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Retracing the steps towards professional football

Practice engagement characteristics and performance attainment
among Norwegian elite youth and senior players

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Sammendrag

Det overordnede formålet med undersøkelsen er å identifisere karakteristika som kan forklare hvorfor noen spillere når igjennom til senior profesjonell fotball på bekostning av andre. Prosjektet undersøker primært i hvilken grad deltagelse i ulike idrettsaktiviteter gjennom oppveksten kan bidra til forskjeller i prestasjonsnivå blant mannlige norske elitefotballspillere, i relasjon til funn og anbefalinger fra internasjonal forskning.

Prosjektet består av tre deler: Den første delen kartlegger publisert litteratur på området ”ekspertise og ekspertiseutvikling i fotball”. Den andre delen består av en kartlegging av samtlige norske aldersbestemte elitespillere i alderen 14-21 år (totalt 745 spillere) fra samtlige Tippeligaklubber. Den tredje delen består av dybdeintervjuer med syv senior Eliteseriespillere fra tre ulike nasjoner, hvor seks av syv har landslagserfaring.

Resultater

Norske aldersbestemte elitespillere rapporterer at de har trent minst like mye fotball gjennom barne- og ungdomsårene som elitespillere i tilsvarende undersøkelser i andre Europeiske land.

Stor mengde fotballaktivitet og – trening fra tidlig alder og gjennom karrieren ser ut til å være et vesentlig fundament for å nå et elitenivå, men den totale akkumulerte mengden trening i seg selv er ikke tilstrekkelig forklaring for senere forskjeller i prestasjonsnivå. Det eksisterer en stor variasjon blant spillerne i treningsmengde og kombinasjon av ulike aktiviteter gjennom karrieren, noe som synliggjør en rekke potensielle utviklingsveier til elitefotball og profesjonell kontrakt.

Selv om aldersbestemte elitespillere med senior proffkontrakt rapporterer gjennomgående et høyere antall timer med fotballaktivitet gjennom karrieren enn spillere uten proffkontrakt, er ikke forskjellen på noe tidspunkt så stor at den i seg selv vil være tilstrekkelig for å forklare disse forskjellene i prestasjonsnivå. Forskjellen i treningsmengde er imidlertid relativt sett større i alderen 6 til 10 år enn de resterende årene, noe som kan ha gitt de profesjonelle spillerne et fortrinn gjennom å trene mye fotball i en periode hvor kroppen er antatt å være spesielt tilpasningsdyktig for påvirkning.

Forskjellen i disse tidlige karriereårene ser ut til i størst grad å gjelde tid brukt i egenorganisert lekpreget fotball (løkkefotball). Denne type aktiviteter anses av en rekke forsknings- og praksismiljøer som relevante for å utvikle funksjonelle fotballferdigheter i tidlig alder, men anses av de aldersbestemte spillerne å være mindre relevante enn mer målrettede aktiviteter.

Dette støttes av seniorspillerne som rapporterer at egenorganisert løkkefotball i tidlig alder gradvis ble prioritert vekk til fordel for mer isolerte repetitive teknikkøvelser, hvor sistnevnte anses å ha vært fruktbare for å utvikle fotballferdigheter men også for å stabilisere prestasjoner på toppnivå. Denne gradvise (om)prioriteringen understreker også en endring av den underliggende motivasjonen for å delta i fotball. I starten så står glede og sosiale relasjoner i sentrum og gir seg utslag i mye spill med venner. Den gradvise endringen til mer målrettede aktiviteter virker å være et utslag av at motivasjonen snur i retning av et ønske om å bli profesjonell spiller en gang i fremtiden. Fotballen går med andre ord fra å være et mål i seg selv til å bli et middel for å nå et fremtidig mål.

Til sammenligning med de ovennevnte resultater så har deltagelse i andre aktiviteter tilsynelatende bidratt lite i utviklingen av fotballspesifikke ferdigheter. Litt over 60 % av de aldersbestemte elitespillerne rapporterer å ha drevet med andre aktiviteter eller idretter, men deltagelsen er svært liten i forhold til tid brukt i fotball. Deltagelsen i andre aktiviteter er størst i alderssegmentet 9-12 år, men selv gjennom disse årene så står deltagelse i fotball for 75-100 % av all aktivitet. Det er små forskjeller mellom spillere med og uten proffkontrakt, men de sistnevnte rapporterer gjennomgående noe høyere deltagelse i andre idretter enn de førstnevnte. Disse funnene understøtter argumentet om at økt deltagelse i andre idretter ikke har bidratt til høyere prestasjonsnivå i fotball. Det finnes imidlertid enkelte viktige nyanser:

¾ av de som har drevet med andre idretter rapporterer å gjøre dette for gøy eller prøve noe nytt eller annet, og kan således ha fungert som et viktig motivasjonsbidrag inn mot videre fotballdeltagelse.

Aktiviteter som deler en rekke karakteristika med fotball oppleves av spillerne å være mer relevant for å utvikle fotballferdigheter enn andre aktiviteter. Dette skyldes antagelig at disse aktivitetene innehar en del funksjonelle elementer som vil være lettere å overføre til fotballspillet.

Praktiske implikasjoner

Fundamentet for fremtidig elitenivå i fotball legges primært gjennom deltagelse i fotballaktivitet. Det er imidlertid ikke mengden i seg selv som er avgjørende, men kvaliteten på og utbytte av treningen. Hva som kan karakteriseres som god kvalitet vil variere individuelt og gjennom ulike vekst- og utviklingsfaser, og krever kompetente trenere som er i stand til å optimalisere treningshverdagen til hver enkelt spiller.

Summary

The overall purpose of this thesis is to identify characteristics that may explain why some players manage to progress to professional football while others do not. Specifically, I focused in this thesis on practice engagement characteristics throughout the career of male Norwegian elite youth and senior football players, and how such engagement relates to recommendations arising from prior research. The main research question for the thesis is: *How and why does engagement in different sport activities contribute throughout the development of Norwegian male elite football players?*

The project has three parts: The first part of the project sought to provide an overview of available research related to the overall aim, resulting in a review-paper that guided further progression of the project (Article 1). In the second and third part, we addressed the engagement characteristics and perceived contributions of such engagement of Norwegian elite youth (Articles 2 and 3) and senior players (Article 4) through retrospective questionnaires and semi-structured interviews respectively.

Article 1 provides a systematic overview of 115 articles dedicated to the identification of specific aspects related to developing expertise specifically in football, where The Developmental Model of Sport Participation (DMSP; Côté, Baker, & Abernethy, 2007) is used as a conceptual framework to systematize the collection and presentation of the results. The results indicate a favorable contribution of football-specific activities from early ages for developing proficient football skills. However, the results also reveal the need of clarifying the contribution of different types of football-specific and non-football activities in relation to each other but also to other aspects, such as motivation, coach/adult interaction, and quality of practice.

Article 2 presents the retrospective estimates of engagement in football-specific activities throughout the career of 745 Norwegian elite youth football players, and how this

engagement forms a foundation for a senior professional contract. We argue that this paper, with the implementation of multilevel modeling to address individual development and the large population of players, represents an important progression in practice history research. The results show that those players who have obtained a professional contract practiced more in certain types of football activities during early childhood compared to those who did not, although the differences in the overall amount of engagement throughout development were small. Potential contributions of factors like motivation, engagement characteristics and timing, and quality of practice are discussed in relation to the findings.

Article 3 presents the retrospective estimates of engagement in non-football activities of the same sample of players and with similar methods as in Article 2. The results show that even though the non-professional players almost consistently report a higher engagement in non-football activities than professional players, none of these differences are significant. Considering the groups combined, the overall amount of time spent in football-specific compared to non-football activities is considerable higher for every age category throughout development. Consequently, participation in non-football activities appears to have made a limited contribution toward differences in present performance attainment. However, the results also point to how the potential advantageous contribution of engaging in non-football activities on motivation and skill development may be related to differences in the activities' characteristics.

Article 4 shows how senior professional football players perceive the characteristics and contribution of deliberate practice throughout their career. Specifically, we address three main areas that have been considered to characterize deliberate practice engagement among football players: activity engagement, motivation, and deliberate practice strategies. Seven players, all with experience from top level international and/or club football, were interviewed. The semi-structured interviews consist of one retrospective part and one part

focusing on their daily work as professionals. First of all, the players underlined the importance of engaging in large amounts of football-specific practice for progressing to professional football. Moreover, the results show that several aspects that the players consider as important in their daily work as professionals were also considered important for progressing to such status: mass-repetition of technical drills (activity engagement), intrinsic motivation, determination to succeed, performance and learning orientation (motivation), and deliberate practice strategies. Results indicate that the quality of practice engagement that is necessary to reach and perform at senior professional football is related to an interaction of activity characteristics, the underlying motivation for engagement, and the deliberate practice strategies applied by players.

The **overall findings** indicate that those players who progress to a professional status have spent large amounts of time playing and practicing football from early ages and throughout their development, which consequently appear to represent an important prerequisite for obtaining a professional contract. In comparison, non-football activities seem to represent only a minor part of the players' overall amount of practice engagement. The findings, however, show that progressing to a professional status cannot singularly be explained through the extensive engagement in football: the timing and combination of different football activities, the quality of engagement, and the underlying motivation of such engagement appear to be necessary to take into account. Moreover, it appears that participating in non-football activities is perceived to have relevance for developing football-specific skills, especially those activities which characteristics share similarities with football. Additionally, the non-football activities may have positively affected the sustained commitment to prolonged engagement into football. In combination, the results indicate that it is important to acknowledge that the abovementioned factors can interact and combine into a variety of individual developmental trajectories towards elite level football.

List of articles

Article 1

Haugaasen, M. & Jordet, G. (2012). Developing football expertise: a football-specific research review. *International Review of Sport and Exercise Psychology*, 5, 177-201

Article 2

Haugaasen, M., Toering, T., & Jordet, G. (2014). From childhood to senior professional football: A multi-level approach to elite youth football players' engagement in football-specific activities. *Psychology of Sport and Exercise*, 15, 336-344

Article 3

Haugaasen, M., Toering, T., & Jordet, G. (2014). From childhood to senior professional football: elite youth players' engagement in non-football activities. *Journal of Sports Sciences*, 32, 1940-1949

Article 4

Haugaasen, M., Toering, T., & Meling, M. (for submission). A qualitative investigation of the development of deliberate practice throughout the careers of senior professional football players.

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1.0 Background and purpose of the thesis

1.1 Introduction

Football (association football or soccer) is one of the most popular sports in the world; it has been estimated that about a quarter of the world's total population has an interest into the game (Giulianotti & Robertson, 2004) while more than 4 % (about 270 million) of the world's total population assumedly regularly plays football (FIFA, 2007). Playing professionally, though, is reserved an exceptional minority of the participants, as there exist only about 100,000 professionals world-wide (FIFA, 2007). Even though most participants would neither have the desire nor the abilities to progress to professional football, the desire for success leads many young players world-wide to devote their lives to an activity where the chances of succeeding are extremely limited (de Vasconcellos Ribeiro & Dimeo, 2009).

Similarly, football is the most popular sport in Norway (Helle-Valle, 2008). Actually, Norway is one of the highest ranked countries in the world on interest into the game and as active participants (Kuper & Szymanski, 2009). Exemplifying the latter, it has been reported that 12 % of the Norwegian population regularly plays football, ranked 13th of the world football-nations, quite similar to their Scandinavian neighbours Sweden (11 %) and Iceland (11 %) (FIFA, 2007). In comparison to the overall amount of world-wide football participants, Norway is quite a small country: today there are about 365,000 players registered within the Norwegian Football Association (NFF), including about 1,000 professional players (FIFA, 2007; NFF, 2013). Compared to other European countries, including Scandinavian, Norway is also a rather young country in terms of professionalism, as full time professional football was not legalized in Norway until 1991 (Gammelsæter, 2009; Taylor, 2006). In the period before the 1990's, Norway has been described as being a "third-rate country in soccer terms" (Larsen, 2001, p. 58). However, since the implementation of professional football the influx of money into Norwegian football has accelerated and has had a positive influence on

the professionalism of clubs and the central organizations (Gammelsæter & Jakobsen, 2008). This increase in available revenue has also nurtured opportunities to put more resources into areas that appear profitable for the future of Norwegian football. One of the areas that have recently been prioritized is to ensure the highest possible quality of youth player development, and subsequently nurture the development of top level players which, in turn, would increase clubs' and national teams' competitiveness at the international stage. The present thesis has emerged from within this area of focus.

1.2 Global competitiveness

The 1990's and early 2000's is considered to be the most successful period of Norwegian football: The national team qualified for the World Cup in 1994, again in 1998, and the European Championship in 2000. Rosenborg BK was established as the leading Scandinavian club with continuous participation in the Champions League between 1995 and 2005, with the exception of 2003. Additionally, Norwegian football led Scandinavia both in terms of player wages and net transfers to large European leagues, England in particular (Goksøyr & Olstad, 2002; Jakobsen, Gammelsæter, & Fløysand, 2009). From 1995 until 2000, Norway was actually the country outside Great Britain to recruit most players to the English league (Goksøyr & Olstad, 2002; Stead & Maguire, 2000).

Following this successful period, however, an opposite trend emerged: Norway experienced a decreasing amount of players moving abroad, and the international results of the national team and clubs were below what was expected. Additionally, there was an increase of foreign players occupying playing time and larger portions of available economic resources on behalf of Norwegian players, and consequently less indigenous players progressed to play in the Norwegian Premier League (Gammelsæter & Jakobsen, 2006). The emergence of such a trend nurtured a general consensus among football administrators, coaches, players, and fans that young Norwegian talented players were not maximizing their

potential. In 2007, the Norwegian Football Association (NFF) and the union of the clubs in the top two divisions, Norwegian Top Football (NTF), initiated a strategic process to evaluate the competitiveness of Norwegian football compared to international top level, which culminated in a new strategic plan for Norwegian football in 2008 (NFF, 2008). This plan contained specific goals and strategies to improve/ensure the competitiveness of both clubs and national teams at the international arena. One important strategy was to increase the “facts-based” knowledge of Norwegian football in comparison to the best in Europe, and aimed to identify potential areas of improvement. Emerging from this process, the Norwegian Centre of Excellence¹ (TFS) was founded as collaboration between NFF and NTF in 2009, with an overall aim to: “build, develop, and transfer world-class competence on player development, that makes Norwegian coaches and players capable of maximizing their performance potential” (NFT, 2009).

1.3 Narrowing the focus

TFS initiated a project that aimed to provide indications of where Norway’s conditions stand in comparison to all the other membership nations of FIFA. Numbers were collected on areas, such as demography (e.g., population, population density), economy (e.g., BNP, BNP/inhabitant), health (e.g., health resources/inhabitant), football context (e.g., number of players, number of players/population, available resources and revenue), and climate (e.g., temperature, precipitation), from which estimates² of the contextual conditions for club and national team performance were calculated (see Table 1). Of particular interest were the available economic resources: In 2008, the total revenue of Norwegian top football was 1.8 billion Nkr while for the Norwegian PL it was 1.3 billion Nkr. When compared to the clubs in

¹ The Norwegian Centre of Football Excellence (TFS) now functions as an operative competence-center for all parts considered within this term, with an overall aim to “optimize structures, systems, and cultures that contribute to developing key performance enhancing factors in top football” (TFS, 2014).

² Each variable were transformed into a value on a scale from 0 to 1,000, where 1,000 was the best. These values were then multiplied with the significance of the variable. Finally, these values were added together and their deviations to the Norwegian score were calculated.

Europe with highest total revenue, these combined numbers were enough to move into 9th and 13th place, respectively (TFS, 2010). The overall conclusion of the project was that the contextual conditions should not be considered a limitation for clubs' and national teams' international performances, given that Norwegian football were able to combine resources and agree on a common future direction. Consequently, there were other areas that appeared to be more pertinent to address to be able to identify how Norwegian football could improve. Of relevance for the present thesis, TFS identified three main areas: i) provide overview over available scientific research on factors influencing (top level) player development and performance, ii) identify characteristics of successful nations, clubs, teams, coaches, and players, and iii) identify similar and comparable characteristics of Norwegian football.

Table 1. *Norway's ranking among the 53 European football nations*

Variable	Ranking
Overall population	30
Number of male football players	15
Number of players	13
Number of football teams	9
Number of football teams per citizen	1
BNP per citizen	1
Health	1
Democracy	1
Football interest	1
<i>Contextual conditions for the senior national team</i>	<i>4</i>
<i>Contextual conditions for the clubs</i>	<i>8</i>

Note. *Adapted from TFS (2010)*

The present thesis represents one of three parts of a project that was rooted within all of these areas, and was conducted as collaboration between the TFS and the Norwegian School of Sport Sciences (NIH). The main aim of the overall project was to identify potential

areas of improvement for Norwegian player development and performance, specifically the contribution of i) practice engagement characteristics, ii) self-regulation of learning, and iii) regulation of emotional processes. The present thesis aimed to gain a deeper understanding of how engagement in different activities throughout development affects differences in performance attainment, both in Norway and in other countries (as indicated by published international research). Subsequently, the thesis aimed to extract and provide applicable recommendations for practitioners working with player development.

1.4 Prior research on expertise development in football

Individual sports, where performance is more easily accessed and measured than in team sports have traditionally been favored in research paradigms, and researchers have been more reluctant to fully embrace the challenge represented by the game of football (Reilly & Gilbourne, 2003). Additionally, the area of football was for a long time viewed by practitioners as inappropriate for scientific investigations:

Less than a quarter of a century ago, the environment of the most popular football codes (association football or soccer) was one in which the scientists was likely to be greeted at worst with suspicion and hostility and at best muted with skepticism.

(Reilly & Gilbourne, 2003, p. 693)

In recent decades, there has been a significant increase in research undertaken to identify factors underpinning elite sport performance, especially as the importance of sport science research and its application to sport has been gradually more accepted (Williams & Hodges, 2005). In its earliest years it appeared “that the soccer world has embraced the biological sciences with greater enthusiasm than the behavioral or social sciences” (Williams & Hodges, 2005, p. 637). However, the area of expertise research on football has grown in interest and expanded to a range of areas within performance demands, such as physiology (for a review, see Stolen, Chamari, Castagna, & Wisloff, 2005), psychology (e.g., Holt & Dunn, 2004;

Jordet, in press; Thelwell, Greenlees, & Weston, 2006), technical (for a review, see Ali, 2011) and tactical skills (Kannekens, Elferink-Gemser, & Visscher, 2009), and player identification and development (for reviews, see Meylan, Cronin, Oliver, & Hughes, 2010; Williams & Reilly, 2000).

One challenge of such polarized approaches is that they do not account for the interaction between different variables and how these may affect the variables in focus (Phillips, Davids, Renshaw, & Portus, 2010). To take into account the potential interaction between variables would be particularly relevant for a complex team sport like football, where performance always would emerge as interaction between each individual's contributions, both teammates and opposition (e.g., Ali, 2011; Dicks & Chow, 2010; Grehaigne, Bouthier, & David, 1997). Some examples of this complexity has become apparent in recent research which has identified how different factors may interact in game performance: for instance, physiological demands with links to role-specific differences in technical and tactical skills (Dellal, Wong, Moalla, & Chamari, 2010), and quality of opposition, match location, and result linked to team and player performance (Lago, 2009; Taylor, Mellalieu, James, & Shearer, 2008). Consequently, this complexity would be important to take into account when identifying and developing young players (see e.g., Vaeyens et al., 2006; Waldron & Worsfold, 2010; Williams & Reilly, 2000). To be aware of the interaction between different variables throughout development would be an important progression for future expertise research in general (Phillips et al., 2010), but also specifically within the domain of football (Meylan et al., 2010).

1.5 Prior research on Norwegian top level football

Given its popularity among the population, surprisingly little published research has focused on identifying aspects of top level player development and performance specifically in Norwegian football. Some exceptions have been a relatively large interest into the areas of

injury occurrence and prevention (e.g., Andersen, Larsen, Tenga, Engebretsen, & Bahr, 2003; Andersen, Tenga, Engebretsen, & Bahr, 2004; Steffen, Bakka, Myklebust, & Bahr, 2008) and physical demands and training (e.g., Helgerud, Engen, Wisloff, & Hoff, 2001; Wisløff, Castagna, Helgerud, Jones, & Hoff, 2004), but also studies addressing tactical (e.g., Tenga, Holme, Ronglan, & Bahr, 2010) and perceptual skills (e.g., Jordet, 2005b). Still, there has been an apparent lack of knowledge of factors affecting the development of elite level players in Norway, and the prerequisites of Norwegian players in relation to prior related research.

1.6 Aim specific research questions

The overall purpose of this thesis was to identify characteristics which may explain why some players manage to progress to professional football while others do not. Specifically, this thesis focused on the practice engagement characteristics throughout the career of Norwegian elite youth and senior football players, and how such engagement relates to recommendations arising from prior research. The main research question for the thesis was: *How and why does engagement in different sport activities contribute throughout the development of Norwegian male elite football players?* The specific research questions that guided the four articles were:

1. What do we know from existing scientific research about the development of male youth football players towards elite level football?
2. What characterizes the practice engagement throughout the development of those players who progress to professional football compared to those who do not?
 - a. How and why does engagement in different football-specific and non-football activities contribute to differences in performance attainment among elite youth players?
 - b. How do senior professional football players perceive the characteristics and contribution of deliberate practice for reaching and performing at top level?

2.0 The global and Norwegian context of player development

2.1 Global football and domestic player development

There are two methods of recruitment of players into professional football; transfer and apprenticeship (trainee) systems (McGovern, 2002), both of which are characterized by an increasing global accessibility of the game and player mobility across borders (e.g., Darby, Akindes, & Kirwin, 2007; Darby & Solberg, 2010; Magee & Sugden, 2002; Maguire & Pearton, 2000; Maguire & Stead, 1998; Weedon, 2012). Although player mobility seems to be determined by a various range of factors (see Magee & Sugden, 2002; Taylor, 2006), it is believed that one key determinant is the extremely skewed distribution of and access to economic resources: At a global basis, European football accounts for about 80 % of football's revenue (Littlewood, Mullen, & Richardson, 2011), and consequently appears to represent an attractive destination for players world-wide (e.g., Darby & Solberg, 2010; de Vasconcellos Ribeiro & Dimeo, 2009; Maguire & Pearton, 2000). European clubs on their side show an increasing tendency toward global recruitment of players at the expense of domestic players who progress through their youth development systems and into the first teams (Littlewood et al., 2011), and Elliott and Weedon (2011) consequently argued that "these recruiting trends are detrimental to the development of indigenous talent" (p. 63).

It seems apparent that these trends of increased available economic resources and player mobility also have an effect on indigenous player development. These trends need, though, to be illustrated from two different sides of the transaction; importing and exporting players. Specifically, the advantages for domestic clubs and leagues of importing foreign talent are perceived to lie in better quality of performance and level of local players, as these foreign players appear to "raise the bar" by representing a different mentality, culture, perspective, and performance standards (Elliott & Weedon, 2011; Littlewood et al., 2011; Maguire & Pearton, 2000). On the other hand, the importing leagues may experience a

reduction of national team performance due to the lack of indigenous players progressing through to gain playing experience at higher levels (Magee & Sugden, 2002). Former England manager, Kevin Keegan, exemplified the latter argument when he reflected on his presence at a match in the English Premier League:

I went to Stamford Bridge to see a match between Chelsea and Arsenal. The head coach of the French National team sat beside me. Paradoxically, he had more players on the pitch than me. (Haugaasen, 2014)

Representing the other side of the transactions, the transfer fees related to exporting talent would supposedly result in better economies among less resourceful clubs. As an example, the five major leagues (England, Spain, France, Italy, and Germany) have distributed a net outflow of approximately €900m to the rest of the world over the recent two seasons 2011-13 (ECA, 2014). Additionally, the exposure of exported players to higher levels of competitive football, in addition to opening opportunities for indigenous players in the domestic leagues, may have a positive impact on national team's performance (Maguire & Pearton, 2000). However, if the selling leagues keep losing their best players, it may reduce the leagues' attractiveness for sponsors and spectators.

2.1.1 Increased focus on local player development

European football has been described as "the core regional entity where football has grown and prospered significantly in the last 10 years" (Littlewood et al., 2011, p. 788), where the five major leagues in particular attract world-wide commercial and public interest (Deloitte, 2014; Magee & Sugden, 2002). Given this importance of European club football concerns have been voiced about its viability and sustainability, particularly in relation to the inflation of player wages, transfer revenues, and club debts (Drut & Raballand, 2012; Müller, Lammert, & Hovemann, 2012). Arising from this concern, it appears that both the governing

bodies of world football and the clubs are aiming to increase their focus on the local development of young players (ECA, 2012; Gardiner & Welch, 2011; Smokvina, 2012).

