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Making It to the Top in Team Sports: Start Later, Intensify, and Be Determined!

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Abstract: It is debated whether young athletes need to specialize early, or if it is more beneficial to follow the path of early diversification. The present study investigates the career paths and related motivational and volitional factors of Danish elite and near-elite team sport athletes. Seventy-six athletes matched by sport, age and sex participated in the study. Elite athletes started their career later and showed higher self-determination and lower values in postponing training. The logistic regression showed that fewer accumulated training hours up to age 12, but more up to age 15 significantly predicted elite group membership. All other investigated variables did not show significant results. It is concluded that there are more similarities than differences between the two groups.

Keywords:
career development, diversification, specialization, motivation, volition

Career Development in Team Sports

The question of how to achieve peak performance is central in elite sports. Researchers within all domains of sport sciences invest considerable effort in gaining knowledge about which variables and processes lead to winning international medals. Within social sciences, and from a developmental perspective, a controversial question concerns which career path leads to expert performance. Based on the "Developmental Model of Sport Participation" (Côte, Baker, & Abernethy, 2007) two ways to reach elite performance are described. The path of *early specialization* focuses on early involvement in the main sport, often occurring in early to middle childhood, with very little or no involvement in other sports. The importance of a high amount of deliberate practice is stressed during all ages (Ericsson, Krampe, & Tesch-Römer, 1993). Originally, deliberate practice was defined as activities that are specially designed to improve performance relevant to the particular domain, that are effortful and not inherently enjoyable (Ericsson et al., 1993). However, Deakin and Cobley (2003) conclude that no practice activity in sports has yet been judged highly relevant and effortful, while simultaneously scoring low on enjoyment. Moreover, many activities that constitute a normal practice regimen of an elite athlete may not improve performance per se, but aim at enhancing required levels in certain domains (e.g. physical training) that lead to increased performance (Ward, Hodge, Williams, & Starkes, 2004). Therefore, it is suggested to define deliberate practice in sport in a broader sense than initially suggested by Ericsson et al. (1993), including all activities aimed at increasing the current level of performance. Additionally, emphasis is placed on constraint factors including motivation and effort, which are considered important to maintain the hard, and sometimes monotonous, training regime (Ericsson et al., 1993). In contrast, the path of *early diversification* postulates that the first years of sport participation should be characterized by the involvement in different sports as well as a high amount of play-like practice that has little focus on deliberate practice activities. After these sampling years, often around age 12, the young athlete gradually reduces involvement in other sports and begins focusing on the main sport. From there, the athlete progresses to

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a highly deliberate practice regime at around age 16 (Côté et al., 2007). The two paths will be described in more detail in the next sections.

Elite Performance Through Early Specialization

Emerging from Ericsson et al.'s (1993) theoretical framework, this path postulates that in order to achieve expertise, one must engage in 10,000 hours of deliberate practice within the chosen domain. The theory is based on a well-documented, strong and positive relationship between amount of practice hours and performance found in the music domain (Ericsson et al., 1993). Ericsson et al. also argue that the accumulation of these practice hours must match sensitive stages of the biological and cognitive development during childhood and adolescence. Wollny (2002) states that prior amount of motoric experience is the decisive factor for how quickly new sport techniques are learned and that simple movements are learned faster by children than by teenagers and adults. In order to accurately exploit these sensitive stages and prevent a delay compared to peers that started earlier, it can be hypothesized that an early onset in a given sport is required to reach expert performance and to be competitive with other athletes. A logical conclusion of the paradigm is that an early start in a given sport is a necessary requirement to reach expertise and to prevent a practice delay compared to peers who started their sport involvement earlier.

There is extensive scientific evidence from different sports that supports a positive relationship between practice hours and expertise level (e.g. Baker, Côté, & Deakin, 2005a; Baker, Deakin, & Côté, 2005b; Helsen, Starkes, & Hodges, 1998; Hodges & Starkes, 1996; Hodges, Kerr, Starkes, Weir, & Nananidou, 2004; Law, Côté, & Ericsson, 2007). In order to persevere on the long and strenuous path to expertise, including deliberate practices that are not considered inherently enjoyable, Ericsson et al. (1993) suggest three domains to be essential in developing expertise. Aside from resource constraints (e.g. access to training facilities and coaches or parental support), which play a crucial role in the development of elite sport performance (Holt & Dunn, 2004; Van Yperen, 2009; Baker & Horton, 2004), Ericsson et al.'s focus is on motivation and effort. The *motivational* constraint refers to an individual's goal commitment. Motivation plays an important role in competitive sports, and the achievement motive seems to be especially relevant for athletic peak performance (Gabler, 1995; 2002). Atkinson (1957) and Heckhausen (1963) divide the achievement motive into two components, namely the motive to achieve success and the motive to avoid failure. Several studies have investigated the achievement motive in relation to sports. Thomassen and Halvari (1996) found a significantly positive relationship between the motive hope for success and the amount of competitive training and athletic success, whereas a strongly developed motive fear of failure correlated negatively with athletic success. Gabler (1981) determined that high hope for success and low fear of failure are important prerequisites for keeping up athletic training over a longer period of time. The lower the hope for success and the higher the fear of failure are, the more likely a cessation or reduction of athletic training is. An individual with a dominance of fear of failure over hope for success may choose achievement goals that are either too easy or too hard (Elbe & Wenhold, 2005), and may be more likely to lose motivation, stagnate in their overall development and be less satisfied with their sport (Elliot & Harackiewicz, 1996). The *effort* constraint refers to the ability of an individual to persist in high levels of deliberate practice; this is comparable to the concept of volition, as discussed e.g. in the Rubicon model of action phases (Heckhausen, 1989). This model stresses the assumption that motivation needs to be complemented by volition or will-strength in order for an intention to be transformed into an action. In other words, motivation alone is not sufficient to maintain athletic training over the long period of time required to achieve expertise, but has to be "backed up" with volitional processes. These processes are responsible for initiating an action, despite internal and external resistance, and for maintaining the action until the goal has been reached (Kuhl, 1983). Several studies confirm the significant role that motivational and volitional factors play in the

