiss & Petlichkoff, 1989). Despite the well-known importance of peers in children’s sport socialization, few studies have been conducted to examine the influence that peers have on an athlete’s performance in sport.

In their study of 15 Australian elite team sport athletes, Abernethy et al. (1999) found that in the early stage of the expert athletes’ career, all mentioned having a group of friends that were involved in sport. Interacting with friends that have interest in sport allows the expert athletes to “play” sport whenever free time was available. When they were with their friends, expert athletes described playing sports as their main activity:

> I suppose the fact that my friends all loved sport really helped. We were all so energetic when we were young. We would all get together and go round to our house and go and have a kick of a football or something. So I suppose that was really good because I grew up loving all different sports. And maybe that helped me get a bit of natural ability as well.

  
  Female hockey player

During the investment years, the expert athletes discussed the importance of having friends outside of sport as well as athlete-friends.

> The fact that you can go to friends outside of sport and just talk about anything [is important]. With a friend in sport, you have that common link, which is a pretty big common link. Whereas a friend outside of sport appreciates the fact of what you are doing in sport, but there is also an outlet to talk about other things.

  
  Male field hockey player
Overall, expert athletes were mainly influenced by peers that were involved in sport during childhood and adolescence. This type of relationship allowed them to spend a considerable amount of their free time playing sport. When sport became more serious at approximately age 16, the athletes mentioned that it was beneficial to have friends outside of sport as well as athlete-friends. This type of peer interaction during the later stage of an athlete’s involvement in sport may fulfill relationship needs that are driven by more complex emotional issues. As athletes move from the sampling to the investment years, they establish a network of peer relationships that satisfy their more complex adult needs. During the sampling years, the origin of interaction with peers is driven by the young athlete’s need for stimulation through deliberate play. As athletes progress to the investment years, peer relationships grow more intense and fulfill motivational and emotional needs that may facilitate involvement in deliberate practice activities. Continued research on the important issue of peer relationships is necessary to more fully understand the social influences that affect the development of expertise.

**Summary**

Ericsson and colleague’s (1993) study of musicians, and subsequent studies of deliberate practice in sport (Helsen, et al., 1998; Hodges & Starkes, 1996; Starkes, et al. 1996; Hodge & Deakin, 1998), strongly support the contention that deliberate practice is a major determinant of expertise. These studies, however, offer few insights as to why certain athletes chose to invest in deliberate practice whereas others do not. The major objective of this chapter was to highlight developmental changes associated with deliberate practice and the achievement of expertise in team sports. By taking a developmental approach, one that describes common changes in experts’ behaviors and social influences from childhood to adulthood, we sought to generate a timeline that described when important observable, predictable, and measurable changes in sport practice and performance occur. A comprehensive understanding of the development of expertise in sport requires that we describe changes in behaviors and social influences at various stages of an athlete’s involvement in sport.

As many others have noted (e.g., Brustad, et al., 2001; Weiss, 1995), it is important not to see young athletes in sport as miniature adults with small-scale skills, attitudes, and abilities. A true developmental approach to expertise promotes the search for optimal approaches to
the development of sport skills that are appropriate to each stage of growth. Because preadolescent athletes have not yet learned how to engage in task persistence, how to delay gratification, or how to be self-controlled, the focus of training for athletes of this age should be on learning basic cognitive and motor skills through deliberate play activities. By the time athletes reach adolescence, they will have acquired fundamental movement skills through deliberate play and will have developed mature cognitive skills. At this point, an appropriate shift in training would include more complex kinds of learning and deliberate practice activities. The roles of coaches, parents, and peers also follow predictable changes throughout the development of expertise that help athletes make the transition from playlike activities to more serious types of training.

The model presented in this chapter, which highlights the changing environment of athletes who achieved a high level of performance in sport, has many implications for the design of sport programs. The choice of learning objectives, curriculum sequence, and teaching methods will need to vary greatly for athletes of different ages. Early sport diversification, high amounts of deliberate play, child-centered coaches and parents, and being around peers that are involved in sport all appear to be essential characteristics of environments for young children that encourage their later investment in deliberate practice activities.

**EXPERT’S COMMENTS**

**Question**

In this chapter, Côté, Baker, and Abernethy suggest that there may be an advantage for young children to pursue a number of sports at a young age before they decide to concentrate on their primary sport. What do you suggest?

**Coach’s Perspective: Nick Cipriano**

The research literature in wrestling supports a multilateral approach to an athlete’s sport participation before one specializes in wrestling training. Researchers believe that participation in a variety of sports enhances general athleticism and better prepares the young athlete for the rigors of wrestling training. In North America, the age of specialization for wrestling is pegged at between 13 and 14 years of age, which coincides with the start of high school. All potential wrestlers have ample opportunity to sample
other sports before they focus on wrestling training. A growing body of anecdotal evidence, however, strongly suggests that the most successful wrestlers in the world are introduced to formalized wrestling training earlier in life, anywhere from age 10 and onward. Even for such early starters, all are involved in a variety of sports activities that serve to supplement wrestling training.