All national associations and clubs are bound by international regulations by for instance the European Union (EU), Fédération Internationale de Football (FIFA), and the United European Football Association (UEFA). Within EU regulations, one key turning point in the regulation of football as labor came in 1995 in form of the “Bosman ruling” that allowed out-of-contract players to freely switch clubs. This ruling has been highlighted as one of the most decisive factors for the increasing international mobility of football players across European leagues (for an overview, see Frick, 2009). The Bosman ruling has been highlighted as being detrimental for the development of domestic players and has motivated both FIFA and UEFA to impose regulations to protect and promote the development of young players in clubs. UEFA was first of the two organizations with its introduction of the “home-grown player rule”³ for international club competitions. FIFA on its side, without success, proposed the “6+5 rule”⁴ for domestic league matches (Gardiner & Welch, 2011; Smokvina, 2012), but have put restrictions on the mobility of young players through their transfer regulations⁵ (Elliott & Weedon, 2011). Finally, it is worth mentioning the newly imposed UEFA Financial Fair Play regulations. These regulations were mainly motivated by protecting “the long-term viability and sustainability of European club football” (Müller et al., 2012, p. 126), but one operative objective has been to stimulate the clubs’ long-term investments in youth

³ The home grown player rule states that clubs participating in the Champions League and the Europa League must have a minimum of 8 places of their squad of 25 reserved for locally trained players, that is; players who have been registered with the club for at least three entire seasons between the ages of 15 to 21 years (Smokvina, 2012).

⁴ The 6+5 rule states that any team, at the beginning of each match, would require fielding at least six players who are eligible to play for the national team of the country of that club. However, due to ambiguities whether the rule is in conflict with EU laws through discriminating on nationality, these rules have not been implemented. “The European Parliament and the European Commission have indicated clearly that they regard the 6+5 rule as directly discriminatory and contrary to Article 45 TFEU” (Gardiner & Welch, 2011, p. 779).

⁵ No player under the age of 18 can transfer between nations, with the following exceptions: i) within the EU a player can transfer from the age of 16 years, ii) the player can transfer to a new club if the player’s family move to another country for non-football reasons, or iii) if the player lives within 50 km of the national boarder of the new club (Elliott & Weedon, 2011).

development rather than excessive transfer fees and salaries (Müller et al., 2012).

Several national associations, for instance Italy, Poland, Switzerland, England, Scotland, Belgium, and Norway, have implemented similar rules for the presence of domestic players in their respective leagues (Smokvina, 2012; Vaeyens, Coutts, & Philippaerts, 2005). More importantly, it seems that several clubs are also adopting a similar philosophy of focusing on local player development. In Belgium, for instance, it has been argued that:

(...) to maintain their sporting and financial status, professional clubs are now more aware of the importance of identifying and developing their own talented youth players with the ability to play in the first team. (Vaeyens et al., 2005, p. 1003)

Similarly, in a recent report from the European Clubs Association (ECA) it was stated that: “As football tries to move away from an era of huge transfer fees and inflated player wages, youth development is seen as a key element to the development of the game” (ECA, 2012, p.11). As such, it appears that across several levels within the hierarchy of European and international football, there is an increasing acceptance for the need of prioritizing and protecting the local development of young players.

2.2 Norwegian football in the context of Norwegian sports

2.2.1 Norwegian sport’s organization and values

All Norwegian sport is organized through *the Norwegian Confederation of Sports and the Olympic and Paralympic committee* (NIF), which is a non-governmental umbrella organization that is responsible for all sports delivery, both elite and mass sport participation (Goksøyr & Hanstad, 2012; Steen-Johnsen & Hanstad, 2008). Today, NIF organizes around 12,000 clubs, and over 2 million memberships (NIF, 2014), and is to a large degree based on volunteer organizations and contributions that are considered to be the most important resource at all levels (Bergsgard & Rommetvedt, 2006; Seippel, 2002; Steen-Johnsen &

Hanstad, 2008). Traditionally, Norwegian sports has been founded on the idea that sport is for everyone, and there is a broad agreement within the political and sports environment “that the purpose of sports activity is not so much as an end in itself but how useful it is to society as a whole” (Augestad, Bergsgard, & Hansen, 2006, p. 306). The present vision of NIF, “sport enjoyment for all”, that forms the basis for all organizational work and politics, reflects the view that all people should be given the opportunity to engage in sports based on their individual abilities, needs, and desires (NIF, 2011a).

2.2.2 Norwegian football’s organization and values

All Norwegian football is organized through NFF, but only a small minority of its organization is counted as “top football”. Those parts of Norwegian football that are counted as top football, are: i) the professional players, ii) top two divisions in male football (32 clubs), iii) the top division in women’s football (12 clubs), iv) the top male division in futsal (10 clubs), and v) the national teams (NFF, 2013). The vast majority of NFF’s members and activities therefore represent “grass-root” or lower-level football, and consequently a large degree of volunteer resources and contributions. As such, the values of NIF and Norwegian sport has traditionally been considered as an important part of NFF’s politics and organizational work, and is today reflected in NFF’s present vision of “enjoyment, opportunities, and challenges for everyone” (NFF, 2013) and working motto: “as many as possible, as long as possible, as good as possible” (NFF, 2011).

Norwegian top clubs are required to be organized as voluntary sports clubs, encouraging the clubs to form cooperative agreements with external limited companies (plc; Gammelsæter & Jakobsen, 2008; NIF, 2011b). Overall, it is believed that having voluntary sport clubs along with a centralized distribution of resources through NFF has been effective and necessary for nurturing talent. The predominant idea has been that Norway, with its low population, would not be able to produce top level players without a wide-spread and diverse

organization that will ensure a rich supply of players. The legitimacy of such a view received support through the perceived success of player development and international performances throughout the 1990's and early 2000, and the fact that a lot of the best Norwegian players have grown up in peripheral clubs in small and distant communities (Gammelsæter & Jakobsen, 2008; Gammelsæter, 2009). The drawback of such an organization has been that many clubs have made themselves dependent on external financing, as the expenses (to a large degree, player salaries) have exceeded the income (i.e., spectators, sponsors, and player sales). This trend has been thought to be a result of an increasing focus on short-term results rather than long-term planning, which, in turn, have negatively affected the focus on local player development and undermined volunteer contributions and local support (Gammelsæter & Jakobsen, 2006).

In Norwegian football, the tension between professionalism and volunteer work, but also elite and grass-root levels, becomes particularly apparent when practitioners are discussing the topic of player development⁶. In relation to Norwegian football's organization and values, two areas appear frequently in this debate: i) parent coaching at youth levels and ii) the Regulations for Children's Sport⁷. i) The daily organization of grass-root football is to a large degree executed through volunteer contributions from parents and adults with little coaching education, while the educated coaches often are attracted to clubs that are in better condition to economically compensate their work. Even though these volunteer contributions are thought to reflect the values of Norwegian sport and football, the lack of competence is believed to have a detrimental effect on the development of youth players (e.g., Vik, 2014). Despite the apparent need of ensuring that those working with youth players have proper

⁶ As this is an ongoing public debate among practitioners, several of the forthcoming references are extracted from media coverage.

⁷ Originally these regulations emerged from advisory guidelines that were discussed and accepted at the General Assembly of Sports in 1976. The original guidelines were voluntary and more of a "be careful" sign for all sports, but sought firstly to prevent early overspecialization and secondly to define children's sport as a pedagogical area in which coaches and adults should have knowledge about the development of children and adolescents (for an overview, see Skirstad, Waddington, & Säfvenbom, 2012).

education, clubs have been reluctant to put coach licensing as a requirement for their volunteer coaches as they are afraid that coaches rather quit than spend additional time on education (see e.g., Lien.H., 2014; Viken.G.I., 2014). ii) In 1987, the Regulations for Children's Sport were established and put considerable restrictions on the organization of sports for children under the age of 13. The regulations state that all training should be play oriented, diverse, stimulating children's physical, psychological, and social development, and that learning is more important than competitions and achievement (Augestad et al., 2006; NIF, 2007). Even though the values underlying these regulations share broad support in the Norwegian society, concerns have been voiced over that the implementation of these regulations, especially the focus on late specialization, may inhibit the development of elite level athletes (Augestad et al., 2006; Ingebrigtsen & Aspvik, 2010; Skirstad et al., 2012). This argument has also repeatedly surfaced in the football community within the discussion of why Norwegian football appears to fall behind its competitors (e.g., Kvam, 2014; Rolness, 2014; Vik, 2014).

2.2.3 Private and public schools and academies

Norwegian clubs do not have academies in the same way as several other European countries: The latter is characterized by developing players through club academies, where players are attached to the clubs through part-time or full time academy or scholarship contracts (Relvas, Littlewood, Nesti, Gilbourne, & Richardson, 2010; Richardson, Gilbourne, & Littlewood, 2004). Norwegian players, however, are either attached to a club on an amateur contract which means that they primarily attend school or have jobs on the side of playing football, or a senior professional contract which means that they are either part-time or full-time employed by their clubs. Commonly, adolescent Norwegian players attend school during the day and practice in the evenings. Most attend public schools, some of which have general or specific sport programs (i.e., football) that allow players to practice during day-time.

Additionally, there exist some private schools (i.e., NTG, WANG) which curricula are centered on sport-specific skill development while ensuring a formal education. These private schools often collaborate closely with their players' respective clubs to optimize development, where club coaches often contribute on day-time sessions at the schools. As such, a player who is contracted to a top club in Norway is likely to spend a considerable amount of valuable practice time during school-time.

In recent years, private academies have emerged as alternatives or supplements to the traditional club/school organization. NFF is not in support of such academies (Graff, 2011). Their view is for the most part grounded in that these academies would represent an opportunity that favors those who can afford it, which contrast their basic values of that football should be available for everyone and that all who wants to participate should have access to the same opportunities.

3.0 Theoretical foundation

3.1 Backdrop

The aim to assess the role of activity engagement and characteristics in developing football skills, relate to a specific domain of practice history research in football. This research has focused on how the characteristics of different activities may provide different effects on skill development (e.g., Ford, Ward, Hodges, & Williams, 2009; Helsen, Starkes, & Hodges, 1998; Ward, Hodges, Starkes, & Williams, 2007). Theoretically, such research has been thought to be a natural progression of a football-specific application of the *deliberate practice framework* (Hodges, Huys, & Starkes, 2007; Williams & Ford, 2008). The deliberate practice framework (DPF) proposes that the quantity of high-quality practice is the most essential prerequisite for reaching and performing at the highest possible levels (Ericsson, Krampe, & Tesch-Roemer, 1993). The DPF emerged from the *expert performance approach*, which aimed to progress toward a general theory of expertise through advancing the scientific studies within this area of research (Ericsson & Smith, 1991b).

The theoretical foundation of the present thesis has been guided by the DPF. However, it is important to acknowledge the attempt to implement the DPF in the larger framework of the Developmental Model of Sport Participation (DMSP; Côté et al., 2007; Côté, Horton, MacDonald, & Wilkes, 2009). The DMSP holds the recommendations arising from the DPF as one of two possible pathways to elite level performance, where the alternative pathway underlines the importance of playful activities and multiple sport participation during early years of engagement. As the reader would note, these suggestions by the DMSP has influenced article 1 and 3 in particular.

3.2 The expert performance approach

Research on expertise grew in interest in the mid- to late sixties, due to developments in the educational system, cognitive psychology, and artificial intelligence (Feltovich,

Prietula, & Ericsson, 2006; Glaser & Chi, 1988). According to Holyoak (1991) and Glaser and Chi (1988) the following two decades saw the emergence of two generations of expertise research and theories. The first generation of expertise research centered on heuristic search in general problem solving, where the first conjecture about expertise was that an expert was someone particularly skilled at general heuristic search. This research did also offer valuable initial insight of the learning and thinking of experts, and the rich structure of domain-specific knowledge such processes require. As it became apparent that expertise was dependent on detailed domain knowledge, a second generation of expertise theories brought the focus over on how experts differed from novices in complex and high-level problem solving across different domains.

In 1991, Ericsson and Smith (1991b) proposed a new *expertise* or *expert performance approach* as an attempt to advance toward a general theory of human expertise development and performance. The emergence of this approach was motivated partly by criticism that experimental laboratory studies of cognition and perception lacked ecological validity (Ericsson in Schraw, 2005), but also the acknowledgment of the need of progressing from prior expertise research to understand how expertise is acquired and how it can be taught (Glaser & Chi, 1988). The approach was based on the idea that by carefully systematizing the wide range of capacities and characteristics related to superior performance, “those should allow us to map out the potential for human performance that can be acquired through experience” (Ericsson & Smith, 1991a, p. 33). In other words, by focusing on the reliable and reproducible aspects of superior performances and by imposing scientific standards for verifiable facts; “our goal of developing a general theory of the acquisition of expert performance becomes more attainable” (Ericsson, 1996, p. 42).

More generally, the expert performance approach seeks methods for measuring and describing many types of expert performance and aptitudes by objective performance standards that are

independent of the social and historic context of the studied expert performance. (Ericsson, Roring, & Nandagopal, 2007a, p. 14)

The expert performance approach was explicitly designed to study individual cases and small samples to identify the acquired structures mediating expert performance, and “starts by identifying reproducibly superior performance and then works backwards to explain the development of the mediating mechanisms” (Ericsson et al., 2007a, p. 5). In this new approach, Ericsson and Smith (1991a) underlined three important aspects: First, the types of acquired mediating mechanisms for expert performance appeared to be remarkably similar across domains. Second, although acknowledging that genetic factors may potentially influence the rate of improvement due to practice, practice was seen as a key prerequisite and determinant for superior performance. Finally, they underlined the importance of distinguishing practice from mere experience, as the latter was not considered to ensure performance improvement and consequently not as an accurate measurement of expertise. In this, learning mechanisms that mediate improvements through practice was thought to play an important role in expertise acquisition.

3.3 The theoretical framework of deliberate practice

Building on this view of practice and learning mechanisms, Ericsson et al. (1993) published what has turned out to be one of the most influential studies and theoretical foundations for the following two decades of expertise research (for a review, see Baker & Young, 2014). The core assumption of the DPF is that superior performances, independent of domains, arise from long-term engagement in a specific type of practice activities termed *deliberate practice*, activities that are specifically designed to effectively improve domain-specific performance as opposed to daily routines, work, or play activities (Ericsson, 1996; Ericsson, 2006b; Ericsson et al., 1993). As such, Ericsson et al. (1993) underlined that “mere repetition of an activity will not automatically lead to improvement in, especially, accuracy of

performance” (p. 367). Specifically, deliberate practice activities needed to fulfil several conditions to ensure optimal learning and performance improvement, those were: i) ensuring the individual’s understanding of the task by building on prior knowledge, ii) ensuring the availability of immediate feedback and knowledge of results of the performance, and iii) repetition of the same or similar tasks. Additionally, the individual’s iv) motivation and v) effort for improving performance were considered important (see Ericsson et al., 1993, p. 367). When these conditions were met, performance was thought to improve monotonically as a function of the amount of practice. This function was originally termed *the power law of practice*, explaining the relationship between performance time and number of practice trials (e.g., Anderson, 1982; Anderson, 1981; Newell & Rosenbloom, 1981), and has later been adopted to describe a more general curve of the relationship between practice and performance (see Fig 1).

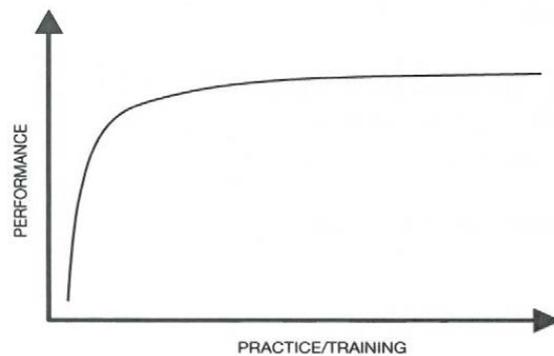


Figure 1. The relationship between practice and performance.

Note. Retrieved from Baker and Cobley (2008), p. 30.

Ericsson et al. (1993) summarized the conditions for deliberate practice in three superior categories that potentially could constrain the effect of practice: environmental (i.e., coaches/parents; i-iii), motivation (iv), and effort (v):

(...) deliberate practice is a highly structured activity, the explicit goal of which is to improve performance. Specific tasks are invented to overcome weaknesses, and performance is carefully monitored to provide cues for ways to improve it further. We claim that deliberate practice requires effort and is not inherently enjoyable. Individuals are motivated to practice because practice improves performance. In addition, engaging in deliberate practice generates no immediate monetary rewards and generates costs associated with access to teachers and training environments. (Ericsson et al., 1993, p. 368)

Deliberate practice activities are characterized as being motivationally demanding, as the reward for, or goal of, engagement lies in future performance improvement and not inherent in the activity in itself (i.e., enjoyment). Moreover, as deliberate practice requires full attention and concentration to ensure effective learning, these activities are considered to be extremely effortful (Ericsson, 2006b; Ericsson et al., 1993). An individual's sustained effort and motivation to seeking excellence through deliberate activities have been considered to be essential to avoid a state of premature automation of performance (or flattening of Fig. 1), referred to as *arrested development* (see Fig. 2). Specifically, expert performers would counteract this automaticity by attaining and sustaining control of their engagement through developing increasingly complex integrated cognitive representations of how to plan, analyze, execute, and monitor their performance. Consequently, motivation has been considered as a key attribute underlying the emergence and use of learning mechanisms that are thought to mediate the quality of practice (Ericsson, 2006b; Ericsson, 1996). However, motivation has usually been inferred through practice engagement, rather than trying to identify "an elusive latent variable corresponding to motivation that is correlated to performance" (Ericsson et al., 2007a, p. 44). One of the reasons for this, Ericsson et al. (1993) argued, was as the motivation to practice at some point becomes so closely connected to the goal of becoming an expert and so integrated within the individual and his/her life that it cannot be easily assessed.

Acknowledging this issue, Ericsson (2004; Ericsson, Roring, & Nandagopal, 2007b) has

argued in favor of closer investigation of the concept of motivation in relation to extended engagement in deliberate practice: “At present, a primary goal is to better understand the motivational factors that support and sustain continued deliberate practice in the lifelong quest for expertise (...)” (Ericsson, 2004, p. 79).

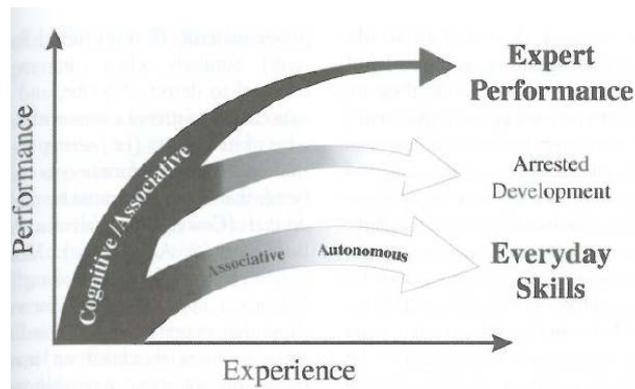


Figure 2. The relationship between commitment to excellence and performance attainment

Note. Retrieved from Ericsson (2006b), p. 685. See also Ericsson (1998), p. 90.

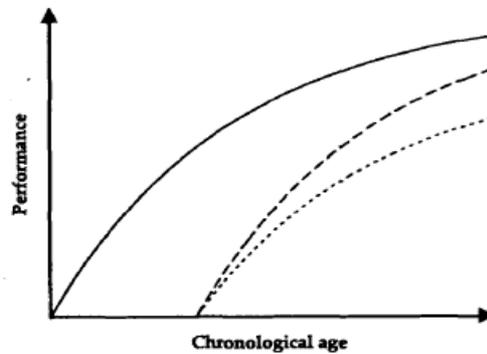


Figure 3 Three schematic relations between chronological age and performance.

Note. “The solid line shows the performance associated with an early starting age and a high level of practice. The line with long dashes shows performance for an equally high level of practice but with a later starting age. Finally, the dotted line shows the performance associated with the same late starting age and a lower level of practice”. Retrieved and quoted from Ericsson et al. (1993), p. 387.

At a general level, Ericsson et al. (1993) proposed that individuals who engage earlier in deliberate practice would gain an accumulative advantage that is difficult to catch up with for individuals who commit to similar engagement at later ages (see Fig 3). In relation, it was proposed that this advantage may also be related to certain critical developmental periods or *windows of opportunity*, where both motoric and cognitive skills could be more easily acquired at younger ages (Ericsson et al., 1993; Ericsson et al., 2007a). In sum, the premises of early, domain-specific deliberate practice for attaining expertise have resulted in recommendations in favor of *early specialization* (e.g., Côté et al., 2009).

3.3.1 Experts, expertise, and expert performance

Arising from the early research on expertise, a primary view of expertise was an orderly progression from novice to intermediate to expert, where the primary criteria mediating this progression were thought to be instruction, training, and experience. Moreover, expertise was often identified through social reputation, completed education, accumulated accessible knowledge, and length of experience in a domain (Ericsson, 2006b). One key factor in the expert performance approach was to move away from these subjective and social criteria for determining superior performances and toward objective and reproducible aspects (Ericsson et al., 2007a). As such, expert performance has been defined as “consistently superior performance on a specified set of representative tasks for a domain” (Ericsson & Lehmann, 1996, p. 277). Ericsson (2006a) has later clarified the difference between expert, expertise, and expert performance: An *expert* is characterized by being highly skillful and well-informed within a special field, and the term *expertise* is often referred to as domain specific skills, characteristics and knowledge that distinguish experts from less experienced people. While the term *expert* refers to a person and *expertise* refers to the competence that differ the experts from other people, *expert performances* are often used to define the specific performances of an expert within a specific field that can be standardized, reproduced, and

subject to scientific study (Ericsson, 2006b). In addition to the latter, Ericsson (1996; Ericsson et al., 1993) suggested that there may exist a phase of *eminent achievements* where expert performers actively pursue to go beyond available knowledge and earlier achievements to be able to produce outstanding or unique contributions to their domain:

To make an eminent achievement one must first achieve the level of an expert and then in addition surpass the achievements of already recognized eminent people and make innovative contributions to the domain. (Ericsson et al., 1993, p. 366)

3.3.2 Experts in the domain of football

Individual excellence is often highly appreciated within the game of football; fancy dribbles, rough challenges, or magnificent goals that stand out from the game as a whole and often have decisive influence on the end result. One challenge in football is that there are no clear definitions of what is regarded as experts, expertise or expert performances, as these terms usually depend on social or subjective opinions. Even among scientific research studies, these terms have been related to various levels of performance which has represented a challenge of providing comparable results across fields of investigation (see Jordet, 2005a). Probably one of the most valid categorizations of experts has been those players who have won individual awards such as UEFA Ball d'Or or FIFA World Player of the Year (e.g., Ford & Williams, 2011; Jordet, 2009), but even these winners are voted by the subjective opinion of other players and coaches.

Relative to the overall estimation of world-wide participants, the number of players who hold a professional contract represent a percentage of 0.04 % (Larsen, Alfermann, Henriksen, & Christensen, 2014). Being counted within this percentage may in itself justify to be termed as an expert. It must be noted that even within such an extreme minority of world-wide participants there will be different levels of performance. First, a professional career may last as long as 20 years which makes it difficult of determining an age of peak or expert

performance (Besson, Poli, & Ravenel, 2011). Second, there will be a difference between those who, as of Ericsson et al.'s (1993) terminology, would represent “eminent performances” and those who manage to “make the cut”. As an example of the latter category, most professional football players perform their profession under the radar of world-wide recognition and struggle constantly “to retain a degree of control over the setting of the standards by which they are judged” (Roderick, 2006, p. 3).

3.4 Limitations and criticism of the expert performance approach and DPF

The expert performance framework has been criticized for putting too much emphasis on the effects of practice compared to other factors that are thought to affect the development of superior performances, such as age, individual learning rates, environmental and sociocultural context, activity characteristics, and genetic predispositions (Ackerman, 2014; Janelle & Hillmann, 2003; for reviews, see Seifert, Button, & Davids, 2013; Tucker & Collins, 2012). Overall, the framework has been criticized on both conceptual and methodological grounds (e.g., Freeman, 2007; Grabner, 2014; Hambrick et al., 2014). Tucker and Collins (2012) for instance, questioned the conceptual foundation of the DPF, as “this theory, in its current form, is unfalsifiable, since the quality of practice can always be questioned to explain why the quantity of practice does not conform to some requisite number” (p. 556). There have also been concerns about the generalizability of the case-based analyses of experts recommended by the expert performance approach (e.g., Ackerman, 2014), and whether it is possible to reliably reproduce all aspects of expert performances for scientific studies (e.g., Runco, 2007). The latter argument has been particularly highlighted within the *ecological dynamics approach*, which argues that emergent behaviour is contextually dependent and that the expert performance approach fails to account for the interaction between environmental constraints and the individual in a performance context (Seifert et al., 2013). Conclusively, Hambrick et al. (2014) actually go as far as stating that

“there is widespread skepticism, then, over Ericsson and colleagues' strong claims regarding the importance of deliberate practice for acquiring expert performance” (p. 36).