involvement and performance level of athletes in top-level sports (e.g. Beckmann & Kazén, 1994; Elbe, Beckmann, & Szymanski, 2003; Holt & Dunn, 2004; Van Yperen, 2009). Elbe, Beckmann and Szymanski (2003) showed significant correlations between achievement motivation and not only the current but also the future sport performance in a sample of young elite athletes. Furthermore, Elbe and Wenhold's (2005) study indicated that competitive athletes scored significantly higher scores on hope for success (achievement motive) than athletes that did not take part in competitions regularly. In Wenhold, Elbe and Beckmann's (2009) research volitional factors discriminated between elite and near-elite athletes. The elite athletes showed higher scores on the beneficial volitional factors related to goal maintenance and self-control and lower values on the not beneficial factors related to problems with initiating actions and staying focused.

Even though the relationship between practice and performance is one of the most robust in behavioral science (Baker et al. 2005b), criticism arose regarding Ericsson et al.'s (1993) approach. Firstly, even though many studies revealed that elite performers trained more than near-elite performers, the elite performers did not reach the magic number of 10,000 practice hours (Van Rossum, 2000; Baker, Côté, & Abernethy, 2003). Secondly, Baker and Côté (2006) point out that reducing the development of expertise in sport solely to deliberate practice fails to acknowledge important developmental, psychosocial and motivational factors of young athletes. Thirdly, there is no consensus that early onset and early specialization are required for the development of expertise (e.g. Carlson, 1988; Barynina & Vaitsekhovskii, 1992; Lidor & Lavyan, 2002). The results of Vaeyens, Güllich, War and Phillippaerts (2009), for example, clearly show that there is no evidence that an early onset and a higher amount of sport-specific training are associated with greater success at a later stage.

Additionally, a body of research emerged showing that early specialization can lead to negative consequences for the athletes, such as attrition and negative health outcomes (e.g. Côté et al., 2007). Law et al. (2007) found that Olympic-level rhythmic gymnasts, who had acquired significantly more training hours in their career, also rated their health as lower and their participation experiences as less fun than that of their peers at the international level. Gould, Udry, Tuffey and Loehr's (1996) study revealed that early specialization and highly structured training reduced intrinsic motivation and increased likelihood of dropout and burnout among young athletes. Likewise, Wall and Côté (2007) found that ice-hockey players who dropped out began off-ice training earlier than athletes that continued their participation. This indicates that early-specialized training regimes that are not inherently enjoyable can have a detrimental effect on the long-term development of athletic expertise. These results strengthen the assumption that in order to become a highly motivated, self-determined and committed adult athlete, it is crucial to build a solid foundation of intrinsic motivation at early stages (Deci & Ryan, 2000).

No one involved in elite sports will negate deliberate practice as an important pillar for reaching expertise, and the prominence of practice is generally agreed upon in literature (Janelle & Hillman, 2003). However, the risks of an early and intense involvement in sports as well as the evidence for late specializing experts need to be acknowledged. Therefore, it has to be questioned whether or not early specialization is the exclusive path to expertise. It also needs to be investigated if different paths that involve lower risks for the individual, can lead to the same outcome (Baker et al., 2005a).