The road to developing expertise in sport is indeed a lengthy one. The position advanced by Ericsson, Krampe, and Tesch-Römer (1993)—that it may require a minimum 10 years/10,000 hours of practice to attain expertise status—is certainly a position I support, based on my knowledge of training patterns in elite athletes. Within the continuum of expertise development in sport, the role of the coach is to accelerate the learning process and to shorten the duration of the journey to expertise. The 10 years/10,000 hours of practice is a benchmark that in my experience holds firm across various sport domains, and it is certainly one that applies to freestyle wrestling. Regardless of the activity, though, it appears that a 10-year period is the minimum time requirement for athletes to do the following: learn and perfect the technical-tactical skills of any sport; gain experience for high-level competition; develop volitional qualities that will sustain a prolonged effort; and cultivate biological adaptations that meet the physical demands of the sport. Each component is orchestrated over a prolonged period, and through repeated practice, simulation, and competition, the athlete will develop the tools necessary to achieve and sustain expert performance.

A freestyle wrestler typically engages in three distinct phases of training en route to becoming an expert. The first phase starts at the age of 13 to 14 years, which coincides with the start of high school. Although many wrestlers are exposed to wrestling before high school, relatively few engage in a training program that offers sufficient structure to serve a meaningful purpose. The four years of high school training serve as the formative years for skill development, and they are a critical time for the coach to cultivate the volitional qualities that will facilitate the athlete’s making a long-term commitment to a training program.

On completing high school, the wrestler either continues to practice with a community-based club or becomes a member of a college program. The second phase is four to five years long and is characteristic of physical development, technical-tactical skill perfection, and the gaining of experience in high-level competition. The wrestler spends upward of 20 to 25 hours a week training, which is broken down into approximately 10 to 12 hours of
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Specific training, 6 to 8 hours of supplemental training, 2 to 3 hours of video analysis, and 2 to 4 hours of recovery and regenerative exercises. At the end of the second phase, wrestlers start a specialized phase of training that focuses on high-level competition, technical-tactical perfection, and physical refinement. The third phase is generally between three and five years in duration, with superior performances emerging anywhere between the first and fifth year. In most cases, if a strong international performance has not been achieved within the first three years of the third phase (23-26 years of age), it is likely that the wrestler will not develop into an international-level performer.

With some noted exceptions (e.g., women’s gymnastics), the developmental process for athletes in other sports is similar to that of the wrestler. All will engage in specialized training somewhere between 10 and 14 years of age, and over a 10-year period, they will develop specific technical-tactical skills, acquire appropriate competition experience, and in concert with physical maturation, emerge as international-level athletes.

**Player’s Perspective: Therese Brisson**

I could not agree more with Côté, Baker, and Abernethy’s point of view. My generation of athletes did all the sports—soccer, swimming, baseball, hockey, basketball, track and field, badminton, you name it. We had a variety of motor experiences, each of which had elements that transferred to other situations. We were good athletes first and specialists second, much later in life. I am very concerned about the trend in Canada toward specialization at an earlier age, especially in hockey, the sport I am involved with. Dr. Steve Norris, a highly regarded physiologist at the University of Calgary who works with many of Canada’s top athletes, says that the younger athletes today are great hockey players, skiers, swimmers, and so on, but they are not very good athletes. In fact, he points out that the best athletes in high-performance programs are actually the older athletes. Therefore, one objective of the training programs Dr. Norris designs today has been to improve what he calls **general athletic ability**. A key element of the women’s hockey team preparations for the 2002 Winter Olympic Games was a month-long summer camp at which the focus was on improving general athletic ability. We did a lot of skipping, jumping, quick foot movement, soccer, basketball, cycling, rock climbing, swimming, yoga, and running, but very little hockey. The objective of the camp was to be better athletes, and I think this camp was one
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of the keys to our success. However, the most effective time for this activity is much earlier in an athletic career.

Despite my support for the generalist approach, I think that windows of opportunity for learning motor skills do exist. In his book *Why Michael Couldn’t Hit*, Klawans (1996) eloquently explains the inability of Michael Jordan, an undisputed expert basketball player, to make the transition to baseball. Klawans’ explanation is that Jordan was not exposed early enough to the perceptual demands of hitting a baseball pitched at major league speeds. Jordan had passed the window of opportunity for developing this skill, and he never was able to hit consistently, even in the minors. Klawans presented evidence in expert violinists to further support this window of opportunity idea. PET scanning showed that children who learned to play the violin before 13 years of age activated completely different areas of the brain than those who learned after the age of 13. It seems that after age 13, the window of opportunity for developing expertise at violin playing closes.

I have noticed the effect of windows of opportunity in my own sport. For example, my first experiences in skating occurred when I was around 2 years old. At 6 years, I began playing ringette, a sport that is like floor hockey on ice. I didn’t start to play organized hockey and practice puck handling until I was 12. No matter how much I practice, I will never have the puck-handling skills of some of my younger teammates, many of whom started handling a puck at 6 years of age. I think I had passed the window of opportunity for expert puck handling! However, my skating skills are much better than those of most of my peers. I think this is because ringette allowed me to concentrate on skating skills at a young age, because it does not present the demands of puck handling. Furthermore, from the ages of 14 to 20, I spent around 20 hours per week on the ice in the winter, playing, practicing, coaching, instructing, and refereeing both ringette and hockey. I think that skating in these varying contexts led to the development of superior skating skills and was the foundation for my development as an athlete. Despite extended practice, some of my teammates have improved weaker skating skills but can’t seem to reach the same level of skating skill as those who did ringette or figure skating as a younger child. The best approach to developing sport expertise is to expose children to a large variety of motor skills and experience early on (6 to 14 years) so that children will not miss windows of opportunity and leave specialization for later on (15 years and older).