Recently, Ericsson (2014; Ericsson et al., 2007b) have responded that much of this criticism relies on misunderstandings of the fundament on which the expert performance framework is based. The framework has, for instance, from its inception acknowledged the potential role of innate factors such as genetic differences in the development of superior performances, but merely required the presence of valid evidence before accepted (Ericsson et al., 1993; Ericsson, 2014). Similarly, Ericsson et al. (2007b) underlined that although they acknowledge the challenge of perfectly replicating all aspects of performance, they disagree with the fact that it would be impossible to scientifically investigate such phenomena.

The expert performance approach emerged from a desire of progressing toward a general or complete theory of expertise development (Ericsson & Smith, 1991a; Ericsson, 1996). It has been argued that the progression toward a general theory of expertise requires researchers to consider the interactive and multiple influences on expertise (Janelle & Hillmann, 2003; Kaufman, 2014; Wai, 2014). For instance, Kaufman (2014) argued that “the most complete understanding of the development of elite performance can only be arrived through an integration of perspectives⁸”. Still, Ericsson (2014) recently stated that he considers the expert performance framework as superior to other approaches studying superior performances, and that anybody within this field of investigation should consider the methods and theories offered by the approach:

I am getting increasingly convinced that the expert-performance framework and its case-based methods offer a superior approach to the study of expert performance than the individual

⁸ Kaufman (2014) proposed that researchers need to stand on common ground, agreeing on seven basic principles: i) There is no such thing as “innate talent”; ii) quantity of practice is subordinate to the quality; iii) there is nothing magical about 10,000 hours, iv) deliberate practice does not explain all the variation in superior performances; v) other traits outside deliberate practice contribute to the development of superior performance; vi) most psychological traits are influenced by a complex interaction between genetic and environmental factors; and vii) individual differences may influence but not necessarily constrain ultimate levels of performance (p. 1).

differences framework. Any method, like the individual difference approach that requires large samples of individuals to identify general traits to account for individual performance will never be able to account for the very highest levels of performance — a level of performance attained by less than handful individuals. (p. 100)

3.5 Sport application

In its earliest application into sports, the search for characteristics of deliberate practice activities showed both consistency and inconsistency toward the original framework: In their studies on wrestlers and figure-skaters, Hodges and Starkes (1996) and Starkes, Deakin, Allard, Hodges, and Hayes (1996) found that practice activities that were almost identical to actual characteristics of performance and activities that were conducted in collaboration with a coach were selected as most critical for improvement. However, Starkes et al. (1996) also underlined that the athletes' ratings of effort, relevance, and enjoyment of different types of activities were inconsistent with the original definition of deliberate practice: "Strictly speaking, then, we have no activities that fit the deliberate practice definition" (p. 99). Additionally, Hodges and Starkes (1996) concluded that "Ericsson et al.'s definition of 'deliberate practice' needs to be considered, especially as 'relevance' correlates highly with 'enjoyment'" (p. 400). Similar findings to the latter were identified also in team sport: Helsen et al. (1998) conducted a study on field-hockey and football (soccer) players at different levels, and concluded that "in contrast with Ericsson et al.'s (1993) findings for musicians, relevant activities were also enjoyable" (p. 12). Although Ericsson (1996) did point out the possibility that enjoying the (social aspect of) activities could be confused with enjoyment of the desired outcome (improvement of performance), it still raised an inevitable question of whether the framework was applicable to sport (Deakin & Copley, 2003).

Other researchers suggested that enjoyment represents an important characteristic of a specific type of activities that children often engage in; an intentional or deliberate type of

play that was termed *deliberate play* (e.g., Côté & Hay, 2002; Côté, 1999). As opposed to deliberate practice, deliberate play were characterized as voluntary, pleasurable, representing intrinsic motivation and immediate gratification, and thought to represent an important arena for developing sport skills during initial years of engagement (Côté, Baker, & Abernethy, 2003; Côté, 1999). These studies also showed how athletes progressed through different stages of development: The first stage, *sampling years*, was characterized by high amount of deliberate play and multiple sports engagement. Throughout the next stage, *specializing years*, athletes typically committed to fewer sports and higher engagement in structured and deliberate practice, and reduced amount of deliberate play. During the third stage, *investment years*, athletes committed to achieving elite level of performance in a single sport by engaging in more deliberate practice and less deliberate play. These developmental stages was systematized in the Developmental Model of Sport Participation (DMSP; Coté, 1999; Côté et al., 2007; Côté et al., 2009; Côté & Hay, 2002; Fig. 5), and suggested that in addition to specializing early in domain-related deliberate practice activities one could attain elite level through early engagement in deliberate play and multiple sports. As such, the DMSP acknowledged the role of the DPF in developing elite athletes, but also proposed that there would potentially be alternative pathways to attaining similar levels of performance. These pathways are often termed early *sampling* or *diversification* as opposed to *early specialization* (see e.g., Baker, Cobley, & Fraser-Thomas, 2009; Wiersma, 2000). Still, the study of Ericsson et al. (1993) stands out as one of the most influential conceptual foundations within the domain of sport expertise research in the last two decades, and several researchers within the domain of sport have shown how the amount of deliberate practice is closely and positively linked with performance attainment (for reviews, see e.g., Baker & Young, 2014; Ford, Hodges, & Williams, 2014; Hodges & Baker, 2011; Ward, Hodges, Williams, & Starkes, 2004). From these, it has been concluded that there are still important elements within the

framework that need to be addressed in the search of developing a superior theory, such as the role of sustained commitment or more thorough comparisons of the causality of different activities (i.e., deliberate practice and deliberate play) throughout the development of future elite performers (Baker & Young, 2014; Hodges & Baker, 2011).

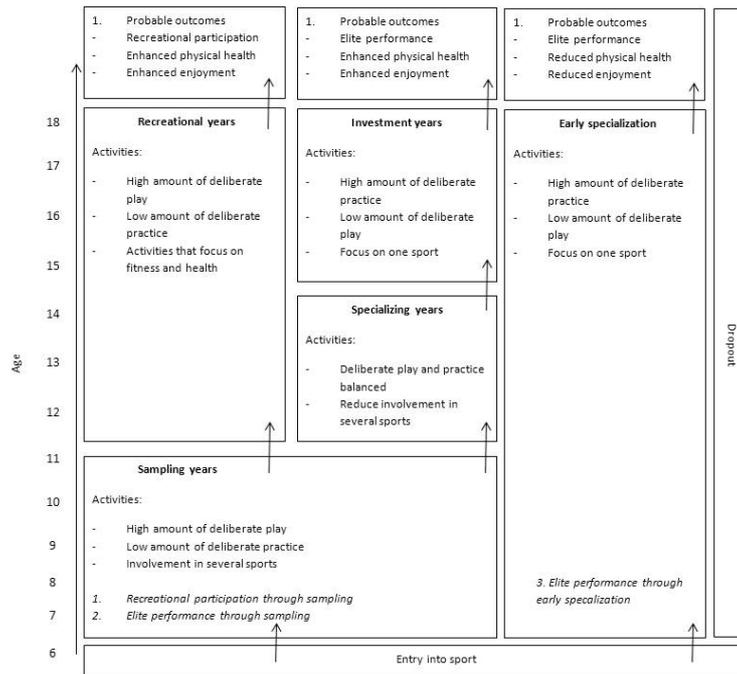


Figure 5. The Developmental Model of Sport Participation

Note. Retrieved from “Practice and play in the development of sport expertise” by Côté, Baker & Abernethy, 2007, p 197. In Tenenbaum G. & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed., pp. 184-204). Hoboken: John Wiley & Sons. Copyright ©2007 by John Wiley & Sons, Inc.

3.5.1 Activity characteristics and sport-specific quality of practice

Emerging from the discussion between deliberate practice and play and early specialization and diversification, was an increased focus on the contribution of different activities by their characteristics on skill development (e.g., Baker, Cote, & Abernethy, 2003; Hodges, Kerr, Starkes, Weir, & Nananidou, 2004). Additionally, it was underlined the importance of acknowledging the different sports’ specific characteristics in order to

determine the potential contribution of non-specific practice (i.e., skill transfer). Such an approach was considered to represent an important contribution to evaluate the DPF contribution in developing sport-specific skills (for reviews, see Hodges et al., 2007; Williams & Ford, 2008):

Perhaps of greater importance in the development of expertise is the nature of the practice activities in which players engage (...) Further research is needed to examine whether athletes who have achieved comparable levels of achievement can be differentiated based on their engagement in specific practice activities (...) Such an approach would provide a more critical evaluation of the deliberate practice framework. (Williams & Ford, 2008, pp. 7-8)

From the study of Helsen et al. (1998), studies on practice history have grown in interest within the domain of football to address the role of different activities in developing football-specific skills (Ford & Williams, 2008; Ford et al., 2009; Ford & Williams, 2012; Ford et al., 2012; Ward et al., 2004; Ward et al., 2007). These studies have provided evidence for the necessity of participating in large amounts of football-specific practice to reach elite youth and senior levels, while little attention has been given to the role of non-football activities. Related to the first, Ford et al. (2009) proposed a football-specific alternative pathway to elite performance to the original two suggested by the DMSP, *the early engagement hypothesis*. This hypothesis was grounded in their findings that elite youth players reported low engagement in other sports but high engagement in football-specific play and deliberate practice activities, and was developed “because the two other pathways did not adequately describe the relative high amounts of play activity in the primary sport” (Ford et al., 2012, p. 1654). Even though this hypothesis has received support in two recent studies (Ford & Williams, 2012; Ford et al., 2012), team practice has, quite naturally, been shown to represent a considerable portion of the overall practice time throughout development of youth (Ward et al., 2007) and senior players (Helsen et al., 1998). These studies also indicated that

the engagement in such activities could explain later differences in performance attainment. As deliberate practice was primarily considered as individual activities, these studies showed that the inclusion of team practice also should be considered as a natural progression of a football-specific implementation of the DPF.

There have been several limitations related to these studies. First, since the study of Helsen et al. (1998) there is a lack of studies addressing players who have actually progressed to senior professional football. Second, relatively low population (or sub-population) samples and young ages of the participants have limited the potential generalizability to the larger pool of football players across the world. In relation, Ford and Williams (2012) and Ford et al. (2012) underlined the importance of acknowledging potential cultural and structural variations in regards of for instance what types of activities are traditionally valued across nations (see also Koslowsky & Da Conceicao Botelho, 2010). Third, the statistical analyses used in these studies have focused on comparing group mean differences throughout age categories, and means that each player's response from one age category to another is treated as independent responses. Although such analyses would provide important insight in (differences in) the amount of time spent in specific activities, one cannot draw conclusions of the actual development of each individual over time (e.g., Krueger & Tian, 2004). Fourth, a more superior concern has been voiced over the lack of overview of how different variables may interact throughout the developmental process, and consequently potentially combine into various pathways other than the three presented above (Ford & Williams, 2012). Nevertheless, these studies should be considered as important contributions toward understanding the potential effects of different activities on football skill development.

3.6. Activity characteristics and skill learning in football

3.6.1 The characteristics of football

The game of football can be characterized as an open, dynamic, complex, and unpredictable environment, where performance is determined by the capacity to adapt to it (Grehaigne et al., 1997). As a result of these characteristics, it has been argued that one cannot explain game-play or match performance by addressing its individual parts: “Soccer is a complex sport and therefore it is difficult to fully assess the various component parts” (Ali, 2011, p. 181). This emergent characteristic has been referred to as the *principle of nonsummativity* (the whole is greater than the sum of its parts) and suggests that “the productivity of the group is more than the sum of the outputs of the individual members (Olsson, Juslin, & Olsson, 2006, p. 43). The ability to excel in football is therefore dependent on the adaptability and coordination of execution to teammates and the opposition, where tactical and perceptual processes that decide what movement to make and when to make it would represent important prerequisites (Dicks & Chow, 2010; Wolpert, Diedrichsen, & Flanagan, 2011). In other words, “a player might have good patterns of movement (technique) but if he does not perform the right action at the right time (skill) then he becomes an almost ‘useless player’” (Ali, 2011, pp. 170-71). Furthermore, this ability to select and perform the right action at the right time may be affected by a players’ physiological condition during phases of the game (e.g., Ali, 2011; Mohr, Krstrup, & Bangsbo, 2003; Mohr, Krstrup, & Bangsbo, 2005a) and psychological factors (e.g., coping with stress; Jordet, Hartman, Visscher, & Lemmink, 2007). The advantage for football players is that they can contribute in various ways dependent on their individual skills and prerequisites, and consequently do not necessarily need extraordinary capacities within all various performance aspects (Stolen et al., 2005). On the contrary, a player can compensate for deficiencies in one skill area by strength in others, from which expertise can be achieved through a unique combination of skills

(Meylan et al., 2010). In a recent study on mental toughness, for instance, it was proposed that players can compensate for some “technical, tactical or physical limitations through being mentally tough” (Cook, Crust, Littlewood, Nesti, & Allen-Collinson, 2014, p. 341).

In relation to the present thesis, the abovementioned characteristics of skills and performance highlight some important areas to take into account. First, one can see the foundation of the criticism toward the ecological validity of attempting to reproduce football performances in traditional laboratory settings (see Ali, 2011; Jordet, 2005a). Second, being in possession of proficient football skills does not equal, but should be considered as an important prerequisite for, superior performances. Third, given that players can compensate deficiencies in some skills by excelling in others, it becomes apparent why it is so difficult to predict who would eventually progress to top level.

3.6.2 Activity categorization and skill learning

Ericsson (1996) underlined that “the mere duration of practice will not be a perfect predictor of attained performance” (p. 34). The point was that a lot of the underlying variables that characterizes the effectiveness of learning may not be accounted for simply by addressing the number of hours of engagement in different activities (see e.g., Wulf, Shea, & Lewthwaite, 2010). As such, one key limitation of practice history research could be that the activity categories are not reflecting the actual content (microstructure) of practice. That being said, linking the characteristics of the activities within each category to research or theories on motor learning, may offer valuable understanding of their effect on skill development. This will be addressed shortly below and more closely in the discussion.

Based on their inherent characteristics, different football-specific activities may be categorized along two continuums: the first is related to the degree of environmental or contextual variability, while the second is related to the variability of skills that are in focus (Williams & Hodges, 2005; Fig 6). From research on motor learning it has long been

acknowledged that repetition of movements is important for developing motor skills, but also that the retention, transfer, and functionality of skills would be dependent on the degree of contextual variability (e.g., Gorman, 2010; Lee, Swanson, & Hall, 1991; Lee, Swinnen, & Serrien, 1994; Shea & Morgan, 1979). As Lee et al. (1991) summarized:

Few would question that *practice* is the key ingredient toward the learning of motor skills. Furthermore, there would be little disagreement that *movement repetition* is a key ingredient, if not the key ingredient, in practice [However] effective practice requires more than just movement repetition. The problem-solving operations undertaken by the learner, especially those involved in the development of an action plan, make important contributions to the development of skill. (pp. 150, 155)

Similarly, in football there will be a continuous tension between gaining enough movement repetitions, but also adequate contextual variability to ensure the functionality of the skill in focus. In this, informal (i.e., street football) or formal (coach-led) small-sided game play has in recent years been perceived as activities that effectively represent an adequate amount of both repetitions and contextual variation (Aguiar, Botelho, Lago, Macas, & ampaio, 2012; Clemente, Martins, & Mendes, 2014; FIFA, 2015; Gorman, 2010; UEFA, 2005).

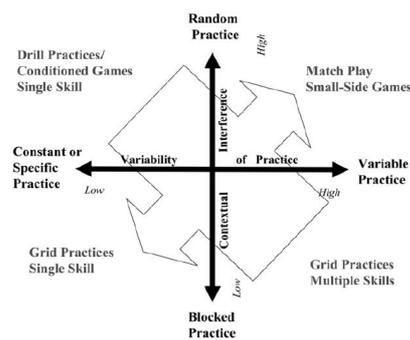


Figure 6. The relationship between variability of practice, contextual interference and practice activity
Note. Retrieved from Williams and Hodges (2005), p. 6.

Within practice history research, including article 2 in this thesis, the informal game play activities are included in a separate category (football specific play; e.g., Ford et al., 2009), while the formal version of these games would fall into the category of (team) practice (Ford & Williams, 2012; Ford et al., 2012). The first category would, therefore, represent a more precise reflection of the activity in which players engage than the latter, as coach-led sessions could contain a large variation of activities that cannot be measured through this superior category. Ward et al. (2007) used a separate category for individual practice, which represented the deliberate activities that players conducted on their own. Given that it would be limited how much contextual variation a player can create by himself, it is reasonable to assume that the activities within this category would primarily vary across the horizontal axes of figure 6. There is still a potential for a large variety of activities, but this superior category would probably represent activities with a higher degree of repetitions and lower contextual variability. Surprisingly, the three most recent practice history studies have actually merged such individual practice with team practice into one “deliberate practice” category (Ford et al., 2009; Ford & Williams, 2012; Ford et al., 2012). Even though this was partly motivated by narrowing the focus on the differences between deliberate practice and play, such a category would represent even larger difficulties of determining how different activities’ characteristics may affect skill learning. In article 2, we therefore separated this category into “coach-led” and “goal-oriented individual/peer led” activities⁹, where the latter category may be assumed to contain a larger portion of activities with higher amounts of repetition but lower contextual variability.

⁹ It must be noted that our category of goal-oriented individual or peer-led activities included all activities that were conducted without adult or coach supervision, and consequently included activities that one or more players organized themselves. The inclusion of more players would open for an even larger variability in the types of activities that are reported within this superior category. However, this specification is necessary as many players often get together to practice different skills, and would therefore be important to include when calculating the overall amount of practice.

4.0 Research methods, strategies, and analyses

The methodological background of the present thesis has been guided by the DPF. Throughout the chapter on “Theoretical foundation” I have presented how the DPF emerged from its original theoretical foundation and its progression into practice history research and the DMSP, and how these expansions and relations are important to take into account when using the framework as the underlying logic for research such as the present thesis. Additionally, it has been argued that expertise research need to rely on a wider theoretical foundation that take into account possible interactive and multiple influences (Janelle & Hillmann, 2003; Kaufman, 2014). Wai (2014) underlined that scientists should not necessarily be “wedded to any particular theory, framework, or definitions but [rather be] interested in the full network of evidence surrounding a topic” (p. 123). It is therefore the logic arising from the DPF that has guided the thesis and not the intention of testing the framework in itself.

The present thesis has addressed the questions in focus through the use of different modes of inquiry; literature review (Article 1), quantitative questionnaires (Article 2 and 3), and qualitative in-depth interviews (Article 4).

4.1 Literature review (Article 1)

4.1.1 Procedure

The literature review initiated from the aim of collecting and providing an overview over available research related to the development of male youth players towards professional football. Specifically, the Developmental Model of Sport Participation (DMSP; Côte et al., 2007) was used as a theoretical foundation for systematizing the process. A selection of terms were developed based on the DMSP and discussed among the authors to ensure that they were representative for the areas included in the model. A title and abstract search was conducted in the electronic SPORTDiscus database, where only peer-reviewed manuscripts in English concerning male players were included. Other relevant articles were identified by cross-

checking the reference lists of articles selected from the electronic search. No additional inclusion criteria were used for this part of the process. This reference list cross-check added a further 6 articles, giving a total of 115 articles that were included in the manuscript. The manuscripts were then systematized into categories related to the DMSP (i.e., deliberate practice, burnout/dropout, skill transfer, talent identification), and then later merged into the structure of the present manuscript.

4.1.2 Strengths and limitations

A systematic review may be defined as “a review that has been prepared using a systematic approach to minimizing biases and random errors” (Egger, Smith, & O'Rourke, 2001, p. 5). The most notable risk of doing literature reviews is that the selection and presentation of included studies may, for several reasons, be biased (Petticrew & Roberts, 2008). This review process sought to avoid potential process biases by using the DMSP as a framework for guiding the search, selection, and presentation of relevant literature. Another strength of this review is the inclusion of a large amount of studies across domains. In comparison to prior reviews that represent narrow focus areas (e.g., physiology, Mohr, Krstrup, & Bangsbo, 2005b, Stolen et al., 2005; and biomechanics, Lees, Asai, Andersen, Nunome, & Sterzing, 2010, Lees & Nolan, 1998), or that have addressed similar across-domain approaches (i.e., talent identification and development; Meylan et al., 2010; Williams & Reilly, 2000), it represents one of the most comprehensive reviews on the topic of expertise development specifically in football. It must be noted that the main limitation of this review relates to focusing solely on one database, and by including studies from other databases one may find studies that could explain or nuance the presented results.

4.2 Cross-sectional data collection with retrospective questionnaire (Article 2 and 3)

4.2.1 Procedure

These studies main aim was to address the contribution of engagement in different football-specific and non-football activities toward performance attainment. Specifically, 745 elite youth players between the ages 13 to 21 years reported their present engagement and engagement history through a questionnaire (see example in Appendices). Of supplementary data that were relevant for these studies, the players reported starting age of different activities and their ratings of the different activities' contribution, relevance, enjoyment, and required concentration towards their last year's skill development, on scales ranging from 0 to 10. For the non-football activities, the players also reported the type of sport and reasons for participation. The data were manually punched into SPSS following a pre-defined code-book, after which all inputs were re-checked and corrected if miss-punched. Players who failed to report any of the variables included in the studies were removed. A re-test and a one-week training diary was conducted on a sample of players three months after initial collection, to be able to test the reliability of reported present and retrospective engagement. The main analyses (practice history) of these studies were conducted by using multilevel modeling, and will be addressed shortly in a separate chapter.

4.2.2 Reliability

When attempting to determine the role of practice toward performance attainment, two issues are of immediate concern; the validity and reliability of data (Ward et al., 2004). The obvious disadvantages of retrospective data are related to memory error and inference, and the methodical challenge becomes to measure variables of interest with validity and precision (Côté, Ericsson, & Law, 2005). The issue of increasing the reliability of practice estimates has traditionally been addressed through the i) collection of longitudinal or quasi-longitudinal (cross-sectional) data, ii) ensuring backward reporting, or iii) the use of training journals for collecting or checking data (for an overview, see Ward et al., 2004). i) Quasi-longitudinal data

arise from the collection of present engagement across age-groups in addition to the retrospective estimates: the comparison of an older individual's (i.e., 15 year old) reported engagement at an earlier age category (i.e., the age of 9) toward present engagement of a younger individual's (i.e., 9 year old) present engagement at the same age, has been believed to provide a strong indicator of reliability that consequently has supported the use of retrospective methods in recalling practice hours (e.g., Ward et al., 2004; 2007). However, to use a 15 year old's estimates of practice engagement at the age of 9 years as a reliability¹⁰ test towards the actual engagement of a present 9 year old, would be based on the assumption that their engagement would follow a similar progression. This would not only fail to account for the actual individual variation among these individuals but, logically, if present estimates of a younger individual can be used to determine the validity or reliability of a retrospective estimate by an older individual then the reverse should also be possible. Based on such an assumption it should therefore be possible to predict the future engagement of an individual, which appears somewhat contradictory to why retrospective recall methods are applied in the first place. ii) There have also been attempts to optimize the chronological order of collection, where the most reliable estimates have been thought to be of the most recent years of practice (Hodges et al., 2004; Ward et al., 2007). As such, the participants in these studies reported their most recent engagement and backwards until they reached their initial years of engagement, a method thought to reduce the potential overestimation of engagement during the earliest years of engagement (Ward et al., 2004). iii) Finally, the use of training diaries have been used both as a direct source of data, but also to check the reliability of data collected through other sources (Starkes, Weir, & Young, 2003; Tønnesen, 2009).