Elite Performance Through Early Diversification

Based on the above-mentioned results, the notion emerged that in addition to early specialization, expertise can also be reached through early diversification (Côté et al., 2007). Two underlying notions exist for this path. From a psycho-social point of view, it can be reasoned that engaging in a variety of different sports allows the young athlete to experience different physical, cognitive, affective, and psycho-social environments (Côté, Lidor, & Hackfort, 2009). It is hypothesized that this path promotes the development of intrinsic motivation (Côté et al., 2007), which again serves as the basis for a self-regulated

involvement in an elite sport at a later stage (Côté et al., 2009). From a performance point of view, it can be hypothesized that experiences in different sports provide the young athlete with important abilities. These abilities prove beneficial in the development of sport-specific skills required to reach elite performance in the main sport at a later stage in one's career. There is a general assumption that talented athletes can benefit from such a transfer across sports (Williams & Ford, 2008). Baker et al. (2003) support that view, stating that a transfer of learning takes place from one sport to another, including both cognitive and physical abilities. Current research further suggests that the effect of such a transfer is most pronounced during early stages of involvement (Schmidt & Wrisberg, 2000), corresponding with the time frame of the sampling years in the "Developmental Model of Sport Participation" (Côté et al., 2007). Based on these considerations, it can be hypothesized that involvement in different sports, during at least the early stage of the career, might be beneficial for reaching elite performance.

There is evidence that later specialization can be more beneficial while training to become an expert athlete. Carlson (1988) found that elite tennis players specialized later, practiced less than their near-elite peers between the ages of 13 and 15, but intensified their training considerably more after age 15. Likewise, Lidor and Lavyan (2002) found that elite athletes from different sports began specializing later than near-elite athletes. Nevertheless, the elite athletes completed more training hours when they reached peak performance, indicating that despite their late start, they managed to compile enough hours to perform at the top level. Barynina and Vaitsekhovskii (1992) found that swimmers who specialized early spent less time on the national team and ended their sport career earlier than athletes who specialized later. Güllich's (2007) results showed that early intensification in athletic development does not correlate with long-term success, but that in contrast, particularly successful careers are characterized by a deceleration of practice and competitive development.

Lidor and Lavyan's result (2002) confirms the idea of sampling, finding that 70% of the elite, compared to 58% of the near-elite athletes, performed more than one sport in their early years of involvement. Likewise, Emrich and Güllich (2005) report that both being active in another sport beside the main sport, and starting one's sport career in another sport and then switching to the main sport at a later age, is significantly more prevalent in internationally competitive German athletes when compared to their peers that competed only at a national level. Evidence suggests a beneficial effect of early diversification, not only on performance level, but also on other variables. Baker and Côté (2006) state that sampling and deliberate play in the early years of sport participation may lead to more enjoyment and a lower frequency of dropout, which indirectly contributes to the attainment of a high level of performance in adult years. Moreover, they report that athletes who sample and diversify in their young years may be less at risk for injuries than their peers that specialize early.

However, doubts concerning sampling being inherently beneficial for all young athletes arose; several authors questioned whether or not early diversification is applicable to all sports (Baker, 2003; Williams & Ford, 2008), and Côté et al. (2009) conclude that early diversification is not beneficial for athletes' performance in sports where peak performance occurs before full maturation, such as gymnastics. Emrich and Güllich's (2005) study also confirms this assumption.

Sport Specificity in Career Development

Based on the results above, it is expected that the career paths of athletes from sports with a focus on different capabilities (e.g. physical, technical, tactical) are unique and should therefore be analyzed separately. However, Emrich and Pitsch (1998) propose that sports sharing similar structural conditions will lead to similar career paths, justifying analyzing similar sports together. Other studies also followed that approach, analyzing data of athletes from different sports with similar structural exigencies (e.g. Güllich, 2007; Emrich & Pitsch, 1998). Team sports have similar requirements: athletes often cope with varying

situational conditions caused by the constant changes of opponents' and teammates' behavior, resulting in a high variability of training and competitive loads (Güllich, 2007). For team sport athletes, it is necessary to have a highly developed, sport-specific technical skill level, distinctive physical capabilities, good tactical understanding as well as excellent visual and perceptual capabilities. Jointly, it is hypothesized that reaching expertise in team sports requires a high volume training regime in order to develop all the required capabilities. This leads to the assumption that athletes in such sports should start their involvement early in hopes of developing these capabilities before reaching peak performance age. Another assumption is that athletes from team sports benefit from involvement in other sports, as this is believed to lead to a broad, diverse motor development, which fosters creativity (Memmert, Baker, & Bertsch, 2010) and additional visual and perceptual capabilities.

Aim of the Study

The aim of this study is to gather and compare data about the careers of elite and near-elite athletes in team sports. The first step will be to investigate if there are differences between elite and near-elite athletes in the following variables: practice hours in the main sport, involvement in other sports, time point of career start, as well as motivational and volitional factors. The second step aims to analyze if these variables predict membership in the elite group.