Prior versions of the questionnaire have demonstrated good test-retest reliability (Ford, Low, McRobert, & Williams, 2010; Helsen et al., 1998; Ward et al., 2007). Although we

¹⁰ Ward et al. (2007) referred to their procedure as a check for validity, but was highlighted by Ward et al. (2004) as an important reliability check: "Comparisons of current estimates with retrospective estimates provide a strong indicator of retrospective reliability" (p. 244).

made some adaptations to the questionnaire, we still followed the suggestions by Ward et al. (2007) by structuring the schema with the highest age at the top and lowest age at the bottom, and encouraged to a backward report of engagement. We also conducted a retest and a one-week training diary on a sample of players three months after the initial data-collection, where the latter was signed by the players' coaches and parents, confirming the correctness of the reported content. Both the test-retest (ICC = .86, 95% CI = .77-.93) and test-diary (ICC = .71, 95% CI = .30-.88) analyses demonstrated good relative reliability. Contrary to the suggestion that the reports closer in time would be more reliable than more time-distant engagement, we identified no consistent differences across age categories. Still, these data need to be treated with caution in terms of determining causality, and should be considered as estimates rather than factual numbers.

4.2.3 Validity

Ward et al. (2004) stated that prior practice history studies have not always provided a valid measure of deliberate practice, which to a large degree was due to the inclusion of activities that are not characterized as deliberate practice are still counted within the hours used to predict current levels of performance. The aim of recent practice history studies have, though, not been to determine whether activities fall into the definition of deliberate practice, but rather how different activities may represent and contribute to different qualitative effects on football-specific skill development (Ford et al., 2009; Ford & Williams, 2012; Ford et al., 2012). One must also keep in mind that it is the participants themselves who report the amount of time spent in each activity category, along with their subjective ratings of the activities' deliberate properties (e.g., Helsen et al., 1998; Ward et al., 2007). As such, if the players (or coaches) perceive an activity as important it should be considered to be an indication of their *ecological validity*, independent of whether the ratings contradict a predetermined definition or characteristic of what researchers may consider as more efficient.

One challenge of prior practice history research has been the *external validity*, which refers to the extent to which the findings are generalizable to groups, environments, and settings outside the context of measure (Onwuegbuzie, 2003). As prior studies have been conducted with relatively small samples of players, it has been difficult to generalize the findings to groups outside the population measured. Moreover, with the exception of the study of Helsen et al. (1998) the studies have exclusively addressed youth players, which consequently have challenged its applicability toward players who actually make the progression to senior professional football. In these studies, we attempted to address these limitations through the inclusion of a relatively large number of participants, some of whom had obtained a senior professional contract. Still, one key limitation would be that some of the younger players may eventually obtain a professional contract, which in turn can add nuances to the results.

The *internal validity* of these prior studies may be questioned with respect to two important issues, both related to the use of statistical analyses. First, one cannot be sure whether other variables may have affected the relationship between activity engagement and performance attainment. Second, the analyses merely compare group differences across age categories, and consequently fail to account for the individual variations within groups but also the relatedness of individual scores over time (Krueger & Tian, 2004; Snijders & Bosker, 2012). In these studies we attempted to address these issues through the use of multilevel modeling, which is described shortly below.

4.2.4 Multilevel modeling

Perhaps the most noteworthy progression from prior practice history studies was the implementation of multilevel modeling. This procedure was chosen to be able to account for the actual individual development over time but also the possibility of including variables that may affect the relationship between practice engagement and the progression to professional

football, at multiple levels. Moreover, the actual reported scores were transformed to relative scores that allowed estimating relative differences between the groups and the standardized effects of these differences, and consequently a more reliable and valid representation of the data. As such, this procedure would address many of the issues of reliability and validity that has just been presented. For a comprehensive presentation and discussion of the procedures I refer to article 2 (pp. 338-40), in particular, but also article 3 (pp. 1942-43).

4.3 Qualitative in-depth interviews (Article 4)

4.3.1 Procedure

In light of the two prior referred studies, this study aimed to supplement the quantitative data with related qualitative data. This study was therefore conducted with the aim of gaining a deeper understanding of the perceived characteristics and contribution of deliberate practice throughout the career of senior professional football players (see Appendices). Seven senior professional players were interviewed by the third author of the manuscript. The players can be said to have been strategically selected and consequently be considered to be key informants to shed light upon the contextual variations of the DPF (Andersen, 2013; Charmaz, 2006; Silverman, 2013). As such, one of the key contributions of this study was the potential to gain a deeper conceptual understanding of the DPF within the context of senior professional football.

This study would fall into the category of qualitative case-studies, which is a label on studies attempting to gain a deeper understanding of a complex social phenomenon within a specific context (Yin, 2009). A case-study focuses on a specific unit and can be studied in several ways, such as qualitatively or quantitatively, where the methods applied not would be decisive for whether it is a case study or not; “the demarcation of the unit’s boundaries is” (Flyvbjerg, 2013, p. 170). The *case* in this particular study, being how to develop to and perform at professional football, would contain several underlying layers; what *context* is

being studied (Norwegian Premier League), *unit of analysis* (practice engagement, motivation, and deliberate practice strategies), and *observation units* (senior professional players) (Yin, 2009).

4.3.2 Reliability

Reliability in qualitative research usually concerns the degree of consistency of informant's accounts and how they are interpreted by the researcher (Corbin & Strauss, 2008). According to Merriam (1995), reliability in qualitative research is not necessarily whether the results can be reproduced in a second or third study but rather "whether the results of a study are consistent with the data collected" (p. 56), a sort of *internal reliability*. Consequently, an important focus would be to ensure that the analytic process and presentation reflect the collected data. In this study, the analyses were conducted by researcher triangulation to avoid researcher bias and to enhance credibility of data (Onwuegbuzie & Leech, 2007). Additionally, the players were given the opportunity to review their quotes along with our interpretation and the context in which they were presented in the manuscript. This ensured that the interpretation, categorization, and presentation of the quotes represented the players' views and reflections. Such an understanding of internal reliability is closely related to *validity*, to which member checking and researcher triangulation also would represent important strategies (e.g., Creswell & Miller, 2000; Merriam, 1995; Onwuegbuzie & Leech, 2007; Yin, 2009).

In addition to a part focusing on the participants' present daily work as professional football players, these interviews also contained a retrospective part. Côté et al. (2005) proposed that it would be possible for respondents "to be very reliable in their responses without the responses reflecting an accurate memory of their past experiences" (p. 10). However, given that the players in this study was even older than the youth players in the two previous, the possibility of memory error and inference could be even more prevalent among

these players (Ward et al., 2004). The retrospective part of the interview therefore cohered around specific, meaningful events throughout the players' development, such as initial engagement into football and signing a professional contract. The use of such "landmark events" is one of several techniques that have been applied in recent years to increase recall accuracy in terms of completeness of data and characteristics of an episode or a related period (Drasch & Matthes, 2013; Glasner & Vaart, 2008).

In the preparation for the interviews, an extensive overview over the players' background and careers were collected (i.e., club sites, media coverage). This information was considered useful for two reasons: First, it functioned as "internal check-list" towards the players' reports of specific events or ages (i.e., signing their first professional contract or moving to a new club). Second, it sought to nurture the feeling of a genuine interest into the players' stories and consequently motivate them to be as open and comprehensive in their responses as possible. To create such an environment with professional football players can be difficult, especially coming from outside: it is necessary to understand the "football-codes" (Cook et al., 2014) but also that such players often develop a "protective barrier" around themselves in which there is a need to establish a sense of trust for players to "open up" (Nesti, 2010). It must be noted that the interviews cohered around the players' voluntarily retelling what they perceived of importance for their football career, and not areas that were considered to expose potential vulnerable or negative sides of themselves. Still, the background information, in addition to that all researchers were familiar with the football environment and "codes", have been considered important for creating a trustworthy interview setting but also in the process of analyzing the data.

4.4.3 Validity

The term validity in qualitative research refers to how well one captures what one aims to study (Corbin & Strauss, 2008). According to Yin (2009), *internal validity* is related to

“seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions” (p.40). As such, establishing causality may also be an important issue in qualitative research. In the present study, though, the aim has not been to determine direct causal effects but rather describe how events coincide, possible interacting factors, and developmental patterns throughout the players’ career (see e.g., Stake, 2005). Still, these events, interactions, and patterns have been grounded in theoretical propositions, which is one way to increase the possibility of explaining how or why something has happened. This type of matching of empirical patterns with the theoretical propositions is what gives the study conceptual value or relevance (Yin, 2009). However, one potential challenge is if the theory is too general, then the coupling between theory and empirical data will be more unclear. On the other hand, an interpretation that is not sensitive to the empirical variation would have problems with validity and trustworthiness (Andersen, 2013). In relation to this, the DPF represents both advantages and disadvantages: the advantage is that the DPF it attempts to determine a chain of causality for developing expertise across domains, and could therefore be used as basis for describing causal connections between empirical data. However, it is reasonable to argue that the framework is not sensitive to sport-specific variations. Our attempt to address these issues was to develop questions that were specifically adapted to football in the categories of activity engagement and self-regulation, through the guidance of prior football-specific research in the areas of practice history and self-regulation of learning, respectively. Questions on motivation were, similar to how the concept has been used in the DPF, more generic. Rather than using a specific motivational theory to develop questions, which potentially could reduce the sensitivity for important nuances, these questions cohered around the two other sections to gain a more nuanced perspective of why the players engaged in different activities. Instead, the categories emerging from the data were illuminated and discussed from several motivational perspectives. Such a procedure would therefore not rely

on pre-defined operational categories, which may have represented a limitation for identifying the correct operational measures for the concepts that we attempt to address (construct validity). To accommodate this issue, the players were invited to review their quotes to ensure that the categories properly reflected their views and perceptions (Yin, 2009).

Yin (2009) has referred to *external validity* as the potential generalizability of findings to a defined domain. Compared to quantitative studies, where generalization is sought by increasing the number of participants that may be representative for a larger population, the potential generalizability of qualitative case studies has usually been considered to be limited (Silverman, 2013). However, (Silverman, 2013) underlined that such studies “generalize to theoretical propositions, not to populations” (p. 145). As such, the generalizability of case studies would refer to the extent to which concepts, relations, or patterns would be valid for certain phenomena under certain conditions (Andersen, 2013). In this regard, a strategic sampling of the players included would be important. If the players are thought to be valid representatives of the context of professional football, then it would be possible to generalize findings to similar contextual conditions (Andersen, 2013).

4.5 Ethical considerations

The abovementioned studies have followed all APA ethical guidelines and guidelines for collecting and storing data. For the interview study, all data was collected anonymously and eventual responses that could identify the players were either removed or anonymized. Both the clubs and the players were informed in written form of the intention of the study. All players participated voluntarily and were informed that they at any point could retract from the study, after which all data would have been deleted. The storing and use of data in the present thesis has been verbally approved by the National Data Protection Authority (NSD). For the study involving youth players, all information was passed out in written form to the clubs, the players, and their parents. This information clearly stated that participation was

voluntarily, anonymous, and that the players at any point could retract from the study without any reason, after which all their respective data would be deleted. All players who agreed to be a part of the project signed a written consent, and for the players under the age of 18 years, a written consent from their parents was collected. The collection and storing of the data for 20 years has been approved by NSD.

4.6 Overall methodical strengths and limitations of the thesis

The main methodical limitations of this thesis relate to three important aspects: retrospective data, the microstructure of practice engagement, and the population included. First, three of the four papers (2-4) are to a large degree based upon elite youth and senior professional players' retrospective estimates or reflections on specific factors throughout their career. The obvious disadvantages related to retrospective data are related to memory error and inference, and the methodical challenge becomes to measure variables of interest with validity and precision. Still, given the difficulties of predicting who would eventually progress to top level, players who have made this transition remain one of the primary sources of information about how to reach and perform at such a level. One must also keep in mind that this thesis was a part of a larger project that aimed to know more about the group of players that were included, where the specific focus on how to get to such a level was one of multiple areas in focus. With these premises, we have tried to address the possible disadvantages related to collecting and using retrospective data through different methodical adaptations as I have presented in the prior sections. Second, one of the key disadvantages of measuring the quantity of practice in the way that it has been conducted in these and prior studies is that we cannot identify the variation in the microstructure within each category. As an example, coach-led team sessions may contain activities that share a lot of similarities with activities in other categories, from which it would be difficult to make specific recommendations and implications for how different activities may contribute to skill development. Third, the

inclusion of elite players only, represents three limitations: 1) We cannot conclude whether their practice engagement characteristics differ from lower-level players, as such (a group of) players have not been included for comparison. As such, we can describe the characteristics of these elite players as representative for the demands for reaching such a level, but not determine whether these characteristics are the cause of difference in performance attainment between elite and lower-level players. 2) It may be that the future progression of players in the younger age categories may influence the results. 3) The generalizability of such an extreme group of players may be limited, and one should be careful to draw recommendations to youth level football in general. Additionally, it may be that cultural differences may limit the transferability to other elite youth populations where various countries or cultures may favor different approaches (e.g., Ford et al., 2014; Ford et al., 2012).

The main methodical strengths of the thesis are related to three areas: multiple methods, the implementation of multilevel modeling, and a large and representative population. First, such a synthesizing of multiple methods has allowed addressing the overall aim by collecting richer and stronger array of data (Yin, 2009). The studies should be viewed as supplementary or complementary to each other, which will be the basis of the discussion of the results in the next section. Second, the implementation of multilevel modeling represents an important progression within practice history research, and the strengths of such a procedure are presented in detail in article 2. Finally, the population of elite youth players is, in a general scale, quite large, representing a much larger potential for creating generalizable data than what has been the case with prior practice history research. In a Norwegian context, the population includes basically all elite youth players between the ages of 14 and 20 years. The data therefore represents a comprehensive overview of the characteristics of the elite players within each age category, specifically for Norway.

5.0 Findings and discussion

5.1 Recapturing the purpose and main aim

The overall purpose of this thesis was to identify characteristics which may explain why some players manage to progress to professional football while others do not. The main research question for the thesis was: How and why does engagement in different sport activities contribute throughout the development of Norwegian male elite football players? In the following section I have highlighted major findings across the four articles. Each finding will be discussed from a broader perspective than in each article separately.

5.2 Major findings

#1: To reach elite youth and senior professional football requires an accumulation of large amounts of football-specific practice (Article 1-4).

In article 2 and 3, the results indicate that a relatively large amount of football-specific practice underlies the progression to elite youth level football. Specifically, the players were estimated to have reached about 10,000 hours of football-specific practice at the age of 20 years, which accounts for about two hours per day on average. The perceived importance of accumulating large amounts of football practice during childhood and adolescence was additionally supported through the literature review but also by the senior professional players in Article 4. Regardless of whether the practice engagement of players included in article 2-4 would be different or higher than lower level players, these articles show that elite players *do* practice a lot of football throughout their development and that they *do* consider this to be an important prerequisite for progressing to professional football.

Our findings correspond well with the importance of extended engagement in domain-specific practice for reaching higher levels of performance proposed by the DPF (Ericsson et al., 1993), but also specifically towards football (e.g., Ford & Williams, 2008; Ward et al., 2007). However, the DPF proposes that extensive experience in a domain contributes to

developing expert performance as long as it is coupled with deliberate practice (Ericsson et al., 1993; Ericsson, 2004). Thus, it is the quality of that engagement that is considered most important. Ericsson et al. (1993) stated that deliberate practice would be so demanding that it can only be practiced for a limited period of time each day, and that a key constraint to ensure optimal performance improvement was to balance the engagement in such activities with adequate periods of recovery. A proper balance between practice load and recovery would be even more important in sport domains with inherent characteristics of high physical demands, as to prevent physical and psychological overload that could lead to injuries, burnout, or motivational problems (Baker, Côté, & Deakin, 2005). Paradoxically, one of the key determinants for further progression of sport athletes is the ability to push beyond current capacity, which consequently may involve a higher risk of training overload:

If the athletes do not push themselves, then they will remain at the current level or begin to revert back toward earlier levels of adaptation. If the athletes push too hard for an extended time, then they are likely to cause physical injury to themselves. And if they do not allow themselves to recuperate before each training session, then they are likely to reach a state of overtraining and burnout. (Ericsson in Schraw, 2005, p. 404)

In football, it has been underlined the importance of individual monitoring of players' total physical and psychological stress load and recovery to avoid uncontrollable periods of overload that may lead to injuries and/or illness (Brink, Nederhof, Visscher, Schmikli, & Lemmink, 2010; Brink et al., 2010). Such periods of not being able to practice would represent a setback in a player's developmental process, and injuries in particular may at outermost consequence hinder the player from continuous participation in football (see e.g., (Inklaar, Bol, Schmikli, & Mosterd, 1996; Kathrin & Engebretsen, 2010). This appears to be particularly relevant during growth periods where the body is considered to be more prone to injuries, due to for instance muscle-tendon tightness, decreased physical strength, and bone

porosity (Caine, Maffulli, & Caine, 2008). It therefore seems that a player's adaptability and tolerance towards training vary across individuals but also throughout development, and failing to monitor, control, and adapt the load of each player with proper recovery may actually hinder optimal development (Jordet, in press). In this, the need for properly educated coaches seems evident. Specifically, it has been argued that coaches working with young athletes should be educated in areas such as "(...) the specific safety risks of children's sports, the psychology and sociology of children and adolescents, and the physiology of growth and development as it relates to physical activity during childhood and adolescence as well as common medical related issues" (Micheli, Glassman, & Klein, 2000, p. 828).

Within the DPF, the effort put into practice (e.g., the amount of hours) has been used as a reflection of an underlying motivation, rather than attempting to assess how and why athletes manage to stay committed to prolonged practice engagement (Ericsson, 2004; Ericsson et al., 2007b; Ericsson et al., 2007a). Consequently, "despite its prominence in the DPF, questions remain about the personal attributes that enable maximal levels of deliberate practice over extended periods" (Baker & Young, 2014, p. 148). Rather than merely assessing players' reported accumulated practice experience, it may therefore be more pertinent to identify and nurture individual motivational characteristics that underlie such extensive engagement in football. In article 4, for instance, the results show how players may be motivated to engage in different football activities by various sources at different stages of their development. Specifically, these players reported that enjoyment and social interaction manifested into spending much time in football during their earliest years of engagement, which is in line with suggestions of representing a proper foundation for prolonged practice engagement (Côté & Hay, 2002; Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993). At later ages, it appeared that their engagement was additionally facilitated by a variety of short-term and long-term outcomes. The latter, for instance, seemed to represent a personal

responsibility towards their progression and manifested into sacrificing time spent with their family and friends to be able to practice enough. Such personal responsibility or self-discipline towards pursuing a future goal is considered within the DPF to be one key feature for developing expertise (Ericsson et al., 1993), and is closely linked with other related terms such as “delaying gratification”, “passion”, “self-control”, or “persistence” that all has been thought to be favorable characteristics of successful football players (e.g., Cook et al., 2014; Holt & Dunn, 2004; Mills, Butt, Maynard, & Harwood, 2012; for an overview, see Jordet, in press). To identify these (variations in) individual characteristics appears to be important in order to construct appropriate developmental environments for each individual player (see e.g., Collins & MacNamara, 2012; Cook et al., 2014). By doing so, coaches can help players to “identify the exact paths through which they can achieve their goals, and support them in making daily sacrifices in order to reach their long-term career goals” (Jordet, in press, p. 8).

#2: The overall accumulated amount of football-specific practice is not sufficient to explain differences in future performance attainment (Article 1, 2, 4).

In the within-elite youth group analyses that were conducted in article 2 we found that although the professional players reported to have accumulated more overall practice hours than non-professionals from ages 6 to 19 years, none of these differences were significant. Such a finding appears contradictory to prior practice history studies in football that have shown that the overall accumulated amount of practice could represent one important explanation for differences in performance attainment (e.g., Helsen et al., 1998). Given the difficulties of determining the degree to which the overall accumulated amount of football practice has contributed to present differences in performance attainment, other possible explanatory factors seem pertinent to address: engagement in other sports, timing of engagement, variation of activities within the overall quantity, quality of practice, and motivation. All of these factors will be addressed in following sections.

#3: The overall engagement in non-football activities is considerably exceeded by the amount of football-specific practice, but may still have contributed to developing football skills (Article 1, 2, 3).

In article 3 we found about 2/3 of the elite youth players have participated in other sports outside football at some point during their career. However, the players' overall engagement in football-specific activities considerably exceeded the amount of time spent in non-football activities throughout every age-category. The estimates from the multilevel analyses conducted in article 2 and 3 are combined in Figure 7 to illustrate these differences. Moreover, we found no significant differences between the two groups of players in the accumulated amount of time spent in non-football activities at any age-category, which means that we were not able to relate differences in performance attainment to an actual difference in non-football participation. In combination, these findings indicate that football-specific practice should be considered the main contributor for developing proficient football-specific skills. This would be in line with suggestions made by Ford and Williams (2008) and Ward et al. (2007) that expert performance in football is mainly developed through football-specific activities, and also corresponds well with the importance of domain-specific practice highlighted through the DPF (Ericsson et al., 1993).

We did, however, find some support for how engaging in non-football activities may have contributed to the development of football-specific skills. First, about 3/4 of the players in article 3 reported that they engaged in other sports because of fun, social reasons, or to try something new or different. It has been suggested that the potential advantages of participating in other sports may be related to social or psychological adaptations that potentially could foster the motivation for prolonged engagement into sports (Côté et al., 2009). It may therefore be that non-football activities have represented an arena that have reduced the potential risks associated with engaging solely in one sport (i.e., burnout, dropout)

and/or positively affected the underlying motivation for continued sport involvement (i.e., enjoyment; Scanlan et al., 1993; Wiersma, 2000). As such, the potential psychosocial benefits emerging from participating in non-football activities may have been one important prerequisite for these players' decision to sustain their engagement into football, and consequently indirectly affected the development of football-specific skills.

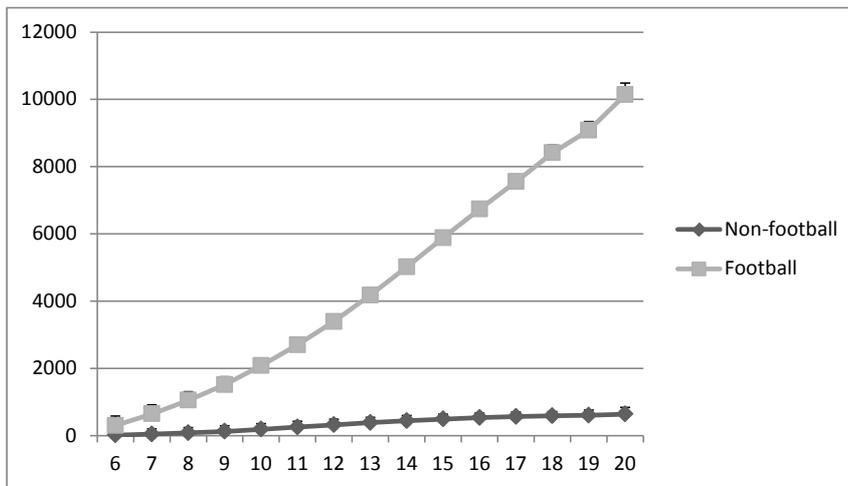


Figure 7. The amount of hours of football-specific and non-football activities accumulated throughout the development of elite youth players (90 % CI-UL).

Note. Numbers represents estimates from the random slopes models that are presented in Table 4 in article 2 and Table 4 in article 3.

Second, we also found indications of how non-football activities may represent a more direct effect on the development of football skills. The players reported that they perceive activities that share a number of characteristics with football as more relevant for developing football-specific skills than other activities, which is in line suggestions by Baker et al. (2003) and findings in the literature review. The latter reveal, however, that the potential transfer of the use or learning of skills from other sports to football is an extremely complex issue, so I will not re-discuss these findings as these are thoroughly addressed and discussed in the review and article 3. However, one area that may deepen the understanding of transfer and learning

of motor skills was one that was not included in the original articles' discussions: underlying neural adaptations to practice. In a recent review on the area, Seidler (2010) highlighted four important suggestions: First, initial motor learning and transfer are unique processes, engaging different parts of the brain. Second, transfer of learning appear to be neurally and behaviourally similar to the late phase of motor learning; transfer seem to involve a retrieval of previously formed motor memory, allowing the learner to move more quickly through the earliest stages of learning. Third, while the sensorimotor plasticity for initial learning may be impaired by the aging process, the plasticity that underlies transfer of learning seems to be more adaptable throughout life. The two latter points would support the potential advantages of early development of a wide basis of motor skills for subsequent sport-specific development (Abbott & Collins, 2004), as adults may benefit from a broader specter of skills from which related skills can more easily be acquisitioned. Finally, similarities and dissimilarities between two activities may represent both potentially positive and negative influences on skill transfer (Seidler, 2010). As such, to know more about the underlying mechanisms of motor skill learning and transfer may be useful to identify "the optimal training regime that might be most beneficial to a given individual" (Zatorre, 2013, p. 589) and consequently provide more nuanced recommendations for when children should be exposed to different activities.

From a broader perspective, the abovementioned findings and discussion relate to one of the most important areas of discussion in recent decades' expertise research: specialization versus diversification (see e.g., Baker et al., 2009; Wiersma, 2000). Following the DPF, early specialization is characterized by investing in one sport from a young age with the goal of developing expertise (Ericsson et al., 1993). More specifically, Baker et al. (2009) characterized specialization by four specific parameters: "early starting age in sport; early involvement in one sport (as opposed to participating in several sports); early involvement in

focused, high intensity training; and early involvement in competitive sport” (pp. 77-78). Diversification, or sampling, is characterized by engaging in multiple sports and/or playful activities (Côté et al., 2009). Early specialization has been related to several negative consequences such as injuries, compromised growth and maturation, overdependence on others, burnout, and drop-out (e.g., Baker et al., 2009; Malina, 2010; Wiersma, 2000). Diversification, on the other hand, has been assumed to represent a more appropriate motoric, cognitive, and motivational foundation for future sport engagement and development of skills (Côté et al., 2009; Côté, Lidor, & Hackfort, 2009). That being said, recent reviews in this area have stated that the literature available is inadequate to draw clear conclusions (Baker et al., 2009; Malina, 2010). Given the lack of conclusive evidence, however, Gould (2010) proposed that “until more evidence is accumulated, it is best for parents and coaches to take a more measured, conservative approach that encourages involvement in multiple sports and waits until the age of 14 or 15 to think about single sport specialization” (p. 36).

The challenge with such a dichotomous discussion of specialization or diversification, is that it fails to account for a range of related variables that would be relevant to consider when determining what activities are more appropriate than others (Baker et al., 2009; Ford et al., 2014). Such a view has become apparent also in football, where the early engagement hypothesis has emerged as a relevant alternative pathway that do not fall within neither definitions of specialization or diversification (Ford et al., 2009). Consequently, Baker et al. (2009) argued that rather than being treated as dichotomous opposites these terms should be considered as a continuum that takes into a wide range of variables, such as:

(...) the nature of tasks and skills that need to be acquired, the degree of variability and stability in performance of such tasks, and the specific competitive performance demands (i.e., physical and cognitive) of the activity under consideration. (p. 86)

Former head of the elite sport organization of Norway (Olympiatoppen), Jarle Aambø, suggested another solution. Rather than talking about specialization or diversification, one should start talking of “immersion” and “variation”:

(...) we should allow talented children that become immersed in one sport to be given the opportunity and support which will enable him/her to become a top athlete. This immersion shall then be paired with variation in coaching in this specific discipline, thus the eager and talented child should not have to be engaged in several sport disciplines. (Helle-Valle, 2008, p. 369)

Such a view would correspond well with Baker et al.'s (2009) suggestion of taking into account each sport's unique characteristics, and would be particularly relevant towards football. Football is characterized through an open, dynamic, complex, and unpredictable environment where performance is defined by players' capacity to adapt to it (Ali, 2011; Grehaigne et al., 1997). Inherent in the game of football is therefore the demands for, and possibilities for developing, a much wider motoric and cognitive basis than other and more closed skills sports. Subsequently, this could accommodate the proposed advantages of early development of a wide basis of motor skills that is acquisitioned through multiple sports engagement (Abbott & Collins, 2004). However, this presupposes that players (are allowed to) engage in activities that recreate these variable characteristics of the game, and it appears that within the football environment there has been a tradition of emphasizing the role of more isolated and closed drill exercises (Cushion & Jones, 2001; Williams & Hodges, 2005) that do not represent similar movement variability as game play activities (Gorman, 2010). In recent years, though, both informal (e.g., street football) and formal football-specific (small-sided games) game-play have been recommended as favorable for initial learning of football skills, where the latter to a larger degree has been implemented in coach-education programs and the agenda of national associations and clubs (FIFA, n.d.; UEFA, 2005).

It is important to note that variation among, and effects of, football activities should not be considered as an “either-or” dichotomy but as supplementary to each other, where coaches and players can adapt and combine a variety drills to enhance the desired effect of improving specific skill aspects (for an overview, see Williams & Hodges, 2005). As such, coaches need to ensure that players gain both enough immersion and variation by applying a variety of different drills. This presupposes that coaches have an overview of the effects of different drills and how they should be adapted to ensure optimal conditioning for each individual player throughout different phases of development. In this regard, as it seems that an early development of a wide motoric and cognitive basis may enhance future skill learning and transfer (Seidler, 2010), different conditioned game-play activities emerge as relevant football activities particularly during the earliest years of engagement (Renshaw, 2010).

#4: Early start and/or early extensive practice engagement may likely be a prerequisite for future higher levels of performance (Article 1, 2, 4).

In article 2, 90 % of the players reported to have started their engagement into football before the age of 6 years, similar to the players in article 4. However, in article 2 there were no differences between the groups of professionals and non-professionals in reported starting age, which indicates that starting early would not singularly represent an adequate explanation for differences in performance attainment. The literature review provided similar results. However, it was interesting to note that between the ages 6 to 10 years the relative differences in the amount of football practice between the professionals and non-professionals were notable higher than between the ages of 11 to 19 years (see Table 4, article 2), as the earliest age-range corresponds with a period that has been suggested to particularly favorable for acquiring new skills:

(...) acquiring fundamentally new skills that cannot be derived from skills already possessed is the most effective before adolescence [where] an early (before 12 years) start of learning some sports, music instruments, second language, etc. often leads to higher level of competence (Janacek, Fiser, & Nemeth, 2012, p. 9).

Such critical periods of development are often termed “windows of opportunity” or “sensitive periods of learning”, which refer to periods throughout growth, maturation, and development that are considered to be more sensitive or adaptable to exposure (e.g., Knudsen, 2004; Steele, Bailey, Zatorre, & Penhune, 2013). Although not being equally age-specific as the abovementioned quote, the adaptability to learning new skills is generally thought to be larger during childhood and with a gradual decline with age (Gruber, Jansen, Marienhagen, & Altenmueller, 2010; Seidler, 2010). In relation to the suggestion that football-specific skills are mainly developed through football-specific practice (Ford & Williams, 2008; Ward et al., 2007), one explanation for differences in present performance attainment may therefore be that the professional players have gained a motoric and cognitive advantage for future progression simply by practicing more football during a period where the body is particularly adaptable. However, it must be noted that although there exist some support within the area of expertise research for the existence of early sensitive periods in domains such as music, similar evidence for sport domains is still scarce (Anderson, Magill, & Thouvarecq, 2012; Gruber et al., 2010; Zatorre, 2013). Moreover, Ericsson (2000) has argued that the age-related declines in physical and cognitive adaptability may not be as evident as to make the prior conclusion. Although acknowledging that getting older involves natural physical limitations compared to younger ages, he implied that “performance in domains of expertise can be dramatically increased through training and practice during all developmental stages during the life span” (p. 370).

Recent directions within the research on acquisition of expertise have provided

evidence of how the adaptability to environmental influences would be related to the plasticity of internal structures of the body and brain (for a review, see Gruber et al., 2010). The term plasticity refers to the capacity of the central nervous system to adapt to functional demands, and in its broadest sense it includes the process of learning (Carr & Shepherd, 1998). Specifically, this plasticity relates to for instance anatomical and functional changes in the brain, nerve fiber growth, myelination of nerve fibers, or growth of structures supporting the nervous functions (Altenmüller, 2008; Fields, 2005; Gruber et al., 2010). Within this discussion, one relevant consideration would be whether a potential advantage of (early) exposure to practice could be related to genetic predispositions that may increase or accelerate the adaptability to practice (see e.g., Plomin, Shakeshaft, McMillan, & Trzaskowski, 2014; Simonton, 2007; Simonton, 2014). Zatorre (2013) stated that “the initial state of the nervous system when it is exposed to the learning situation is not identical for all individuals” (p. 585), and further elaborated:

It also remains unclear whether predispositions for learning pertain to ultimate attainment potential, or merely speed of learning; the experimental evidence [reviewed above] suggests that both situations arise, and it is therefore important to not lump them together. (p. 589)

A logical consequence of such an understanding would be to assume that the potential advantages emerging from practicing football, do presuppose that it is a proper football activity that has been adapted to the players' individual prerequisites for adaptation throughout different developmental phases. Specifically, one suggested general advice to coaches is that growth spurts lead to a decrease in the ability of learning new skills and that learning takes place more easily during more stable phases of development (Renshaw, 2010). To be able to make such adaptations it appears that we fall back on the recommendations from Micheli et al. (2000), that coaches need to be familiar with how each individual's psychosocial and physical attributes relate to different physical activities throughout different

developmental phases. In this regard, applied scientific research that enhances and deepens the understanding of such interactions would represent an important contribution towards making more nuanced recommendations for practitioners. As Ericsson (in Schraw, 2005) suggested:

All aspects of learning must have some correspondence to some changes at the level of physiology. It is, however, unlikely that we will be able to assess the specific changes in the trillions of synapses in the brain associated with cognitive behavior in the near future. There are, on the other hand, other physiological changes involving other physiological systems, such as muscles, capillaries and peripheral nerves, where the changes are directly observable. If we can understand the factors that influence and control these peripheral physiological changes we should be able to better understand the factors influencing learning that involve the brain and the central nervous system. (p. 403)

#5: Differences in performance attainment are most likely explained by the quality of engagement in football-specific activities (Article 1, 2, 4)

Given the lack of significant differences in practice engagement in article 2, a closer discussion of the quality of practice appears pertinent. As mentioned, the quality of practice is considered to be one key prerequisite for expertise development within the DPF (Ericsson et al., 1993). Within this section I will address the quality of practice in relation to three areas that have emerged from the data; motivation, activity characteristics, and self-regulation.

Motivation. In an earlier section, I discussed the role of motivation as underlying the quantity of practice. In this section, motivation is considered in relation to the quality of practice engagement. Ericsson (1996; 2006b) considered the underlying motivation as an important prerequisite for the emergence and use of learning mechanisms that are thought to influence the quality of practice (Fig. 2). Kaufman (2014) argued, in similar fashion as Ericsson (2004) and Ericsson et al. (2007b), in favor of addressing the underlying motivation for prolonged engagement in deliberate practice. More specifically, he suggested that when

people get inspired to realize some future image of themselves they get more dedicated, productive, and efficient:

It is the clarity of this vision, and the belief that the vision is attainable, that can propel a person from apathy to engagement, and sustain the energy to engage in deliberate practice over the long haul, despite obstacles and setbacks. (p. 2)

The increased dedication arising from valuing the importance of an upcoming task towards a future outcome that is perceived as attainable is recognized within motivational theories such as expectancy-value theory (Wigfield & Eccles, 2000) and self-efficacy theory (Bandura, 1977; Bandura, 1989), but has also been thought to represent an important fundament for increasing the quality of practice: Within the area of self-regulation of learning, it has been suggested that people who value the importance of an activity not only choose to do it more often but also are more likely to use self-regulated processes to learn it (Zimmermann, 2011). These views may represent a valid explanation for why the players in article 4 reported an increased dedication and deliberate focus toward practice at the time when becoming professional emerged as realistic. However, in his overview over how different motivational sources, beliefs, or predispositions may affect self-regulation of learning, Zimmermann (2011) also explained how both adaptive and maladaptive strategies towards practice can emerge and be adopted. For instance, it has been suggested that how athletes perceive the causes of success in an activity are related to achievement strategies they adopt during practice and hence may be associated with dispositional achievement goals (Nicholls, 1984; Wigfield & Eccles, 2000). More specifically, a learning orientation (also called task or mastery) is predicted to be advantageous towards applying effective learning strategies such as mastery or problem solving (Roberts, 2012; Wigfield & Eccles, 2000; Zimmermann, 2011).

Although it would be beyond the scope of this thesis to go into depth of how different

motivational sources may function as prerequisites for increasing the quality of practice engagement, it seems that such variations are important to take into consideration when trying to explain why some people appear to gain more from practice than others (Kaufman, 2014; Zimmermann, 2011). This becomes particularly interesting following Kaufman's (2014) proposal that motivation in itself may increase productivity and efficiency of engagement, raising "the intriguing idea that motivational characteristics may cause an increase in cognitive efficiency, which would ultimately increase the rate of expertise acquisition" (p. 2). In support of such a view, it has been shown that tasks with high behavioural relevance for the individual that cause strong emotional and motivational activation, increase brain plasticity (Altenmüller, 2008; Gruber et al., 2010). From this, an interesting question arises: could it be that some players could gain more from practice simply by wanting it more? It has been suggested that players from less privileged background may have a stronger need and desire to achieve success than other players (Elliott & Weedon, 2011), and the following quotes were used by coaches at English Premier League academy to explain the differences between English and foreign players:

The attitude of the young English player; they don't need it. A lot of them want to be players, but they don't need to be players – want and need – and these young kids coming over, they need to be players (...) The types of [foreign] boys that we bring here have a stronger and harder work ethic, they come from 'less privileged' backgrounds than some of the boys that we have from more middle-class backgrounds. So in terms of the work ethic side, they certainly bring a lot to the table. (Elliott & Weedon, 2011, pp. 69-70)

Similarly, such work ethic has been highlighted as an important characteristic of players who progress to senior professional football, specifically manifesting into a commitment to learning and improvement (Cook et al., 2014). Being far from conclusive, though, it may therefore be that people could increase the effect of practice from experiencing a stronger emotional and motivational connection towards their engagement, both through the

implementation of self-regulation processes but also by increasing the adaptability/receptivity of the brain. Nevertheless, it appears that further investigations are necessary to determine whether or how motivational characteristics may actually increase cognitive efficiency (Kaufman, 2014).

Activity characteristics. One of the key disadvantages of merely measuring number hours within each activity category is the lack of overview over the microstructure of practice. However, this should not hinder the attempt to understand how different activities may contribute to developing football skills. In light of the findings in article 2 and 4, two types of activities appear pertinent to address: play and mass-repetition of technical skills. To address the latter first, the players in article 4 considered practicing repetitive technical skills as beneficial for developing their present skill proficiency and for stabilizing, and building confidence towards, performance as professionals. These findings appear to correspond well with Williams and Hodges' (2005) suggestion that such activities may be advantageous for both initial learning of skills and performance, although they appear to be more beneficial towards performance than learning (Hodges, Lohse, Wilson, Lim, & Mulligan, 2014) . Interestingly, such activities have rarely been highlighted to be of importance in prior practice history research (Ford et al., 2009; Ford & Williams, 2012; Ford et al., 2012), and have also been considered to be limited in developing functional skills that are adaptable to more complex game situations:

While closed drills may provide a simplified environment that allows players to execute skills with increased precision and reduced error, open drills provide players with an opportunity to better calibrate the execution of the skill with relevant and reliable perceptual variables, such as the location of defenders relative to teammates. (Gorman, 2010, p. 147)

In this regard, it was interesting that the players in article 4 seem to indicate that such practice was considered particularly favorable for situations that share more frequent similarities than

regular open-play situations, such as crosses into the box or set-pieces. Such situations would represent a more limited contextual variability than open play situations, which in turn appears to make more repetitive drills more relevant. Nevertheless, it seems that to increase contextual variability in mass-repetition of technical skills could increase the adaptability of the learned skill in that particular context. However, it has been argued that to ensure optimal learning one needs to construct a *functional* task difficulty, that is, not just an increase of contextual variability but an adaptation of these conditions to the level of each individual (Guadagnoli & Lee, 2004). Moreover, questions still remains whether the skill needs to be practiced directly within this context or if this context can be applied before or after repetitive skill practice and still ensure adaptability to the specific context (Hodges et al., 2014).

In article 2, the professionals reported to have spent significantly more time in football-specific play activities than their non-professional counterparts in their earliest years of engagement. Such activities were also highlighted by the players in article 4 as prominent from their initial engagement into football. Football-specific play, or informal game-play, usually manifest as a game activities that are organized among peers (i.e., street football). Such activities have been highlighted as favorable for football-specific skill development, particularly perceptual and tactical skills, due to their variable and random conditions and frequent situational repetitions (Ward et al., 2007; Williams, Ward, Bell-Walker, & Ford, 2012; Williams & Hodges, 2005). As such, the differences in present performance attainment among the players in article 2 may arise from variations in the amount of time spent in such activities during childhood, which would be in line with findings in prior practice history research (Ford et al., 2009; Ford & Williams, 2012). Such a conclusion could also be viewed as supporting the indication that players' potential advantages arising from this period are more implicit than explicit in nature (see next section). Ericsson et al. (1993) characterized play activities with a "state of diffused attention [that] is almost antithetical to focused

attention required by deliberate practice” (p. 368). The players in article 4 reported in support of such a view. They reported that their motivation for engaging in play activities emerged mainly from their social and inherently enjoyable characteristics, and were therefore not explicitly focused on progression. Interestingly, these players also reported that when they committed to a goal of becoming a professional, they also reduced their engagement into such activities. In combination with that we in article 2 only identified differences between the two groups of players in the amount of time spent in play activities in the earliest years of engagement, these results could actually indicate that such activities (are considered to) represent an important contribution for skill development during the earliest years of engagement but less of importance at later ages.

It has been shown that children in countries with highly developed youth developmental systems to a larger degree engage into more formalized forms of activities (e.g., coach-led sessions) from earlier ages than children with less formal (Ford et al., 2012; Koslowsky & Da Conceicao Botelho, 2010). In other words, as the developmental systems become more organized, children engage earlier in club organized activities at the expense of those activities that earlier were organized on their own and that appear very relevant for developing football skills. Many clubs have therefore implemented small-sided games (SSG) in their schedules, which emerged from, and share a lot of the same characteristics with, peer-organized play (Clemente et al., 2014). SSG are perceived to represent a time-effective arena for simultaneously practicing technical, tactical, perceptual, and physical skill aspects in game-like situations (for reviews, see Aguiar et al., 2012; Clemente et al., 2014). However, while play activities are organized and regulated by the players themselves, one of the key perceived advantages of SSG is that coaches easily can adapt and manipulate constraints (e.g., pitch size, number of players, or rules) to increase the effect on specific skill aspects (Clemente, Couceiro, Martins, & Mendes, 2012; Davids, Araújo, Correia, & Vilar, 2013).

Such imposed conditions are thought to be important to ensure that the complexity of game situations is optimally adapted to the players (Gorman, 2010), and consequently help players pick up and adapt to functionally relevant information:

The structure and organization of SSCG¹¹ need to be designed specifically for individual learners to practice exploring different performance solutions as performance environment contexts change, rather than practicing the same actions repetitively (...) Manipulation of task constraints during SSCG is extremely important to prevent randomness in the actions of learners: their exploratory activities need to be bounded to encourage them to explore the balance between stable and variable movement patterns in achieving specific task goals (Davids et al., 2013, pp. 159-160).

However, it appears important that the coaches let players sustain a high degree of autonomy or self-control over the activity, as this autonomy is perceived to increase learning efficiency and motivation for participation (Sanli, Patterson, Bray, & Lee, 2012; Wulf et al., 2010). Specifically, it has been argued that it is necessary to reduce the amount of formal instruction and rather adopt a more ‘hands-off’ approach that allow players to take more responsibility for their own development, increase problem solving and creativity, implicitly adapt functional movements and co-ordination solutions, and subsequently develop to be better learners (Renshaw, 2010; Williams & Hodges, 2005). In combination, these arguments indicate that to increase the effectiveness of SSG and the motivation for further participation, players should be given a high degree of freedom to control and regulate such activities on their own (see also UEFA, 2005).

It is important to note that much of this argumentation has emerged from within the ecological dynamics approach that stands in opposition to the role of cognitive processes that are emphasized by the DPF (Seifert et al., 2013). However, it may still be important to

¹¹ Small-Sided Conditioned Games.

acknowledge the potential gains arising from focusing more on the functional adaptation of skills to a (to some degree) manipulated environment in the initial learning of football skills.

Self-regulation. In article 2, activities with a deliberate intention of improving skills were, overall, rated higher for their contribution towards improving football-specific skills than just playing for fun. Although the differences were small, the professional players' ratings of the activities' contribution were higher than the non-professionals which could indicate that the professionals have gained more from participating in such activities. Within the DPF, such a deliberate intention to improve is considered as an important characteristic of increasing the quality of practice (Ericsson et al., 1993). More specifically, deliberate practice aims to increase the effectiveness of learning, a process that includes mechanisms like planning, self-monitoring, and evaluation of engagement (Ericsson, 2006b; Ericsson et al., 1993). Such processes are considered to be characteristics of self-regulation, which refers to the processes whereby individuals “personally activate and sustain cognitions, affects, and behaviors that are systematically oriented toward the attainment of personal goals” (Zimmermann & Schunk, 2011, p. 1). In other words, they are proactive participants in their own learning process. Specifically for football, the use of self-regulation strategies has been found to be positively associated with performance attainment (e.g., Toering, Elferink-Gemser, Jordet, & Visscher, 2009). As we did not include measurements of self-regulation in article 2, we cannot be sure whether these processes contributed to differences in performance attainment. However, article 4 provides interesting insight in how such strategies may have contributed to progressing to professional football.

First, these strategies reportedly emerge at different stages in relation to maturation and experience but also the decision to invest into becoming a professional player. The latter is interesting: as many of the players already at that point were at quite a high performance level (e.g., national youth teams), this indicate that such strategies may have represented a

lesser contribution for skill development during early compared to later years of engagement. One must keep in mind, though, the potential memory error and inference related to remembering whether or how such strategies were applied several years ago. Still, it could be that other factors have been more important during these players' earliest years of engagement. To keep the focus on self-regulation, it could be that their regulation of behaviours has been more subconscious of nature as many of such processes appear to originate and are regulated outside conscious awareness (Aarts & Custers, 2012; Papies & Aarts, 2011; Wolters, Benzion, & Arroyo-Giner, 2011). Such an argument share similarities with the belief that "motor learning is largely implicit" (Seidler, 2010, p. 2). Implicit processes work independent of the working memory, in which implicit motor learning techniques are thought to engender resistance to disruption from additional cognitive loads, moderate psychological pressure, and physiological exertion (Masters, Poolton, Maxwell, & Raab, 2008). As such, it may be that the players' potential advantages during early years of engagement do not reflect a superior explicit approach to learning, but rather a more implicit effect emerging from a participation in relevant activities and its guidance by a deliberate intention of improving skills (e.g., Wolters et al., 2011).

Second, it appears that coaches, but also parents and peers, played an important role in developing and using such strategies at later stages of the players' development. Some of the players also underlined that they perceived that their usage of such strategies to have been a key contributor for progressing to professional football. In general, the interaction with coaches corresponds well with the highlighted importance of supervised training for reaching higher levels of performance within the DPF (Ericsson et al., 1993). One of the advantages of such interaction has been suggested to be related to learning athletes to coach themselves (Ericsson, Prietula, & Cokely, 2008). The latter is considered to be an important characteristic of players who eventually progress to the highest levels of football, by teaching them to take

“some control over their own development in order to foster their independence and resourcefulness” (Cook et al., 2014, p. 341). Accordingly, our players reported that such personal responsibility was considered important both during development but also in their daily work as professionals. One interesting nuance to such “self-coaching” is that the players also reported to have adapted specific drills or exercises from friends or other arenas, such as team sessions. This finding appears to support the suggestion we made in article 2 that some players may use team sessions as motivation and guidance towards self- or peer organized football activities. This appeared as a valid explanation for why the amount of time spent in team sessions and play activity at younger ages, both previously and in article 2, seems to coincide with higher levels of attainment (Ford & Williams, 2012; Ward et al., 2004).

6: There are many different pathways for progressing to elite level football (Article 1-4).

Across the four articles included in this thesis it becomes apparent that there exist a potential for various pathways that may lead to elite football. Already by merely assessing the overall amount of hours in article 2 and 3 the results show that there is a large variation among players, even within such an elite group. In article 2, in particular, this became visible through the statistical analyses: when we allowed players to randomly deviate within each group (random slopes model), the differences that were identified through the fixed slopes model disappear. Additionally, the literature review and article 4 provide a broader and deeper overview of how and when different variables may emerge and interact, and even represent different effects under different conditions at different times. It is not the intention to recapture all of these variables, as these has already been thoroughly discussed. However, as the individual variation is of crucial significance, failing to address these variations would lead to an uncertainty whether the relationship between practice and performance applies to every individual (Tucker & Collins, 2012). In relation, Ackerman (2014) stated that “the science of expert/elite performers must be a science of individual differences” (p. 10).