Based on the reflections about the team sport category mentioned above, the following hypotheses are formulated:

H1 – Prediction About Group Differences. It was expected that due to the complexity of team sports, elite athletes practice more, and this way accumulate more practice hours during their career than their near-elite peers (H1.1). Likewise, as team sports pose high demands on technical and tactical capabilities, and a skill transfer from other sports (at least at a young age, Baker, 2003; Williams & Ford, 2008) can be expected, it is hypothesized that elite athletes have participated in a larger number of sports and have been involved longer in other sports during their career (H1.2). Based on the assumption that elite athletes need to accumulate more practice before reaching expertise, it is hypothesized that they begin their career at an earlier age than their near-elite peers (H1.3). Finally, in order to pursue a dedicated and goal-oriented training regime, it is hypothesized that elite athletes have more beneficial values concerning motivational (H1.4) and volitional variables (H1.5) than near-elite athletes as for example indicated in the Wenhold, Beckmann and Elbe (2009) study. This means that we expect that elite athletes show higher hope for success and lower fear of failure. Further we expect higher scores on volitional scales assessing beneficial factors related to goal maintenance and lower scores on factors relating to problematic aspects of goal maintenance.

H2 – Assumptions About Prediction of Group Membership. It is assumed that variables related to accumulated practice hours, engagement in other sports, initiation of career, as well as motivational and volitional variables predict the membership in the elite group.

Method

Design

In order to get more information about the optimal path for reaching high-level athletic performance, it seems meaningful to identify how elite and near-elite athletes can be differentiated based on exposure to practice activities (Williams & Ford, 2008). Many studies in the domain of talent development and expertise have been conducted with a retrospective design based on the seminal work of Bloom (1985). Since Bloom's open-ended interview studies, other study designs have been applied using fixed-response questionnaires (e.g. Helsen, Starkes, & Hodges, 1998; Starkes et al., 1996;) and quantitative

interviews (Côté, Ericsson, & Law, 2005). Common for all of these approaches is that they face methodological risks, namely that athletes cannot recall their past experiences or that the recall of past experiences is biased (see Hodges, Huys, & Starkes, 2007). These risks pertain especially to questions asking about characteristics of past training (e.g. enjoyment, effort; Côté, Ericsson, & Law, 2005). However, Helsen, Starkes and Hodges (1998) and Côté, Ericsson, and Law, (2005) documented that elite athletes can recall objective information like training hours and athletic success fairly reliably both in questionnaires and interviews. This indicates that retrospective studies can provide interesting and meaningful insights into the early experiences of elite and near-elite athletes when the focus is on objective information, and not enough resources for longitudinal studies are available. Based on these considerations, the present study adopts a cross-sectional, retrospective design. In order to economically access a large and geographically widely spread sample and due to the fact that the questions related to objective past experiences a questionnaire design was chosen for this study.

Procedure

A link to a web-based questionnaire was sent out to the target group by email. A web-based design was chosen because it seemed most suitable for a sample involving young persons. Web-based studies offer the advantage that the participants can choose individually when they want to answer and are also a low-cost method for obtaining responses from participants from different parts of the country (Shaugnessy, Zechmeister, & Zechmeister, 2006). Before starting the questionnaire, the athletes were informed about the content and the aim of the research project, were told that all data would be treated confidentially, and that participation was voluntary. According to Danish rules, no further ethical approval is necessary for this study. After six weeks, a re-test was sent out to the participating athletes with the aim of checking the reliability of some of the variables. In order to increase response rates, reminders were sent out by mail and/or SMS after both surveys. To further check the reliability of the data, 16 participants who simultaneously took part in an interview study were on that occasion asked the same questions again, offering the unique opportunity for another reliability check four months after data collection. For this study only the team sport athletes were selected.

Sample

All athletes that were registered in the database of *Team Danmark*[1] and who were either supported in the year of the survey (2009) or had been supported within the last six years were contacted. Data of 91 female and 94 male Danish athletes ($N = 185$) from team sports with a mean age of 21.51 ($SD = 5.29$) could be gathered. The total sample involves athletes from soccer ($n = 92$), handball ($n = 45$), ice hockey ($n = 38$), and volleyball ($n = 10$). The "elite" group ($n = 64$; 38 females and 26 males; age: $M = 23.20$, $SD = 5.74$) included athletes who placed among the top ten at a world-level championship (e.g. World Cup, Olympics) or who won a medal at a championship on a European level (e.g. European Championship) on a senior level.

The differentiation between elite and near-elite athletes based on Championships results follows the procedure applied by Emrich, Fröhlich, Klein and Pitsch (2009) and Emrich and Güllich (2005). In order to eliminate an age bias, athletes up to age 21 were also included in the elite group if they stated that they had won a medal at a junior world championship. All athletes who did not meet one of these criteria were consequently labeled as near-elite athletes ($n = 121$; 53 females and 68 males; age: $M = 20.62$, $SD = 4.83$). Near-elite athletes can thus be described as high level athletes competing at international level, without so far having succeeded in ranking top at international championships. Analysis performed on the entire sample of team sport athletes, indicated that the elites were significantly older than the near-elites. In order to eliminate this age bias, which could lead to skewed results, only active athletes were selected for these further analyses. Furthermore, each elite athlete was paired with a near elite athlete of the

Table 1. Description of Sample

Sport	N_{total}	n_{elite}	$n_{near\text{-}elite}$
Soccer	32	16	16
Handball	18	9	9
Ice Hockey	24	12	12
Volleyball	2	1	1
Total	76	38	38

same sport, age (+/-12 months) and sex. In the case that there was more than one matching near-elite athlete the athlete closest in age (birth month) and with the lowest number of missing answers was selected. In total 38 pairs ($N = 76$; 50% males, 50% females) of elite and near-elite athletes could be matched in the entire sample and form the basis of the analyses. Table 1 displays a description of the sports in the final sample.