Similarly, it has been argued that it is important to acknowledge that there are multiple pathways to excellence within each sport, which in turn would represent important pragmatic consequences for the identification, selection, and development of young athletes (see e.g., (Abbott, Button, Pepping, & Collins, 2005; Gulbin, Weissensteiner, Oldenziel, & Gagné, 2013; Tucker & Collins, 2012). This does not necessarily mean that it is not possible to identify and structure superior developmental patterns that appear to relate to different levels of performance, and further to create theoretical models (e.g., DMSP, Côté et al., 2007; DPF, Ericsson et al., 1993) and related recommendations for practitioners (e.g., Côté, Young, Duffy, & North, 2007). In article 4, for instance, we identified several similar patterns among the players in relation to motivation and activity engagement. However, there were also interesting individual variations across players but also throughout development. As such, theoretical frameworks and practical recommendations need to be sensitive to how and why different patterns of development emerge (Baker et al., 2009; Ford et al., 2014). Subsequently, one important aim should be to gain deeper understanding of the effect of underlying variables throughout the development of athletes who reaches various levels of performance.

6.0 Practical implications

First, it seems apparent that one of the fundamental prerequisites for reaching elite youth and senior level football is accumulating vast experience in football-specific activities. This means that the underlying motivation for sustained commitment into football would represent a key constraint for accumulating adequate experience. It is believed that peer-organized football-specific play has traditionally represented an informal arena in which children themselves (are allowed to) generate and regulate their motivation for future participation (e.g., enjoyment and social interaction; Côté et al., 2007; Scanlan et al., 1993; UEFA, 2005). Following the increasing trend of players entering club organized practice at earlier ages at the expense of such activities, FIFA (n.d.) and UEFA (2005) have encouraged

grass-root coaches to implement small-sided games with characteristics that replicate these conditions. Still, it seems apparent that club organized sessions alone would not be sufficient to accumulate the necessary hours of practice to reach elite level football. Consequently, club organized sessions should not only function as a motivator for future participation but also motivate and guide engagement in additional self- or peer-organized practice. To be able to do so, coaches need to be flexible and responsive to that the players' reasons for participating and the adaptability and needs underlying further progression appear to vary across individuals but also throughout life (Ackerman, 2014; Côté et al., 2007; Gruber et al., 2010). In relation to the overall amount of hours and the multiple arenas that youth players appear to engage in, one specific recommendation would be that it is not the aim in itself to (motivate to) engage in as much practice as possible but to guide optimal progression through controlling the combined load that these arenas represent for players (Brink et al., 2010).

Second, it seems clear that it is not necessarily vast football-practice experience that would explain differences in performance attainment, but rather the quality of engagement. One challenge is that the prerequisites for quality of practice seem to be dependent on a combination of factors, and vary both between and within individuals throughout different developmental phases (Ackerman, 2014). Similarly, it would be difficult to determine how exactly to measure quality: firstly, several important effects would be internal adaptations that are difficult to assess. These adaptations happen at different time-rates, which provide challenges for when to assess potential effects (Gruber et al., 2010). Secondly, development is not linear but rather a process that would individually vary in intensity and direction, which in turn would make it difficult to find a common norm for how to determine progression within a team of individuals (Phillips et al., 2010). Finally, it would be relevant to discuss whether development should be determined through performance or practice. On one hand it does not seem relevant to develop skills that are not applicable in games, while on the other hand it is

the dilemma to what extent individual development should be considered relative to an (uncontrollable) opposition. Martinkova and Parry (2011) argued that these two should not be considered independently, but that both should be taken into consideration when determining development. Still, there exist several applicable recommendations in general sport practice theory and research for instance in areas of motor learning (e.g., Magill & Anderson, 2014; Schmidt & Lee, 2005), practice instruction (e.g., Hodges & Williams, 2012; Renshaw, Davids, & Savelsbergh, 2010), or self-regulation (e.g., Kitsantas & Kavussanu, 2011), but also specifically towards football (e.g., self-regulation of learning, Toering et al., 2009; practice instruction, Cushion & Jones, 2001, Williams & Hodges, 2005). One potentially important arena to make such relevant recommendations available for coaches would be through each nation's formal coach educations.

Third, given the various football-specific activities that the elite players in these studies report to have engaged in throughout childhood and adolescence, it seems apparent that the activities should be considered as supplementary to each other as they all represent advantages and disadvantages towards developing functional football skills (Ward et al., 2007; Williams & Hodges, 2005). One interesting finding compared to prior practice history research, for instance, is that the senior professional players underlined the perceived importance of mass-repetition of technical skills both during development and underlying consistent performances as professionals. Such drills may accommodate for the lack of adequate repetitions in more complex drills, while the latter would be important for creating an understanding of how these acquisitioned skills should be adapted and transferred to more complex situations. Additionally, there are indications of that the (perceived) effect and appropriateness of different activities could vary across developmental periods. During growth spurts, for instance, there appears to be an increased risk of injuries along with a decreased effect of learning (Caine et al., 2008; Renshaw, 2010). This could for instance

mean that SSG that are considered to be a particular relevant activity for developing skills in the earliest years of development may not be equally appropriate during these periods, as the confrontation with oppositional players will represent a higher injury risk than drills without the potential for such direct contact (Hill-Haas, Dawson, Impellizzeri, & Coutts, 2011). Coaches should at least be familiar with how different imposed conditions may be applied to reduce the load (intensity) of such activities (e.g., rules, pitch dimension, number of players, coach encouragement; see Aguiar et al., 2012; Hill-Haas et al., 2011; Rampinini et al., 2007). Combined, this discussion indicate that rather than assuming that activities have similar motivational or learning effects on all players, coaches should seek to continuously assess the players' prerequisites and needs which makes it is easier to identify the appropriate activity for improving the desired aspects.

Fourth, based on the low amount of time spent in non-football activities among the youth players it is difficult to determine that such activities have had a decisive impact on the development of football-specific skills. However, there are some indications that such arenas have nurtured motivation for sustained football participation, especially during late childhood, in addition to a possible positive effect on football-specific skill development. The latter appears to be related to whether the sports share similar characteristics with football. Interestingly, as the majority of the players reported that their non-football engagement emerged from a desire to try something new or fun or from social reasons, it appears that this was something they wanted for themselves. As such, to have parents or coaches that facilitate such engagement may be profitable towards future football engagement.

Finally, it seems clear that it is important to acknowledge that the factors that have been assessed in the present thesis can combine into a variety of individual pathways to elite level football. At the same time, the demands for reaching and performing at top level have increased significantly over time and appear to continuously develop (for an overview, see

Wallace & Norton, 2014). As such, the combination of an assessment of players' present prerequisites, the demands for the desired future level of performance, and consequently the distance between the two, will be essential to provide appropriate guidance and direction of progression. However, not all clubs would have sufficient resources to optimize such control, but a natural consequence would be to ensure that coaches have the proper competence and know how to "align their own competencies such that they are congruent with the needs of their athletes and the context in which they work" (Côté et al., 2007, p. 6).

7.0 Concluding remarks

The overall purpose of this thesis was to identify characteristics which may explain why some players manage to progress to professional football while others do not. The main research question for the thesis was: How and why does engagement in different sport activities contribute throughout the development of Norwegian male elite football players?

The overall findings of this thesis indicate that those players who progress to a professional status have spent large amounts of time playing and practicing football from early ages and throughout their development, which consequently appear to represent an important prerequisite for obtaining a professional contract. In comparison, non-football activities seem to represent only a minor part of the players' overall amount of practice engagement. The findings, however, show that progressing to a professional status cannot singularly be explained through the extensive engagement in football activities: the timing and combination of different football activities, the quality of engagement, and the underlying motivation of such engagement appear to be necessary to take into account. Moreover, it appears that participating in non-football activities is perceived to have relevance for developing football-specific skills, especially those activities which characteristics share similarities with football. Additionally, the non-football activities may have positively affected the sustained commitment to prolonged engagement into football. In combination,

the results indicate that it is important to acknowledge that the abovementioned factors can interact and combine into a variety of individual developmental trajectories towards elite level football.

It is important to underline that many players would probably neither have the desire nor the prerequisites or abilities to reach the levels of performance that are assessed in the present thesis. This means that possible generalizable recommendations to younger or lower-level players should be treated with caution, especially as representatives for such groups have not been included for comparison. That being said, the possible practical implications appear to be relevant for coaches working with players at a variety of levels, and could potentially be a common platform for developing both future elite players and the large remainder.

7.1 Future research

Inter-disciplinary and prospective and longitudinal designs could be a natural progression of the necessity of analyzing individual developmental patterns of athletes achieving various levels of performance. The latter would allow for a closer and frequent dialogue between researcher and participant that subsequently could lead to deeper understanding of how different variables may interact in the developmental process of players reaching various levels of performance. In this, field based designs that represent higher ecological validity and contextual sensitivity towards determining the effect of various types of activities, would possibly be more likely to capture the functional interaction between various aspects of development and performance and environmental conditions. Similarly, to combine designs that take into account neurological or physiological adaptations to the exposure to different environmental conditions would be desirable, and may lead to a better understanding of individual prerequisites for and adaptations to practice.

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Articles

Article 1

Haugaasen, M. & Jordet, G. (2012). Developing football expertise: a football-specific research review. *International Review of Sport and Exercise Psychology*, 5, 177-201

Article 2

Haugaasen, M., Toering, T., & Jordet, G. (2014). From childhood to senior professional football: A multi-level approach to elite youth football players' engagement in football-specific activities. *Psychology of Sport and Exercise*, 15, 336-344

Article 3

Haugaasen, M., Toering, T., & Jordet, G. (2014). From childhood to senior professional football: elite youth players' engagement in non-football activities. *Journal of Sports Sciences*, 32, 1940-1949

Article 4

Haugaasen, M., Toering, T., & Meling, M. (for submission). A qualitative investigation of the development of deliberate practice throughout the careers of senior professional football players.

Article 1

Developing football expertise: a football-specific research review

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About 265 million people regularly play football, of which only 0.04% play in a professional league. This suggests that reaching expertise specifically in football is difficult and highly competitive. In recent decades, research on the development of football expertise has increased substantially. However, most of these studies have focused on isolated aspects of the developmental process, and consequently there has been a lack of overview of how these different aspects interact to produce football experts. The aim of this study is to review available research on the development of expertise specific for football. The review is limited to papers found in the electronic SportDiscus database. The 2007 Developmental Model of Sport Participation (DMSP) has been used as the conceptual framework. The results highlight the importance of football-specific practice in early developmental phases in becoming an expert in football. It is also proposed that football-specific nuances may need to be applied to the DMSP in order to make the debate of early specialization *versus* diversification sufficiently valid for this particular context. Consequences for practice engagement and future research are discussed.

Keywords: football; soccer; expertise; youth; development; deliberate practice; deliberate play; specialization; diversification

Introduction

Football (association football or 'soccer') is one of the most popular sports in the world, engaging people worldwide as players, spectators and TV viewers. The world of football is following the increasing trends of global access to culture, economy, knowledge, labor and faster transport, which means that football as labor, entertainment and leisure activity is more accessible across borders than ever before (see Maguire & Pearton, 2000, for an overview). Large football events have in recent years drawn more TV viewers than most other sporting events. The World Cup tournament of 2006 had 27 billion accumulated viewers and the final alone attracted an audience of more than 700 million (Fédération Internationale de Football Association; FIFA, 2007b). This globalized access to football has allowed the clubs to extend their international market segments, both in terms of value and labor access. As a consequence, the economic resources available have increased significantly in recent decades, and have led to a highly polarized market. In European football, the total market value reported in 2009 had grown to about €16 billion, with the top five leagues accounting for 51% of the total revenues. Specifically, 25% of the total revenues are now in the hands of only 20 clubs

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(Deloitte, 2010). This economic advantage of top European clubs has in recent years led to an increase in player migration to Europe from regions like Africa and South America (Darby, Akindes, & Kirwin, 2007; Maguire & Pearton, 2000). It seems like we have just seen the beginning of such a trend, especially considering that regions like Africa, South America and Asia are gradually systematizing their developmental systems for young players: 'This migration is arguably not only reshaping European club soccer, but is claimed to be having a significant impact on indigenous player development, recruitment and retention' (Maguire & Pearton, 2000, p. 759). A natural consequence of the increasing number of available players would be that the demands for reaching top professional levels also increase. The last report from FIFA in 2007 shows that as many as 265 million people worldwide regularly play football, an increase of about 20 million from the previous report in 2001 (FIFA, 2001, 2007a). This means that approximately 4.1% of the world's total population regularly plays football. It seems that football is especially popular among the male population, which represents approximately 90% of all worldwide participants. The total number of registered football players (registered with a club or team) was reported to be 38 million in 2007 and increased by nearly a quarter (23%) since 2000. Approximately 34 million of these registered players are male (FIFA, 2007a). Since 2000, however, the number of male players at the highest level (i.e., at the professional level) has been quite stable at about 110,000, meaning that only about 0.3% of all registered male players actually reach professional status (FIFA, 2001, 2007a). Additionally, the demands for reaching and performing at top professional levels in men's football keep getting higher in terms of speed, physical demands, technical precision and tactical adaptation (English Football Association; FA, 2010; Huijgen, Elferink-Gemser, Post, & Visscher, 2009; Paulis, Perea, & Blanco-Villaseñor, 2009; Reilly & Gilbourne, 2003; Stolen, Chamari, Castagna, & Wisloff, 2005). This means that football should now be considered one of the most competitive sports, and given its increasing popularity among the male population in particular, there are indications that it will become even harder for young boys to reach top professional levels in the coming years.

One of the reasons football is so popular is that players may not need extraordinary capacities within all of the various technical, psychological and physical demands (Stolen et al., 2005). A player can compensate for deficiencies in one area by strength in others, from which expertise can be achieved through a unique combination of skills (Meylan, Cronin, Oliver, & Hughes, 2010). The developmental process from youth player to expert in football is therefore complex, and dependent on various interacting personal and circumstantial factors (Neto, Barbieri, Barbieri, & Gobbi, 2009; Reilly, Bangsbo & Franks, 2000). This is underlined by the wide range of studies that have made important contributions to the understanding of development of football players in areas such as perceptual (Vaeyens, Lenoir, Williams, Mazyn, & Philippaerts, 2007; Williams & Davids, 1998; for review see Casanova, Oliveira, Williams & Garganta, 2009), tactical (Kannekens, Elferink-Gemser, & Visscher, 2009; Memmert, 2010) and technical skills (Ali, 2011; Lees & Nolan, 1998), and physiological (Reilly, Williams et al., 2000; Stolen et al., 2005) and psychological characteristics (Van Yperen, 2009; Van-Yperen & Duda, 1999). However, research on expertise development in football, as in sport in general, is still in its early infancy, and there is much more to learn about the interaction between these factors (Abernethy, 2008). One attempt to account for this interaction

has been the Developmental Model of Sport Participation (DMSP) (Côté, 1999; Côté, Baker, & Abernethy, 2007; Côté, Horton, MacDonald, & Wilkes, 2009). The DMSP is based on research from various sports, and has yet to be validated specifically in football. The aim of the current review is therefore to provide a systematic overview of research specifically related to the development of male youth players towards expertise in football. As explained more thoroughly in the Method section, the DMSP has been used as a framework for reviewing available literature and the review will be structured in accordance with this model.

The DMSP seeks to explain the developmental pathways from the age at which athletes first engage in sport, to either recreational participation or elite performance as an adult (Figure 1) (Côté, 1999; Côté et al., 2007; Côté, Horton, et al., 2009). According to the model, it is possible to reach elite or expert performance through two different pathways: (i) by specializing early in one sport; or (ii) through early sampling/diversification and later specialization.

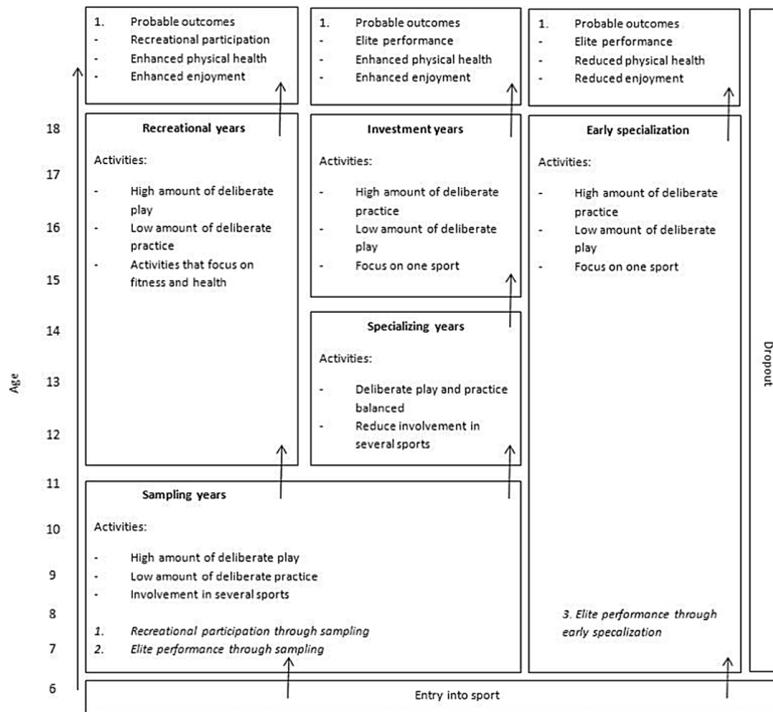


Figure 1. The Developmental Model of Sport Participation.
 Note: Adapted from Côté, J., Baker, J., & Abernethy, B. (2007). 'Practice and play in the development of sport expertise'. In G. Tenenbaum & R.C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed., pp. 184–204, at p. 197). Hoboken: John Wiley & Sons. Copyright 2007 by John Wiley & Sons, Inc. Reproduced with permission of John Wiley & Sons, Inc.

In 1993, Ericsson, Krampe and Tesch-Roemer presented the *theory of deliberate practice*. According to this theory, it is not necessarily the amount of practice that differentiates whether or not some athletes reach expert performance, but more precisely the amount of *deliberate practice*. Deliberate practice is characterized by being 'specially designed to improve current level of performance' (Ericsson et al., 1993, p. 368), consisting of hard work and little to no immediate reward. Although this theory originated from a study of musicians, it has later been transferred to and supported by studies within different sport domains (see, e.g., Baker, Côté, & Abernethy, 2003). The theory stresses the importance of domain-specific practice, which means a focus on one sport from an early age. This early specialization approach suggests that athletes who engage in domain-specific deliberate practice from an early age will have an advantage in developing skills and eventually reaching elite levels within their respective domains.

Somewhat contrary to this early specialization approach is the suggested pathway of early sampling and diversification followed by later specialization. At first the athlete engages in multiple sports, high amounts of play activity and little to no deliberate and structured practice (sampling years). Gradually, the athlete increases the amount of deliberate practice at the expense of play activity and focuses more and more on one sport (specializing years). Finally, the focus is solely to deliberately develop skills within one particular domain, and the amount of play activity is relatively low compared to earlier years (investment years).

The early diversification approach contains two important features which are not necessarily compatible with the theory of deliberate practice or with the early specialization view. The first feature is the possibility of transferring the use of skills from one domain to another. Variation in activities and within activities is assumed to give a basic motor or cognitive foundation that later makes it easier to learn sport-specific skills (Côté et al., 2007). Exposure to practice in other sport domains is suggested to circumvent the need for sport-specific practice to become an expert within a particular domain. Secondly, the importance of play activities is highlighted. According to Ericsson and colleagues (1993), play activities are characterized by an enjoyable state of 'diffused attention which is almost antithetical to focused attention required by deliberate practice to maximize feedback and information about corrective action' (p. 368). The term 'deliberate play' was introduced by Côté (1999) to capture the kind of activity that differs from the early physical play activities of infancy or early childhood, such as running, climbing and jumping. In contrast to Ericsson and colleagues' (1993) view, play activities are highlighted as important for motoric and cognitive development in the early stages of an athlete's career. However, while the play activity is such a key aspect of this pathway, the model does not specify whether this activity is carried out solely in the athlete's primary sport.

Method

This review is based on an abstract search of peer-reviewed articles within the electronic SportDiscus database. The search was limited to English text only. The following search terms were used in combination with 'football' or 'soccer': deliberate practice, deliberate play, practice, practice history, expertise, elite, high-level, expertise development, elite development, competitive level, performance level, peak performance, skill transfer, transfer, diversity, diversification, specialization,

relative age effect, youth, talent identification, talent development, specific practice, technical, technique, technical skill, tactical, physical, mental, and learning. To be included, the articles had to concern the development of male youth football players, which provided a total of 115 articles for further analysis. The results are structured and presented according to the framework of the DMSP. Four key areas are highlighted: (i) career length and peak performance age; (ii) the amount and content of football-specific practice; (iii) non-specific practice, with special focus on the relationship between diversification, specialization and skill transfer; and (iv) results related to drop-out from football.

Results

Career length and peak performance age

Sport entry

According to the DMSP, entry into participation in sport is approximately at the age of 6 years (Côté et al., 2009). In football, however, the studies conducted on the practice history of players indicate that the age of entry for both elite and sub-elite players can vary from 5 to 12 years (Ford, Ward, Hodges, & Williams, 2009; Helsen, Starkes, & Hodges, 1998; Ward, Hodges, Starkes, & Williams, 2007) (see Table 1 for a complete overview). In a retrospective questionnaire study of Portuguese national team players, as much as 90.5% of the players had started participating in football by the age of 10 years (Leite, Baker, & Sampaio, 2009). The same study reported start ages as high as 14 years. The results from this study, though, are based on categorical responses within the range of 6–10 years and 11–14 years, so one cannot make precise conclusions. Other studies that have focused on other aspects than practice histories have reported similar start ages to the above, with most players starting to participate before the age of 10 years (Christensen & Sørensen, 2009; Gissis et al., 2006; Huijgen et al., 2009; Malina, Ribeiro, Aroso, & Cumming, 2007; Toering, Elferink-Gemser, Jordet, & Visscher, 2009; Vaeyens, Lenoir, Williams, Mazyn, & Philippaerts, 2007; Vaeyens, Lenoir, Williams, & Philippaerts, 2007; Williams & Davids, 1995).

There is some evidence that elite youth players engage in football activities slightly earlier than sub-elite players (Gissis et al., 2006; Malina et al., 2007; Vaeyens, Lenoir, Williams, Mazyn, & Philippaerts, 2007; Vaeyens, Lenoir, Williams, & Philippaerts, 2007; Ward et al., 2007). However, of these studies, only one specifically focused on practice history as its major research area. Through practice history questionnaires, this study reported significant effects for the age of entry in team practice only, with the elite players starting earlier than the non-elites, but with no differences for individual or play practice (Ward et al., 2007). Three other studies have shown no differences in starting age between elite and sub-elite players (Helsen, Starkes, & Hodges, 1998; Huijgen et al., 2009) or between elite and ex-elite players (Ford et al., 2009). These studies have tried to deal with one of the key disadvantages of retrospective research on elite youth players, which is that these players may never actually turn professional. Ford and colleagues (2009) followed up the elite players from the population examined by Ward and colleagues (2007) four years after the first data collection. This quasi-longitudinal approach represents probably the most reliable design employed to study elite youth players' practice history up to now. The

Table 1. Studies that include practice history, mean (SD) age of entry (years), and years of experience of football players.

Authors	Design	Measurement	Level ^a	Age	Number of players	Age of start of football practice	Experience (years)	Background of football-specific practice (hrs)
Practice history								
Helsen, Starkes & Hodges (1998)	Quantitative	Retrospective questionnaire	Belgian Soccer league	25.6	17	5.5 years (0.3), (both groups)	20 years	4587 hrs (after 10 years)
Ward, Hodges, Starkes, & Williams (2007)	Quantitative	Retrospective questionnaire	Provincial league Elite (academy) Sub-elite (amateur school/club)	25.4 U-9-U-18	35 203 (in total)	IP ^b :6.28, TP ^c :6.50 IP ^b :7.1, TP ^c :7.7	18 years /	3306 hrs (after 10 years) 6513 hrs (U-18) 4990 hrs (U-18)
Ford & Williams (2008)	Quantitative	Retrospective questionnaire	Professional (with exp. from Gaelic football) Professional (without exp. from Gaelic football)	24.15 22.09	0 10	6.60 (2.12) 6.20 (1.48)	/	/
Ford, Ward, Hodges, & Williams (2009)	Quantitative	Retrospective questionnaire	Elite (academy) Ex-elite (academy) Recreational	16-18	11 11 11	5.3 (2.1) 5.5 (1.8)	/	1484 ^d hrs 1813 ^d hrs 609 ^e hrs
Lete et al. (2009)	Quantitative	Retrospective questionnaire	Portuguese national team	Senior	42	93%: 6-10 years 7%: 11-14 years	/	/
Skill and anthropometric measures								
Williams & Davids (1995)	Laboratory testing	Film sequence visual response test	Semi-professional Amateur/recreational	23.2 (4.1) 26.5 (3.8)	12 12	6-10 (playing) 8-12 (playing)	14.7 (3.8) 15.7 (3.9)	650 comp. matches 620 comp. matches
Vaeys, Lenoir, Williams, Mazyn, & Philippaerts (2007); Vaeys, Lenoir, Williams, & Philippaerts (2007)	Laboratory testing	Film sequence visual response test and decision making	Elite Sub-elite Regional	14.7 (0.5) 14.6 (0.3) 14.6 (0.6)	21 21 23	6.2 (0.5) 6.4 (0.5) 7.3 (0.5)	8.5 (0.5) 8.2 (1.1) 7.3 (1.4)	427 matches 404 matches 298 matches
Philippaerts (2007)	Laboratory testing	10m sprint Vertical jump Isometric force	National youth team Sub-elite Recreational	16.3 (1.26) 16.4 (1.32) 16.2 (1.29)	18 18 18	10-11* 12-13* 12-13*	5 (0.7) 3.6 (0.7) 2.7 (0.7)	4.3 sess/week 3.2 sess/week 2.7 sess/week
Gissis et al. (2006)	Laboratory testing	Max cycling speed Anthropometry	Elite youth	11-12 13-14 15-16	135 in total	9-10* 9-11* 9-12*	2.6 (1.0) 3.1 (1.6) 4.7 (2.4)	/

Table 1 (Continued)

Authors	Design	Measurement	Level ^a	Age	Number of players	Age of start of football practice	Experience (years)	Background of football-specific practice (hrs)
Malina, Ribeiro, Aroso, & Cumming (2007)	Field testing	Growth, maturity status and functional capacity	Top level Portugal (U-16)		14	9-10*	5.1 (1.7)	/
			Highest skilled	14.5 (0.5)				
Huijgen, Elferink-Gemser, Post, & Visscher (2009)	Longitudinal - field testing	Football skill Shuttle dribble Anthropometry +	Elite - professionals		54	6.5-7 (for both groups)*	7.6 (1.6) ^b	Average 7.5 hrs/week
			Elite - amateurs	14-18				
Huijgen, Elferink-Gemser, Post & Visscher (2010)	Longitudinal - field testing	Shuttle dribble Sprint Anthropometry	Elite		267	5-7*	5.96 (1.20)	/
			Elite	12-19				
Christensen & Sørensen (2009)	Qualitative	Semi-structured interview, social dilemmas school vs. football	Elite		25	5-7	/	/
			Elite	15-19				
Toering, Elferink-Gemser, Jordet, & Visscher (2009)	Quantitative, cross-sectional	Questionnaire, self-regulation of learning	Elite		159	6*	8.4 (1.9)	/
			Sub-elite	11-17 (total) 14.3 (1.6)				

* = calculated estimated start age (mean age - years of practice), ^a = terms used in the studies, ^b = start of measurement, ^cTP = Team Practice, ^dCalculation based on average hours of football-specific practice per year (6-12).

first study to use a retrospective questionnaire on already senior professional/amateur players reported no differences in starting ages between international, national or provincial players (Helsen, Starkes, & Hodges, 1998). One key limitation in this design is that the players were retrospectively reporting their starting age and practice engagement 20 years back in time. Another study used a longitudinal design over six years with youth players while they were part of a developmental football program within Dutch Premier League clubs (Huijgen et al., 2009). After reaching their adult playing levels, the players were categorized according to their professional or amateur status. However, this study analyzed physical and technical performance rather than practice engagement, and it is not clear how the age of entry was analyzed.

Overall, the results from the above-mentioned studies show that the age of entry for youth football players varies. Some elite players begin their participation in football as early as 5 years of age, but there are also reports of players starting as late as 14 years of age (Leite et al., 2009). Some studies reveal that elite youth players start football at earlier ages than their sub-elite or amateur counterparts (Gissis et al., 2006; Malina et al., 2007; Vaeyens, Lenoir, Williams, Mazyn, & Philippaerts, 2007; Vaeyens, Lenoir, Williams, & Philippaerts, 2007; Ward et al., 2007). However, in studies with arguably more reliable designs, where age of entry explicitly has been considered, no such differences have been reported (Ford et al., 2009; Helsen, Starkes, & Hodges, 1998).

Peak performance

A recent descriptive analysis of all professional football players in Europe showed that this population's mean age was 25.8 years (Besson, Poli, & Ravenel, 2011). Only about 6% of these players were under the age of 20 years and about 11% were above 32 years of age, meaning that as much as 83% of all players were between the ages of 20 and 31 years. The report also showed that a professional career could last as long as 20 years, from under 20 and up to 40 years of age. It therefore seems that the peak age of professional football players could vary within this age range. Another way to define the level of expertise has been to base it on individual awards such as the Union of European Football Associations (UEFA) Ball d'Or and FIFA World Player of the Year. Players who have won such awards have a mean age of 25.6 years (Ford & Williams, 2011). Although this mean age also included players from ice hockey, baseball and Australian football (AFL), it corresponds well with the report of Besson and colleagues (2011).

In combination with the results of sport entry, we see that football players could have as much as 20 years of development before reaching their peak performance age. In the next section we will address what these years actually consist of in terms of quantity and quality of practice.

Football-specific practice

The amount of practice

Only a few studies have reported the amount of accumulated practice hours in elite youth football (Ford & Williams, 2008; Helsen, Starkes, & Hodges, 1998; Koslowsky

& Da Conceicao Botelho, 2010; Ward et al., 2007). In the only study including senior players, significant differences between international and provincial players were first identified as late as 10 years into their career with 4587 hours and 3306 hours of accumulated football-specific practice, respectively (Helsen, Starkes, & Hodges, 1998). Three additional years were necessary to identify significant differences between international (6328 hours) and national (5220 hours) players. Similar findings on the amount of practice are presented in studies of Irish Premier League players (Ford & Williams, 2008) and between elite and sub-elite youth players in England (Ward et al., 2007). The first study compared the practice history of those who had or had not participated in Gaelic football as part of their youth development. About 12 years into their career, both groups reported to have accumulated approximately 5000 hours of practice (Ford & Williams, 2008). The second study compared the practice history of elite youth players from four English Premier League academies with sub-elite players from lower levels such as local elementary schools, high schools and universities. The players in the sub-elite group (playing at the under-18 level) had invested a total of 4990 hours, while the elite group had invested about 6500 hours, with participation durations of 11 and 10.5 years, respectively (Ward et al., 2007). In comparison, in a study of Portuguese and Brazilian elite youth players, the amount of accumulated football-specific practice was reported to be about 4000 hours for both groups up to the age of 18 years (Koslowsky & Da Conceicao Botelho, 2010). However, these latter results should be treated with caution as there is a lack of clear definitions of the variables used for the analysis and for the calculation of hours.

Two recent studies including senior professional players, although not reporting accumulated hours of practice, give further support to the importance of football-specific practice in early years of engagement. Firstly, it was shown that 67% of Portuguese national team players had already by the age of 10 years invested on average more than 240 minutes of football-specific practice each week. By the age of 14 years, this percentage had risen to as much as 90% (Leite et al., 2009). Secondly, Dutch senior professional players reported to have participated in one hour more of football-specific practice each week from the age of 14 years than their amateur counterparts (Huijgen et al., 2009).

In summary, the above-mentioned studies show that the total number of accumulated practice hours can differentiate who reaches both elite youth (Ford et al., 2009; Ward et al., 2007) and senior status (Helsen, Starkes, & Hodges, 1998). Although it seems apparent that a large quantity of football-specific practice is necessary to reach high levels of performance, the number of accumulated hours cannot singularly be used as an explanation for why some players reach such levels and others do not. Firstly, no significant differences have been found between international and lower level players less than 10 years into their career (Helsen, Starkes, & Hodges, 1998). Secondly, research has shown that the type of practice engagement varies within the total amount of hours, such as individual, team and play practice (Ford et al., 2009; Helsen, Starkes, & Hodges, 1998; Leite et al., 2009; Ward et al., 2007). It may be that the characteristics of the variety of football-specific activities could offer different qualitative effects on development. To address this issue we will first present findings on variations within football-specific practice. Second, we will address how participation in other domains may contribute to improving football-specific skills and performance. Within the latter topic the

Table 2. Research on skill transfer to football-specific performance.

Topic	Authors	Design	Measurement	Participant age and skill level	Important findings
Tactical and perceptual skills	Smeeton, Ward, & Williams (2004)	Static group comparison with no intervention	Pattern recognition and decision accuracy to film sequences	N = 12 (6 skilled and 6 less skilled) Skilled; from top 5 divisions Age = approx. 21 for both groups	Skilled participants were more accurate than their less skilled counterparts. Bi-directional transfer effect between similar team sports (field hockey-football). Uni-directional transfer effect from football/field hockey to dissimilar team sports (volleyball).
	Holt, Ward, & Wallhead (2006)	Field intervention Multiple treatment, single subject	Independent observer evaluation	N = 8 undergraduate students. Age = /	Participants needed above 70% appropriate responses in practice to improve game performance. Suggestions: repetition of drill practices needed alongside Play Practices to elicit the technical learning required to perform tactical responses consistently and for this to transfer to game performance.
	Memmert & Roth (2007)	15 month field intervention: static group comparison with intervention and control group	'Game Test Situation' for tactical creativity	N = 135 (239) children Age = 6.9 (mean)	Soccer-specific training group improved more than the other groups in soccer-specific creativity. Soccer-specific group improved in handball and field hockey creativity. Highest improvements in areas in which the participants trained.
	Williams, Ward, & Smeeton (2008)	Static group comparison with no intervention	Anticipatory accuracy to film sequences	N = 32, expert and novice players Expert; playing football for 10 years, 50% professionally. Age = 22.5 (mean)	The expert defensive players were more accurate than expert offensive players and novice players. Expert offensive players were more accurate than novice players. Suggestions: general practice within the sport helps develop requisite knowledge structures, whereas specific practice in a particular positional role is necessary to further refine and extend these structures.

Table 2 (Continued)

Topic	Authors	Design	Measurement	Participant age and skill level	Important findings
	Harvey (2009)	Eight week field intervention	Participant observation and qualitative interviews of perception of learning	N = 34, American soccer high school program. Age = 14–18	The players highlight the importance of 'getting the game right' to enable learning and positive transfer to occur. When the coach did get the game right, not only did this physically engage the players and improve their game performance, it also mentally engaged the players and fostered a greater understanding of the game.
Technical skills	Weigelt, Williams, Wingrove, & Scott (2000)	Four-week static group experiment w/pre and posttest of transfer and motor skill learning	Participant diary and score quantification	N = 20, university players Age = 19–40	The trained group demonstrated a significant improvement in performance on the knee-juggling task. The trained group demonstrated significant improvements on ball control as a result of juggling training. The present results suggest that practice on a juggling task leads to an improvement in ball control tasks.

so-called 'transfer effect' is of particular interest, that is, the potential of transferring the use of skills from one domain to football-specific performance (see Table 2 for overview).

The characteristics of football-specific practice

Studies on football practice history have usually made a distinction between organized team practice, individual practice and play activities, and there have been reports of variations within these types of practice engagement. Individual practice, for instance, has been shown to distinguish international from national and provincial players in their early years of engagement (Helsen, Starkes, & Hodges, 1998). More specifically, international players spent significantly more time in individual practice than national or provincial players in their first years of engagement in football practice.

Coach-led, organized team practice has also been reported to be important during childhood and adolescence. Accumulated hours spent in team practice have been shown to significantly distinguish between senior international, national and provincial players (Helsen, Starkes, & Hodges, 1998) and between elite and sub-elite youth players (Ward et al., 2007). These findings were supported by the study of Dutch Premier League academy players, where the authors concluded that 'receiving specialized coaching and training over a prolonged period of time is once again demonstrated to be important to ultimately reach the highest levels' (Huijgen et al., 2009, p. 590).

In contrast to these findings about football-specific practice, a recent study has indicated that football-specific play may be of higher importance in early years of development than organized team practice (Ford et al., 2009). The amount of play activity between the ages of 6 and 12 years was the only discriminating factor between those who were still in elite academies (338 hours/year, SD = 308) and those who had been released from the academies (148 hours/year, SD = 114). There are indications that the degree of engagement in organized football practice or play activity may be moderated by cultural differences between countries. In a study of Brazilian and Portuguese elite youth football players, the total amount of practice hours up to 18 years of age was similar for players from both countries, but the Brazilians had almost twice as many hours of football-specific play activity (1600 hours) than their Portuguese counterparts (960 hours) (Koslowsky & Da Conceicao Botelho, 2010). There is still some uncertainty related to the latter study, due to the unclear description of the calculations used. Similarly, the results of the first study need to be treated with caution due to a low population sample ($n = 11$ for both groups) (Ford et al., 2009).

To summarize, the contribution of different football-specific activities to the developmental process towards expertise appears complementary rather than 'either/or'. Team practice has been shown to be important in reaching elite youth (Ward et al., 2007) or senior professional (Helsen, Starkes, & Hodges, 1998) status. More specifically, it seems that the absence of sufficient team practice could negatively affect the possible advantage of participating in football-specific play (Ward et al., 2007). There are indications, however, that the reverse could be apparent and that play activity at younger ages may be particularly important for reaching elite levels in football (Ford et al., 2009). The true contribution of these different types of activities,

though, is difficult to assess based on the available research (Ward et al., 2007). These findings seem to add important nuances to the DMSP specifically towards football. Team practice is likely to be a relevant part of the theory of deliberate practice specifically applied in football (Ericsson et al., 1993). Although not originally considered deliberate practice, team practice has repeatedly been shown to be an important discriminator across skill class, particularly in football. This is most likely because of its deliberate practice properties. Furthermore, the DMSP does not specify what kind of play activities affect the development of expertise, while it appears that within a football context, football-specific play is important (Ford et al., 2009; Koslowsky & Da Conceicao Botelho, 2010).

Non-specific practice

Participation in other sports

It seems that elite youth footballers participate in one or two sports outside football and this number decreases as age and the amount of time spent in football increases (Ford et al., 2009; Ford & Williams, 2008; Leite et al., 2009; Ward et al., 2007). In the study of Portuguese national team players, 33% of the players were reported to have participated in one additional sport besides football in their early years of engagement (up to 10 years of age). Only 2.4% participated in two sports in addition to football (Leite et al., 2009). By the age of 14 years the participation among all players was limited to only one sport. The percentage of players who participated in one additional sport had dropped to 10%, and continued dropping to 2% by the age of 18 years. This means that by the age of 10 years, as much as 65% of these players had never participated in other sports than football. By the age of 14 years the proportion of players who only participated in football had risen to 91%.

Overall, many players report to only participate in football from the beginning of participation and throughout adolescence (e.g., Leite et al., 2009). This has led Ford and Williams (2008, p. 719) to argue that 'expert performance in soccer is mainly developed through soccer-specific activities'. Similarly, Ward and colleagues (2007, p. 149) state that 'without the deliberate intention to improve (...), no amount of time spent in other activities would facilitate performance within the specialist domain'. Both statements seem to contradict the early diversification approach within the DMSP (e.g., Côté et al., 2007). There are indications, however, that it is possible to reach both youth (Ford et al., 2009) and senior (Ford & Williams, 2008; Leite et al., 2009) elite or professional status by participating in other sports besides football in early years of development. Still, it does not seem clear whether such activities are either necessary or helpful for reaching the highest levels of football. Following this line of research, it therefore seems pertinent to address the potential transfer effect more closely.

Transfer of skills between sports

The potential transfer of tactical creativity between similar team sports (football, handball and field hockey) has recently been investigated (Memmert & Roth, 2007). A total of 135 children, aged about 7 years, completed a 15 month field intervention. The authors found that the different practice groups showed greater improvements

within the domain they practiced. For instance, the football-specific practice group improved significantly more in football-specific creativity than the other groups did. The data also indicated that some concepts of tactical creativity are general or non-specific rather than sport-specific, which led to the suggestion that a possible transfer of tactical skills from one sport to another could exist independent of the motor skill execution. One of the main limitations of this study, however, was the absence of elite players and consequently the lack of control of skill level. The only recent study on tactical and/or perceptual transfer in football to include elite players found that perceptual accuracy is both football-specific and position-specific (Williams, Ward, Ward, & Smeeton, 2008). These findings led the authors to the conclusion that general practice only helps developing general perceptual skills and that football-specific practice is necessary to refine and transfer these skills to football-specific performance.

There is a lack of studies focusing on the transfer of ball-specific skills between football and other sports. We found only one study which focused on the transfer between feet and knee juggling in football (Weigelt, Williams, Wingrove, & Scott, 2000). The lack of studies in this area may be due to the obvious difficulties of practicing football-specific technical skills in other sport domains. Through participation in ice hockey or handball, for instance, one would not be able to practice technical skills such as passing or shooting a ball by foot.

The transfer of physical skills across sports is a complex issue. We have not been able to identify any studies focusing on the transfer of physical skills between football and other sports. There do exist, though, a lot of studies analyzing the effects of general physical practice on football-specific performance (e.g., Helgerud, Engen, Wisloff, & Hoff, 2001; Hill-Haas, Dawson, Coutts, & Rowsell, 2009; Hoff, 2005; Hoff & Helgerud, 2004; Impellizzeri et al., 2006). To fully go into this literature would be beyond the scope of this review. However, recent reviews on physical development (Meylan et al., 2010) and endurance training (Iaia, Rampinini, & Bangsbo, 2009) provide two important conclusions with relevance for the topic of this review. Firstly, it is important to acknowledge the potential effect that general physical training could have on the development of physical skills throughout childhood and adolescence, both in terms of injury prevention and reducing the disadvantage of those players who are less physically developed than others (Meylan et al., 2010). Secondly, physical training should be conducted as close to role-, position- and football-specific variations as possible, to secure an optimal training effect (Iaia et al., 2009). The latter argument has been supported by the fact that important physical skills such as maximum speed, acceleration and agility were shown to be specific qualities and relatively unrelated to one another (Little & Williams, 2005). The authors found low coefficients of determination (r^2) of 0.39, 0.12 and 0.21 when analyzing the relationship between acceleration and maximum speed, acceleration and agility, and maximum speed and agility, respectively. Furthermore, a recent study on football endurance showed that football-specific training was three times as effective as general training in developing football-specific endurance (Roescher, Elferink-Gemser, Huijgen, & Visscher, 2010).

In summary, it appears that the potential effect of participating in other sports on improving football-specific skills is related to the complexity of the game. Perceptual and technical skills and physical aspects such as agility, strength, sprint and endurance seem to be closely related to both role- and position-specific differences.

Delorme, Boiche, and Raspaud (2010b), however, state that sport participation in itself could offer some general benefits that can be transferred across sports: 'In the case of transfer from one sport to another, children will continue to benefit from moderate but regular sport participation in terms of social acceptance, psychological self-perception, and health' (p. 721). Furthermore, it has been argued that some skills, such as general perceptual and tactical skills, share similar general features that can be improved through various activities (Memmert & Roth, 2007; Williams et al., 2008). One of the logical consequences of such an argument would be that these skills may be practiced and improved independently of the following motor execution. Regardless, transfer to and improvement of football-specific skills in general are suggested to depend on the activities' similarities to football, the presence of football-specific training and the deliberate intention to improve (Kannekens et al., 2009; Ward et al., 2007). Furthermore, general physical training may be an important tool for reducing the risk of injuries (Young, 2006) and the disadvantage of later maturation (Meylan et al., 2010).

Injuries and late maturation have been used as two explanations for the link between early specialization and sport drop-out, and this link has been one of the main arguments in favor of early diversification (see, e.g., Côté, Lidor, & Hackfort, 2009). Most football players will never reach professional status, but either continue their participation in football at a recreational level or drop out. It therefore seems pertinent to address the different reasons for why players drop out of the search for a professional football career. In the next section we will present the different factors related to drop-out, with a specific focus on the debate of early specialization *versus* diversification.

Drop-out

Among the factors that have been shown to affect the decision to continue participating or drop out of football are increased physical demands (Malina et al., 2000), prioritization of other leisure activities (Christensen & Sørensen, 2009), personality and perfectionism (Hill, Hall, Appleton, & Kozub, 2008) and environmental aspects such as economy, parents, peers, team mates and club structure and organization (Ferreira & Armstrong, 2002; Holt, Tamminen, Black, Sehn, & Wall, 2008). However, in highly competitive environments, such as academies at top professional clubs, two reasons seem more prevalent: injuries (Kathrin & Engebretsen, 2010; Merron, Selfe, Swire, & Rolf, 2006; Vaeyens et al., 2006) and de-selection (Ford et al., 2009; Meylan et al., 2010).

The presence of a serious injury will represent a major setback in a player's developmental process, both in terms of losing valuable practice time and of the risk of not being able to continue participation in football (Inklaar, Bol, Schmikli, & Mosterd, 1996; Kathrin & Engebretsen, 2010). In a review of all studies conducted on injury occurrence in elite youth football, it was shown that male youth international tournaments had up to a three times higher risk (frequency) of injuries than national matches, which in turn could have up to five times the injury risk of regular practice (Kathrin & Engebretsen, 2010). It has been suggested that during growth, players are more prone to injuries, and maturation has been shown to affect injury risks. In a 10 season study of 233 elite French under-14 players, a significantly higher incidence of major injuries was observed in late compared to early maturers

(le Gall, Carling, & Reilly, 2007). The study also showed that early maturers were absent from training less often (34 days/year) than normal (48 days/year) and late (43 days/year) maturers. Furthermore, high-level youth football players have a significantly higher injury risk than lower-level players and this risk was mainly related to playing matches rather than participating in regular practice (Inklaar et al., 1996).

The selection process is a natural consequence of increasing age and competitiveness. Club or academy staff will decide whether players are included in or excluded from further participation (Baker, Schorer, Bräutingham, & Büsch, 2009; Carling, le Gall, Reilly, & Williams, 2009; Mujika et al., 2009; Williams & Reilly, 2000). There have been suggestions that these selection processes are focused on physical rather than technical or tactical skills (Mujika et al., 2009), leading to an over-representation of players who are physically superior. Early mature players seem to use their physical advantage to outperform their counterparts in football-specific skills (Huijgen et al., 2009), and therefore have a higher chance of being selected for further participation in a professional environment (Delorme et al., 2010b). Delorme and colleagues (2010b) point out that less mature players may experience more failure, fewer opportunities for high-level practice and competitive matches and fewer opportunities for high-level coaching. As a result of one or more of these negative experiences, players may eventually drop out (Helsen, Starkes, & van Winckel, 1998; Williams & Reilly, 2000). When this skewed selection is due to some players being born relatively earlier in the selection year than others, it has been called the relative age effect, and is well documented both in youth football (Baker, Schorer et al., 2009; Diaz Del Campo, Vicedo, Villora, & Jordan, 2010; Hansen, Klausen, Bangsbo, & Mueller, 1999; Helsen, van Winckel, & Williams, 2005; Jimenez & Pain, 2008; Mujika et al., 2009) and senior football (Baker, Schorer et al., 2009; Delorme, Boiché, & Raspaud, 2010a; Helsen, Starkes, & van Winckel, 2000; Wiium, Lie, Ommundsen, & Enksen, 2010), and has been visible as early as 12 years of age (Helsen, Starkes, & Hodges, 1998).

In summary, football is claimed as one of the most injury-prone sports due to its characteristics of physical contact (Kathrin & Engebretsen, 2010). Although technically, tactically (le Gall et al., 2006) and perceptually (Arnason, Tenga, Engebretsen, & Bahr, 2004) advanced players may confer protection against match play injuries, there have been reports of higher injury incidences at higher levels of match play in youth football (Arnason et al., 2004; le Gall et al., 2006). This may be due to the game being more intense, aggressive and forceful as a consequence of players being better trained and the fact that the players will take more risks in achieving their goals (Merron et al., 2006). In a competitive environment it is also not unusual for young, skilled players more often than others to regularly play matches against older players and compete for several teams in higher age groups (Kathrin & Engebretsen, 2010). Furthermore, it seems that during growth periods, players are more prone to injuries than after maturation (le Gall et al., 2007; Merron et al., 2006), which may be due to their bodies not being ready to meet the demands of full-time training (Merron et al., 2006). The presence of injuries may therefore not necessarily be related to monotonous activity in itself, but rather a mismatch between the total physical and psychosocial stress load and recovery (Brink, Nederhof, Visscher, Schmikli, & Lemmink, 2010; Kathrin & Engebretsen, 2010). Consequently, injuries could be controlled and prevented through individually based monitoring

and feedback, and by adapting the training load to each player (Brink, Nederhof, et al., 2010; Brink, Visscher, et al., 2010; Mujika, Santisteban, Angulo, & Padilla, 2007).

Discussion

The demands for reaching top levels of professional football are extremely high, considering the vast number of available players worldwide and the relatively limited opportunities to gain a professional contract. The aim of this review has been to provide an overview of how different factors interact in the development of youth football players to adult expertise.