Instruments

The questionnaire gathered information about the following topics:

- **Biographical Information**
- **Practice Hours in the Main Sport.** The athletes had to report how many hours they trained on average per week for every year in their main sport, starting with the current year and then working backwards (Hodges et al., 2007). To cover the definition of deliberate practice in sport in the best possible way (see introduction), they were asked to include all forms of training (technical, physical, mental) in their main sport as well as competitions in this calculation. The accumulated amount of practice hours at age 9, 12, 15, 18 and 21 was calculated based on this question.
- **Involvement in Other Sports.** The athletes were asked to state all additional sports they were involved in during their career by indicating which sport they were engaged in and how many months they practiced in the respective sport. In order to properly address the question of diversification which focuses on additional sport activities in the early stages of a sport career, the additional sports were added if they were started before the age of 15.
- **Career Start.** The athletes had to state at what age they started participation in their main sport.
- **Weekly Training Schedule.** For data validation purposes, the athletes were asked to report their average training schedules for every weekday during the current year or, alternatively, for the last year they were involved in their main sport at an elite level.
- **Athletic Success.** The athletes were asked to state their results at different international competitions at junior and senior levels.

The theoretical basis for including the motivational and volitional factors is the Rubicon model of action phases (Heckhausen, 1989; see introduction). This model shares similarities with the idea of motivation and effort proposed by Ericsson et al. (1993). The following measurement instruments were chosen based on availability of these questionnaires in Danish, as well as good reliability and validity in previous studies:

- **Achievement Motive.** The short version of the Achievement Motives Scale-Sport Danish (Elbe & Wenhold, 2005; Elbe, 2008) assesses the two achievement motive components, *hope for success* and *fear of failure*. Each scale has five items, with a Likert-scale answering format ranging from 0 (*not true for me at all*) to 3 (*exactly true for me*). The values for the scales range from 0 (very low) to 15 (very high). The two scales show high internal consistency with the current sample (*Hope for success*: Cronbachs alpha[2] $\alpha = .83$, $N = 573$; *Fear of failure*: $\alpha = .85$, $N = 573$).

- **Volition.** The Volitional Components Questionnaire Sport (VCQ-Sport; Wenhold et al., 2009) measures volitional skills as well as deficits related to training and competitions. It assesses 60 items through 20 scales within four main components (self-optimization, self-impediment, lack of activation, and loss of focus). The questionnaire has a Likert-scale answering format ranging from 0 (very low, *"not true for me at all"*) to 3 (very high, *"exactly true for me"*). The scales are formed by taking the average of all items, resulting in scale values ranging from 0 (very low) to 3 (very high). For the present study, due to the length of the questionnaire, it was decided to focus on the four scales: *self-determination* (Danish version: 4 items), *lack of energy* (4), *postponing training* (3) and *avoiding effort* (4). These scales were considered particularly meaningful for the research question and showed satisfactory to good psychometric properties in the Danish version (α between .68 and .83; Test-retest reliability between .67 and .70; Wikman, 2007). The scales showed acceptable internal consistencies for the present sample (lack of energy: $\alpha = .71$, $N = 563$; postponing training: $\alpha = .78$, $N = 563$; avoiding effort: $\alpha = .68$, $N = 563$; and self-determination: $\alpha = .61$, $N = 563$).

Data Analyses

Missing data presents a challenge in research (Tabachnick & Fidell, 2007). In the present study, due to the required extensive reporting of training hours for all career years a relatively high amount of missing values was expected concerning this question. To reduce the risk for bias, only athletes that filled in data for at least five years of their career, respectively three years for athletes under the age of 20 were included in the analyses regarding the training hours. For these remaining 50 athletes, 87% of the expected data was reported by the athletes. The total number of athletes was included in all other analyses (see also table 1).

To analyze outliers, data of the variables *practice hours in main sport* and *involvement in other sport* was z-transformed. Values exceeding a z-value of ± 3.29 (see Tabachnick & Fidell, 2007) were listed and analyzed separately. For all variables including outliers, a cut-off was set that was based on the raw value of the first outlying value as well as foundations of the author team. All outliers were then adapted to this value (i.e. values exceeding 50 hours of training per week for athletes above 20 years were set to 50).

After gathering data from the main survey and the two re-tests, correlations were performed to analyze the reliability of the data on practice hours in the main sport. This was done as retrospective data can be biased, and checking the data before analyzing seems indispensable.

In order to investigate differences between the elite and the near-elite sample, in terms of the variables related to practice hours in the main sport, involvement in other sports, data on career development, as well as motivational and volitional factors, one-tailed t-tests were conducted. The significance level was set at $\leq .0.05$. Furthermore, the effect sizes were analyzed to judge for meaningfulness and power values were calculated.

A logistic regression was performed to investigate if practice hours in the main sport, involvement in other sports, data on career start, as well as motivational and volitional factors (IV's) predicted membership in the elite athlete group (DV). The enter method was chosen, as this seemed most suitable since there are no hypotheses about the order of importance of predictor variables. Assumptions regarding the distribution of the predictor variables are not required for logistic regressions (Tabachnick & Fidell, 2007).

Due to the equal distribution of males and females in the elite and near-elite group no gender specific evaluations were performed.

Results

Reliability of the Data

Checking the reliability of the reported practice hours during the career occurred with three different measures. 1) A correlation between two measures given in separate sections of the questionnaire was performed, both aimed at gathering the same information (e.g. the amount of weekly training in the data on practice hours history and the information about the average training amount per week from the same year). The correlation between these two measures was .70 ($N = 459$). 2) The average result of the written re-test (4 weeks after the data collection) over the seven different time points was .75 for the weekly training amount. 3) The results of the re-test gathered during the interview study with 16 athletes (4 months after the data collection) showed a correlation of .74 for the weekly training amount. All correlations can be categorized as strong (Brace, Kemp, & Sneglar, 2009). Additionally, analyses revealed that the correlations in the elite and the near-elite athletes (elite athletes: .76, near-elite athletes: .74) did not differ, indicating that the two groups had a similar level of recall.

Group Differences

T-tests reveal significant differences between the elite and near-elite athletes in 3 of 14 variables (table 2). The results show that elite athletes start their sport career significantly later ($M = 6.45$, $SD = 2.83$) than their near-elite peers ($M = 5.45$, $SD = 2.46$; $t = -1.65$, $df = 74$, $p = .05$. The result is confirmed by a small to moderate effect size (0.38; Cohen, 1969) All other variables regarding accumulated practice hours in the main sport and involvement in other sports show no significant group differences.

Table 2. Comparison Between the Elite and the Near-elite Group on Data About Accumulated Practice Hours, Involvement in Other Sports, Career Development, Motivation and Volition (Means, Standard Deviation, Mean Differences and Effect Sizes)

	Elite			Near-elite							
	n	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*	|*d*|	Power
Accumulated Practice hours up to age 9	24	763.75	691.72	26	956.00	816.92	0.89	48	.19	0.25	0.50
Accumulated practice hours up to age 12	24	1688.90	1264.00	26	1984.00	1662.80	0.70	48	.24	0.20	0.50
Accumulated practice hours up to age 15	24	3547.90	1813.00	26	3525.00	2651.30	-0.04	48	.49	0.01	0.50
Accumulated practice hours up to age 18	24	5925.80	2506.60	26	5903.00	3579.80	-0.03	48	.49	0.00	0.49
Accumulated practice hours up to age 21	24	7438.10	3124.30	26	7491.00	4046.20	0.51	48	.48	0.01	0.49
Months of involvement in other sports	38	70.89	86.07	38	58.82	77.04	-0.71	74	.22	0.18	0.50
Entering sport	38	6.45	2.83	38	5.45	2.46	-1.65	74	.05	0.38	0.50
AMS–hope for success	38	10.89	2.84	38	10.21	2.72	-1.07	74	.14	0.24	0.48
AMS–fear of failure	38	3.37	2.68	38	2.95	2.09	-0.76	74	.22	0.17	0.49
VCQ–self-determination	37	2.76	0.33	36	2.60	0.43	-1.77	71	<.05	0.42	0.51
VCQ–avoiding effort	37	0.47	0.50	36	0.58	0.46	1.05	71	.15	0.23	0.48
VCQ–lack of energy	37	0.73	0.51	36	0.89	0.55	1.28	71	.10	0.30	0.50
VCQ–postponing training	37	0.26	0.47	36	0.50	0.63	1.85	71	<.05	0.43	0.50

Table 3. Results of the Logistic Regression with Data on Practice Hours, Involvement in Other Sports, Career Development and Motivation and Volition as Predictor and Athletic Success as Dependent Variable

Variable	Coefficient	*SE*	Wald	*df*	*p*	Exp(B)	Confidence Interval	
							Low	High
Accumulated practice hours up to age 15	0.001	0.001	5.30	1	.02	1.001	1.00[a]	1.002
Accumulated practice hours up to age 12	-0.002	0.001	5.04	1	.03	0.998	0.997	1.001
Entering Initiation stage	0.110	0.120	0.80	1	.37	1.113	0.880	1.410

Note. [a] These values have been rounded to 1.00, but do reflect a significant result and no confidence interval includes the exact number of 1.00.

The data on motivational and volitional factors revealed significant group differences on the volitional scales, self-determination and postponing training, with effect sizes that can be considered close to medium (0.42 and 0.43, respectively; Cohen, 1969). Elite athletes show higher values concerning self-determination ($M = 2.76$, $SD = 0.33$) and lower values concerning postponing training ($M = 0.26$, $SD = 0.47$) than the near-elite athletes ($M = 2.60$, $SD = 0.43$, and $M = 0.50$, $SD = 0.63$ respectively).

Prediction of Group Membership

In a first step of logistic regressions three variables (accumulated practice hours up to age 15, accumulated practice hours up to age 12, entering sport) were significant and were re-entered in a second logistic regression. The full model of this second analysis significantly predicted membership in the elite group $\chi^2 = 8.11$, $df = 3$, $p < .05$). The model accounts for between 15% and 20% of the variance of the membership in the elite group. Overall, 62% of group predictions are accurate. Table 3 illustrates coefficients, the Wald statistics, associated degrees of freedom, probability values, as well as a confidence interval for each predictor variable. The coefficients reveal that a lower amount of accumulated practice hours at age 12, and a higher amount of practice hours at age 15 significantly predict international success. The remaining variables regarding accumulated practice hours in the main sport and regarding volition, as well as variables measuring involvement in other sports, and the achievement motive, do not significantly predict membership in the elite group.

Discussion

Investigating the career development of Danish elite and near-elite athletes in team sports has provided rather unexpected results. By rejecting hypothesis H1.1, H1.2, H1.4, and partly H1.5, it can be shown that the career paths in terms of accumulated practice hours, involvement in other sports, as well as motivational factors do not differ between the two groups. The only differences between the elite and the near-elite athletes are that elite athletes start their career later than their near-elite peers (thereby rejecting H1.3), and that elite athletes have more beneficial values on the volitional scales self-determination and postponing training (thereby partly confirming H1.5). The results further revealed that having accumulated fewer training hours up to age 12, and having accumulated more training hours up to age 15 significantly predict the membership in the elite group. This result partially supports hypothesis H2.

Contrary to the predictions of Ericsson et al. (1993), the elite athletes of the current study do not accumulate significantly more practice hours during their career than their near-elite peers. However, even though a whole body of research confirms the positive relationship between practice hours and expertise level (e.g. Baker et al., 2005a; Ericsson et al, 1993; Hodges et al., 2004; Law et al., 2007), a closer look at team sport athletes reveals some controversies in the current state of the art. Some studies do indeed confirm the above mentioned positive relationship, stating that elite team sport athletes train more, and therefore sample more practice hours during their career (Emrich & Pitsch, 1998; Helsen et al., 1998; Baker et al., 2003). However, Helsen et al.'s results for field hockey, in contrast with the above mentioned results for soccer players, are more similar to the present findings. The authors also found a main effect for skill and years into career for the field hockey players for all three groups. However, the difference between international and national players did not reach significance within the studied time frame of 18 years upwards in the career, even though the international players did train slightly more from 15 years upwards in their career. Güllich (2007) found that the more successful team sport athletes, between the ages of 15 and 18, practice less in their main sport than their less successful peers.

It cannot be claimed that more practice simply leads to better performance in team sports. Starkes (2000) hypothesized that the absolute amount of practice might not be predictive of team athletes' individual performance, as a certain part of the practice is normally adapted to the skills of the best or worst player on the team, which might not correspond to each player's optimal practice level. Another reason for such equivocal results could be that the range of accumulated practice hours is highly variable, both within and between different team sports, suggesting factors besides total hours of practice that may influence expert attainment in team sports (Baker et al., 2003). Additionally, focusing solely on hours of practice without accounting for content and quality of practice, does not seem sufficient (Janelle & Hillman, 2003; Van Rossum, 2009), and could partially explain the equivocal results found so far. Helsen et al. (1998), for example, suggest that team and individual practice might have different effects on performance. Supporting that view, Ward et al. (2004) summarized that team practice and practice with others were often more accurate predictors of attained performance level. Also, Ward, Hodges, Starkes, & Williams (2007) found that team practice was the most important discriminator between elite and near-elite athletes. Concerning quality of practice, it has to be questioned whether or not all practice hours stated by the athletes should be counted as what Ericsson et al. (1993) call deliberate practice. Deliberate practice is a form of highly goal oriented practice that aims at maximizing improvement. However, to investigate questions dealing with the quality and content of practice, different methodological approaches (e.g. in-depth interviews, longitudinal design) must be adopted, as it can be assumed that such information is difficult to recall after several career years.

The assumption that early onset and early specialization are needed in order to excel in team sports, as suggested in the "elite performance through early specialization" path in the "Developmental Model of Sport Participation" (Côté et al., 2007), cannot be supported by the data of the current study. The elite athletes start later than their near-elite peers, and fewer training hours at age 12 significantly predicts membership in the elite group. These two results are in contrast to the concept of early specialization. These results can be seen in line with Güllich (2007) who reports a lower number of elite players who had already been competing in their main sport between age 11 and 14, showing tendencies that late specialization was more beneficial in his sample. Baker et al., (2003) conclude that early specialization may not be a necessary requirement for expert level performance in decision making sports (such as team sports).

Surprisingly, with regard to the demands that are placed on team athletes, no significant results emerged from the variables concerning involvement in other sports. Sampling different sport experiences, as suggested to be one factor in the "elite performance

through sampling'' path (Côté et al., 2007), does not differ among elite and near-elite athletes. This is in line with Ward et al.'s (2007) study which found that athletic diversity did not differ among elite and near-elite soccer players. In contrast, the results of Güllich (2007) revealed that there is a higher number of athletes among the successful team sport athletes who have been practicing consistently in another sport beside the main sport, and did so until the end of their junior years. The accumulated time practiced in other sports is twice as high as that of less successful players. It seems that, even when it comes to the impact of the engagement in other sports on elite performance in team sports, no clear conclusions can be drawn so far.

The present study revealed no significant results regarding the sport specific achievement motive. This is surprising, as motivation is discussed as one core constraint in Ericsson et al.'s (1993) approach, and the sport specific achievement motive has shown to predict athletic success in a sample of young elite athletes (Elbe et al, 2003). In line with this, Reilly, Williams, Nevill and Franks (2000) conclude that motivational orientation is the most important indicator of talent in soccer. Likewise, Holt and Dunn (2004) and Van Yperen (2009) confirm that factors such as commitment and discipline form core competencies for team sport athletes who want to reach expertise. However, at the adult level, a high achievement motive is taken as a given and no longer differentiates between the two very similar groups in our study. More important seem to be volitional skills which support the achievement motive. Partially supporting this are the results of the present study, which reveal the importance of specific volitional factors, namely high values of self-determination and low values in postponing training. Looking at data from individual sports where the individual's performance is immediately visible and athletes never have the opportunity to hide, none of the volitional variables predict membership in the elite group, nor do significant group differences exist (Moesch, Elbe, Hauge, & Wikman, 2011).

To summarize, the findings of the present study reveal that the career paths of elite and near-elite team sport athletes show more similarities than differences. Differences between these two groups of athletes explaining why one group is more successful in international competitions are small in number. One strength of the current study is its design with matching elite with near-elite athletes that share the same socio-demographic characteristics. However, some limitations must be considered when making inferences. 1) The use of retrospective data collection, often considered as prone to error in recall (e.g. Hodges et al., 2007), could have led to distorted data. However, retrospective investigations will remain the main source of information about the acquisition of high elite performance as long as it is not possible to accurately foresee which athletes will succeed on their way to the top (Côté, Ericsson, & Law, 2005). In order to check for biases, several steps to validate the data were taken. The data revealed satisfying results, comparable with those from other studies (Helsen et al., 1998; Hodges et al., 2004). Additionally, Côté et al. (2005, p. 16) concluded, that ''athletes were able to accurately recall many aspects of their development even after decades had elapsed.'' It can be hypothesized that training activities played such an important part in the athletes' lives that they recall accurate numbers. 2) It has to be considered that due to the cross-sectional design of the study, conclusions cannot be made about the causal effect of practice. To address that flaw, longitudinal studies have to be conducted. This also applies to the results concerning the volitional factors, which develop during youth (Elbe, Szymanski, & Beckmann, 2005). No conclusions can be made on whether the decisive volitional factors were pronounced at the beginning of the career or were developed during involvement in elite sports. 3). No information about the content of practice was gathered for the present study and different types of training (e.g. physical, mental, competitions) were combined in one question. Therefore, conclusions cannot be drawn about the importance of play-like training activities (e.g. deliberate play; Côté et al., 2007) or about the importance of different forms of training activities (e.g. solitary vs. group practice; Ericsson, 2003; see above). 4) Likewise, no information about the quality of training is available (see above).

Conclusions

The findings of the present study reveal that the career paths of elite and near-elite athletes show few differences. It seems that a later start and a later intensification of training are beneficial in order to make it to the elite group. Furthermore, elite athletes show more beneficial volitional skills than their near-elite peers. However, many variables did not reveal any significant results. It can be assumed that the high level of the athletes of both groups makes it difficult to detect clearer results in the studied variables and that possibly other factors besides the ones investigated in this study make the difference between these two groups.

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Reference Notes

[1] Team Danmark is the organ that handles overall planning of elite sports in Denmark through financial and instrumental support to sport-specific federations and athletes. Support is given to the sport federations, who in turn decide which athletes they want to support. This support is strategic, i.e. mainly based on the sport federation's evaluation of the athlete's potential to win medals in international competitions.

[2] The Cronbach's alpha are based on the analyses of the complete sample of the project, involving the sample from team sports as well as athletes from other sport categories.

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