The assumption that 10,000 accumulated practice hours over 10 years, and consequently an earlier starting age, would be important in the development of expertise dates back to the studies of Simon and Chase (1973) and Ericsson and colleagues (1993). However, as the literature in this review shows, the starting age of both elite youth players and later senior professional football players can vary as much as 10 years (5–14 years). Furthermore, elite players' starting ages do not differ from their sub-elite, recreational or amateur counterparts, which suggests that the starting age is not as important as other aspects of the developmental process throughout childhood and adolescence.

The '10 year rule' has been supported by studies in various domains, such as music (Ericsson et al., 1993) and mathematics (Gustin, 1985) and sports such as tennis (Monsaas, 1985), long distance running (Wallingford, 1975), swimming (Kalinowski, 1985), basketball, field hockey and netball (Baker et al., 2003) (for overview, see Williams & Ford, 2008). To define an exact age at which a football player reaches expertise would be difficult as a professional career could last as long as 20 years (Besson et al., 2011). Reports of age of entry show that most footballers start playing football by the age of 10. Even at the reported average age of professional footballers (25.6 years), the age range seems to be closer to 20 years. The possible age range for reaching expertise is therefore a lot wider than other sports such as gymnastics or figure skating, where the possibility of reaching top-level performances is more limited by competitive performance at earlier ages (Malina, 2010; see also Baker & Côté, 2006).

Within these years of development, however, it may be more relevant to focus specifically on the characteristics of participation. With respect to the quantity, the reported accumulated practice hours in football are consistently lower than the 10,000 hours reported in the music study by Ericsson and colleagues (1993) but similar to those reported in other sports such as field hockey (Helsen, Starkes, & Hodges, 1998) and basketball (Baker et al., 2003). It is difficult to discuss why there is such a difference between sports and other domains, and even a variety within sports, without more specifically analyzing what these different practice hours actually consist of. As suggested by Baker and colleagues (2003), both the type of activity and the quality of participation would be critical to the development of sport expertise. For instance, the participation in other sport-related domains could 'circumvent the need for, or partially substitute, some of the many hours of sport-specific practice needed to become an expert in team sports' (Baker et al., 2003, p. 22). In our review we find little support for such an assumption. Elite youth players and later senior professionals spend little time in other sports and most of their time in football play

activity. The participation in sport-specific play activity supports only some of the predictions of the DMSP (Côté, 1999; Côté et al., 2007; Côté, Horton, et al., 2009). According to the DMSP, the early diversification pathway consists of *both* participation in other sports *and* play activity. In addition, the model does not precisely state that the activities should be sport-specific play, where our review indicates that it is time spent in football play activity rather than general play activity or within other sport domains that differentiates across skill level. Football-specific play activities such as futsal and street football are associated with a high degree of context-specific learning, characterized by lots of repetitions within a randomized and variable learning environment. This type of learning environment has been suggested to facilitate the development of high-level skills, and has been used as one explanation for the advantage some countries experience in developing top-level players (see Williams & Hodges, 2005). However, it is important to specify that these results come from studies on youth players. Consequently, there is no evidence that these variations in activity participation differentiate who eventually reaches top senior levels.

The open and dynamic nature of the football game provides relatively complex demands for performance. Furthermore, it seems that this complexity is also reflected in both role-specific and position-specific differences, suggesting that any training should be conducted as close to these variations as possible (Dellal, Wong, Moalla & Chamari, 2010; Reilly, Bangsbo & Franks, 2000; Williams, 2000; Williams et al., 2008). With such complexity, one might, however, assume that there is a need for a wide base of motor skills which have similarities with movement solutions in other related domains, and therefore can be practiced accordingly (see, e.g., Branta, 2010). Having said this, both Ward and colleagues (2007) and Ford and Williams (2008) state that expert performance in football is mainly developed through football-specific activities. This is consistent with conclusions from recent reviews on physical skills (Iaia et al., 2009; Young, 2006; Young & Farrow, 2006) and technical skills (Ali, 2011), which state that such skills are so specific to each sport domain that to achieve optimal development they should be practiced as close to the performance characteristics of each sport as possible. Studies on tactical and perceptual expertise report similar findings (Ward & Williams, 2003), although some general perceptual skills such as determining the ball trajectory and pace can relate to a range of activities. However, it is argued that features like cue recognition, cue accuracy and decision making need to be practiced within the football context to improve football-specific skills and performance (Ward & Williams, 2003; Williams, 2000). Still, the difference between sports in their similarities to football seems to be an important mediator in regard to improving football-specific skills (Baker et al., 2003). The experts in Baker and colleagues' (2003) study were reported, for instance, to have spent a lot of time in sports with similar rules, tactical solutions and movement patterns, and this similarity was suggested to have a positive transfer effect across the respective sports (see also Smeeton, Ward, & Williams, 2004). These results suggest that there are some important differences between sports that need to be addressed to fully understand potential transfer effects.

The relative benefits of a diverse approach or early specialization approach to the development of expertise have been one of the central topics in the expert development literature in recent decades. In this review we have focused on engagement characteristics in relation to the DMSP. However, there are important

issues that could mediate our findings, which are especially related to the psychosocial development throughout childhood and adolescence (see Wiersma, 2000, for a review). In a review of this subject, it was stated that early specialization has been shown to shorten athletes' careers, increase burn-out/drop-out and increase the risk of injuries (Côté, Lidor, & Hackfort, 2009). In their last modified version of the DMSP, Côté, Horton, and colleagues (2009, p. 9) presented five areas in which children who diversify are assumed to gain an advantage compared to those who specialize early in one activity: (1) life skills; (2) prosocial behavior; (3) healthy identity; (4) diverse peer groups; and (5) social capital. However, the potential negative or positive effect of early specialization or diversification has yet to be fully clarified (Malina, 2010). In the last significant review of this area, it was concluded that the literature is inadequate to resolve this issue (Baker, Cobley, & Fraser-Thomas, 2009). Neither in psychology (see Gould, 2010), physiology (see Kalth & Mikesky, 2010) nor biomechanics (see Mattson & Richards, 2010) have researchers been able to draw clear conclusions. Malina (2010) points out the athletes' activity environment as one of the key issues, where coaches and parents are important factors in both reducing and enhancing potential negative effects of sport participation. Consequently, adults are 'implicated, directly and indirectly, in consequences of specialization' (Malina, 2010, p. 369). Even though it seems like this is an unresolved issue, it is important to keep in mind the potential effect that both activity characteristics and developmental environment could have on young players.

Following the preceding discussion it seems that a discussion of specialization *versus* diversification contains at least two different levels: (i) number of sports (often referred to as sampling); and (ii) range of potential movements. Because of the dynamic, complex and open nature of football, the game's characteristics offer a wider range of potential movement solutions than less complex sports. An athlete who participates in cross-country skiing during the winter and long distance running in the summer has, from a number of sports point of view, a more diverse approach than one who plays football all year. However, if we take into account the variety of movements within each sport, it would be more logical to argue the opposite. Furthermore, the term 'specialization' needs clarification. At what point does a player who only plays football for fun all year fall into the category of specialization? Is it when we add a coach or a deliberate intention to improve skills? Thus, in such a discussion it appears important to systematically address and consider different sports' unique characteristics.

Conclusion

In recent years there has been a growing amount of research concerning youth player development in football. However, both from a scientific and a practical point of view, the lack of an overview of available research on player development and how different elements interact has become visible. One of the most important contributions to the understanding of this interaction has been the Developmental Model of Sport Participation (Côté, 1999; Côté et al., 2007; Côté, Horton, et al., 2009). Although the model is supported by a substantial amount of research across sports, it has yet to be fully validated in one of the world's largest and most popular sports, association football. This review shows that there are some key issues that

may need to be integrated to fully validate such a framework in football. Firstly, participation in other sports does not seem to be as important as suggested for the 'sampling years'. Our review indicates that elite youth players and later professionals participate in other sports only to a small degree. Secondly, football-specific play is more important than non-specific play activity. Thirdly, related team sports that share similar rules, movement execution, perceptual cues and strategies with football appear to have a higher potential transfer effect than other sports. And fourthly, different skills seem to be affected in different ways by various types of practice.

One of the most discussed topics in football development research over the last decade has been the relationship between early diversification and specialization. Our review indicates that the most optimal way of improving football-specific skills and performance is through practice that is conducted as close to individual role- and position-specific variations as possible. However, there may be some advantages to general or diverse practice that need to be taken into account, such as injury prevention, general physical and psychosocial development and its suggested effect on motivation and burn-out (see, e.g., Wiersma, 2000). Moreover, the quality of participation seems to be an important factor that enables some players to gain more from practice than others (see also Brylinsky, 2010). More specifically, the deliberate intention to improve skills and performance could be manifested through a high degree of goal commitment (Holt & Dunn, 2004; Van Yperen, 2009) and self-regulative behavior such as planning, reflection, monitoring and evaluation (Toering et al., 2009, 2011). The few studies conducted on football with respect to these topics suggest that these processes may supplement the understanding of what characterizes football-specific quality of practice.

Future research

The ecological or external validity of some of the studies considered in this review may be questioned in two ways. Firstly, the widespread use of controlled laboratory designs suggests the need for more field-based and longitudinal designs. Secondly, the interaction between factors affecting skill development sometimes seems to be ignored in favor of studies on isolated aspects of a skill. Thus, to move the field forwards in an ecologically valid and context-sensitive manner, future research needs to take these two issues into account. This can be done by studying football players operating within their own real habitats (field studies), following them over several practice sessions/games/seasons (longitudinal studies), and finally by attempting to capture the functional interaction between the technical, psychological and physical aspects of both their development and performance.

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Article 2



From childhood to senior professional football: A multi-level approach to elite youth football players' engagement in football-specific activities



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ABSTRACT

Objectives: The main aim of this study was to identify the development of engagement in football-specific activities of elite youth association football (soccer) players who have made the transition to senior professional status or not.

Design: Comparative research design.

Method: Data were collected from all elite youth players ($N = 745$) within the age-range of 14–21 years from all Norwegian Premier League clubs, using a retrospective questionnaire. A within elite-group comparison of players who had obtained a senior professional contract or not was conducted by using multi-level modeling ($n = 491$).

Results: The results showed that although the professional players reported to have accumulated more overall practice hours than non-professionals from ages 6 to 19 years, none of these differences were significant. The professional players reported to have accumulated significantly more hours in play and coach-led practice at the youngest age categories. No significant differences were identified at older age categories or for other types of football-specific practice at any age.

Conclusions: Differences in performance attainment may be due to variation in the amount and types of football practice at the earliest years of participation, but may also be related to other factors than the number of hours spent in certain football-specific activities. We argue that implementation of multi-level modeling represents an important progression within practice history research, and is necessary to account for the actual individual's development over time in addition to identify how different variables may affect the developmental process.

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Association football is one of the world's most popular sports, and also represents one of the most competitive and complex sports for reaching expertise (Aguar, Botelho, Lago, Macas, & Sampaio, 2012). Consequently, football has been an area of interest for many researchers over the last decades who have tried to identify factors that could determine why some players manage to reach senior professional status (for a review, see Haugaasen & Jordet, 2012). One of the main disciplines within this field of research has focused on the relationship between engagement history and expert attainment, where players' activity engagement during childhood and adolescence has been viewed as one key factor in developing expertise (e.g., Ford et al., 2012). From a broader perspective, the positive relationship between the amount of time spent in practice and level of achievement represents one of

the most robust relationships in behavioral research (e.g., Baker, Cobley, & Fraser-Thomas, 2009). As a consequence, expertise has often been viewed as a logical progression of practice accumulation. One of the most influential theoretical frameworks linking practice engagement with expertise development was first introduced by Ericsson and Smith (1991) as the *expert performance approach*, and later specified through *the theory of deliberate practice* (Ericsson, Krampe, & Tesch-Roemer, 1993). The framework "predicts a monotonic relation between the current level of performance and the accumulated amount of deliberate practice for individuals attaining expert performance" (Ericsson et al., 1993, p. 387). Developing expertise is therefore not necessarily a result of the quantity itself but also of the quality of an individual's participation, emphasized through the term *deliberate practice*.

The theory of deliberate practice has recently been criticized for failing to consider several factors that may affect the developmental process, such as age effects, sociocultural context, genetic predispositions, and activity characteristics (for reviews, see Tucker

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& Collins, 2012; Seifert, Button, & Davids, 2013). Criticism within practice history research has emerged mostly from the latter, where findings have suggested that expert performers in sports engage in various sports or play activities from early ages (Baker, Côté, & Abernethy, 2003; Berry, Abernethy, & Côté, 2008; Bloom, 1985). Such results appear contradictory to the domain-specific activities emphasized by the theory of deliberate practice, and one attempt to systematize these findings has been through the Developmental Model of Sport Participation (DMSP; Côté, 1999; Côté, Baker, & Abernethy, 2007; Côté, Horton, MacDonald, & Wilkes, 2009). Within football specifically, however, none of the abovementioned frameworks appear to capture the developmental activities toward elite levels engaged in by youth football players. Three recent studies indicate that such players, from early ages, spend little time in other sports but rather engage in high amounts of football-specific activities which preferably are fun and joyful (Ford, Ward, Hodges, & Williams, 2009; Ford et al., 2012; Ford & Williams, 2012). The *early engagement hypothesis* was proposed by Ford et al. (2009) to explain these findings as opposed to the engagement in domain-specific deliberate practice or multiple sports emphasized through the theory of deliberate practice and the DMSP, respectively.

Previous practice history research in football has provided important insight in the engagement characteristics of young football players. Considering the amount of research available, however, we know surprisingly little about the pragmatic consequences of the developmental process toward senior elite levels. One of the most notable limitations of prior studies has been related to the sample of participants, where either low sample size or the young ages of respondents have provided difficulties to address the transferability of results to elite senior level football (Ford & Williams, 2008, 2012; Ford et al., 2009; Ward, Hodges, Starkes, & Williams, 2007). Second, there has been an apparent lack of overview of how different variables may affect or interact in the developmental process. This was pointed out by Haugaasen and Jordet (2012) in their review on the subject, and later specified by Ford et al. (2012) to include for instance:

(...) the amount of formal, coach-led versus informal, non-coach-led activity and whether the intention of the coach, athlete and significant others during the activity is to win, implicitly or explicitly improve performance, or to have fun and enjoyment" (p. 1654).

Third, the statistical analyses used in practice history studies have focused on comparing group mean differences of either accumulated (e.g., Helsen, Starkes, & Hodges, 1998; Ward et al., 2007) or yearly sums (e.g., Ford et al., 2009; Ford & Williams, 2012) of hours of practice. Analyses of this kind address group differences in the amount of practice throughout chronological age categories, which typically have been interpreted as representing development of activity engagement over time. However, a common misconception is to overlook the fact that two (or more) related scores are not sampled independently of each other, and "failing to deal with this properly in the statistical analysis may lead to erroneous inferences" (Snijders & Bosker, 2012, p. 7). This means that each player's response from one age category to another is not treated in relation to each other but rather as two independent measurements. Consequently, one cannot draw conclusions about the actual individual player's development over time (e.g., Krueger & Tian, 2004).

The main aim of the present study was to provide an overview of the development of engagement in football-specific activities of elite youth players in relation to current performance level (here: professional vs. non-professional players). Some of the

abovementioned challenges from earlier practice history research have been addressed:

- (1) A relatively large sample of players was included ($N = 745$), all of whom were involved in elite youth teams within a Norwegian Premier League (NPL) club.
- (2) Some of these players had already obtained a senior professional contract, which made it possible to conduct within elite-group analyses comparing professional with non-professional players. By using players who have made the transition to senior football but still, by age, were counted within youth levels, we sought to reduce the potential memory inference that would probably be more apparent at older ages (Ward et al., 2007).
- (3) Multi-level modeling was used to analyze the practice engagement data. This procedure was chosen to properly account for each individual player's developmental scores over time, and to estimate the actual effect of variables hypothesized to affect the outcome scores.

Method

Participants

In total, 745 football players aged 14–21 years from elite teams within all clubs participating in the NPL, participated in this study. The data of 27 players were removed due to incomplete responses of all variables, leaving 718 players ($M_{\text{age}} = 16.2$, $SD = 1.8$) available for further analyses (see Table 1 for sample overview). The statistical analyses were divided into three main sections (see chapter on Statistical analyses). For the first section all players in the sample were included. For the two other sections, the players were categorized into two groups based on their current contract status (professional or non-professional). Here, two additional inclusion criteria were applied to filter the sample of players. First, the age at which a player is eligible to sign a senior professional contract is 15 years, and players younger than this at the time of measurement ($n = 153$) were excluded. Second, 22 players were removed due to missing contract status. For the analyses of activity ratings a total of 543 players fulfilled the inclusion criteria, who were divided into one group of 81 professional contracted players ($M_{\text{age}} = 18.7$, $SD = 1.3$) and one group of 462 non-professional players ($M_{\text{age}} = 15.8$, $SD = 1.6$). For the multi-level analyses, an additional 52 players were removed due to failing to report any practice history. A total of 491 players were included

Table 1
Sample distribution by age and contract status.

Age ^a	Overall sample	Contract status	
		Professional players	Non-professional players
13	35		30
14	125		123
15	137		128
16	126	6	119
17	114	8	105
18	99	21	77
19	52	24	27
20	21	15	6
21	7	7	–
Distribution sum	716	81	615
Missing ^b	2	22	
Overall total	718	718	

^a At time of measurement.

^b Missing either age or contract status.

in the analyses, divided into 66 professional players ($M_{\text{age}} = 18.6$, $SD = 1.3$) and 425 non-professional players ($M_{\text{age}} = 16.5$, $SD = 1.3$).

Procedure

Consent for conducting the project and storing responses was collected from the Regional Ethical Committee and The National Data Protection Authority. The study followed the ethical guidelines, and guidelines for collecting and storing information, provided by the two institutions. Before the start of the 2011 season all clubs in the NPL were invited to be a part of the project. An information letter was distributed by the clubs to all players, their parents, and coaches. All players who agreed to be a part of the project signed a written consent, and for players under the age of 18 years a written consent from their parents was collected. The data were collected at the clubs' training or match facilities, under supervision and guidance of representatives from the research group. Three months after the initial data collection, a sample of participating players from four clubs conducted a re-test of the questionnaire in addition to the completion of a one-week training diary.

The data were collected through a retrospective practice history questionnaire, which was adapted from previous research (e.g., Helsen et al., 1998; Ford et al., 2009; Ford, Low, McRobert, & Williams, 2010; Ward et al., 2007). A translation to Norwegian and back translation to English was conducted. The questionnaire was pilot tested among 19 players ($M_{\text{age}} = 17.6$, $SD = 1.0$) from a local amateur club, and minor adjustments were made in the translation. Due to some adjustments from the original questionnaire (see next section), the re-test and the one-week diary ensured the possibility to test the reliability of both retrospective and present year's practice engagement data. The re-test of the questionnaire was performed including 29 players ($M_{\text{age}} = 15.1$, $SD = 1.5$) from two clubs. The one-week training diary was collected from 26 players from two other clubs ($M_{\text{age}} = 16.7$, $SD = 1.0$). The diary was completed during one week of the season by each player, with their respective parents and coaches confirming the content by signing the diary after completion.

The questionnaire and diary

At the start of the questionnaire, the players were asked to report their birthdate and the age at which they began participating in football-specific activities. Further on, the questionnaire contained four subcategories of football-specific activities (see Table 2) in which the players retrospectively reported the average amount of time per week spent in each, in addition to how many weeks of the year the participation lasted. These data were then

Table 2
Definitions for categorization of football specific activities.

Activity	Definition
Coach-led	Activities that have been organized by a coach/teacher/adult (such as training with a club, a team or at school)
Competition/match play	Team matches against oppositional team. For instance: pre-season matches, league matches, cup matches etc.
Play	Activities where you have not had a deliberate intention of improving a skill, but <u>have been just for fun and enjoyment in itself</u>
Goal-oriented individual/peer led	Activities that you and/or your friends have organized yourselves (e.g., without a coach/adult), and <u>where you have had a deliberate intention or a clear goal of improving a specific skill</u>

computed to yearly sums of hours of practice, from which the total accumulated scores for each age category were calculated. Compared to the original questionnaire, two additions were applied: First, the original questionnaire followed a year-by-year chronology where each year contained the four activities. In the present study we divided each of the activities into separate chronological age categories (e.g., play was filled in from 6 to 21 years, before moving to coach-led, etc.). Second, players were specifically instructed to include all football-specific *school practice*.¹ Finally, we asked the players to rate the contribution, relevance, enjoyment, and required concentration of activities regarding their last year's skill development, on scales ranging from 0 to 10.

The diary consisted of a day to day matrix of time spent in each of the four football-specific activities adapted from the questionnaire. The data structure from the diary was therefore identical to the questionnaire, which made it possible to compare the computed yearly sums from the diary to the ones computed from the questionnaire responses.

The original questionnaire has demonstrated good test–re-test reliability ($r = .84-.94$, $p < .05$; Helsen et al., 1998). The correlation has been shown to be stronger for the last five years prior to collection ($r = .95-.92$) and weaker and non-significant for the previous years ($r = .68-.62$, $p > .05$; Ward et al., 2007). Ford et al. (2010) reported a large intraclass correlation coefficient (ICC) of .87 between test and re-test. The latter study also tested the validity of data by comparing players' and parents' responses, with an ICC of .76 between the two tests.

For the present study, an intraclass correlation analysis was conducted to assess the relative reliability of the computed yearly sums of the test and re-test. A large ICC of .86 (95% CI = .77–.93) demonstrated good relative reliability. No consistent differences were identified across age categories. Similar procedures were conducted for the test and one-week diary, from which we found an ICC of .71 (95% CI = .30–.88).

Statistical analyses

All data were analyzed using SPSS 18. The analyses were divided into three main sections:

- (1) Starting age.
- (2) Multi-level analyses of practice engagement history.
- (3) Activity rankings.
 - (1) An independent samples *t*-test was used to compare starting age in football-specific activities between professional and non-professional players. The standardized effect of the difference between the two groups was based on probabilistic magnitude-based inferences from the values of a 90% Confidence Interval (CI) (Hopkins, Marshall, Batterham, & Hanin, 2009; see next paragraph).
 - (2) The accumulated development of participation in football-specific practice was investigated by using multi-level modeling through a linear mixed model procedure. This procedure was adopted to properly account for practice history as a repeated measure and individual responses within the different groups (e.g., Gueorguieva & Krystal, 2004; Hopkins et al., 2009; Krueger & Tian, 2004). The aim of using a multi-level model was to create estimates of

¹ At the ages 15–19 many players attend public or private schools that are specially adapted to developing football players. Many clubs cooperate with these schools when planning total practice load for each player and it is therefore important to include school practice in the equation.

accumulated hours of football-specific practice, and to identify potential differences across ages between groups of players based on their current contract status. The differences between the two groups were investigated with both relative and absolute values of the dependent variable. The first was used to evaluate the relative differences between the groups of professional and non-professional players through both a fixed slopes and a random slopes model, while the latter was included to present the actual differences in, and the overall accumulation of, the amount of practice. For all analyses, the values of a 90% CI were used to evaluate the true positive or negative differences. The relative scores from the fixed slopes model were used to calculate standardized effects through probabilistic magnitude-based inferences, that allows for more informative assertions about the magnitude and the uncertainty of effects compared to the dichotomous representation of whether an effect deviates from zero (e.g., *p*-values; Hopkins et al., 2009). This approach is based on probabilities that the effect is substantially positive or negative, on a scale from <.2, trivial; .2–.6, small; .6–1.2, moderate; >1.2, large, where the uncertainties of the effects were expressed as probabilities in relation to the smallest substantial effect (± 2) (Hopkins et al., 2009; Solberg, Hopkins, Ommundsen, & Halvari, 2012). For the random slopes model, the values of a 90% CI were used to evaluate the true differences between the two groups, while the *p*-values were used to supplement these differences with a measure of statistical significance (Gardner & Altman, 1986). The values of $-2LL$ were used to evaluate the model fit of the empty, fixed, and random slopes models (Table 3).

Each subject could have up to 15 scores of accumulated hours of practice, one for each year from 6 to 21 years. For all players included in the analyses all values within their participation age-range (starting age to present age) were present. Values outside the players' participation age-range were treated as missing values. In preparation for the analyses, each subject's scores were combined into one single unit of analysis. This procedure is called within-subject modeling, which is recommended to avoid interdependence of observations (Hopkins et al., 2009).

A two-level model consisting of the longitudinal measurements (level 1) nested within individuals (level 2) was created (Eq. (1)):

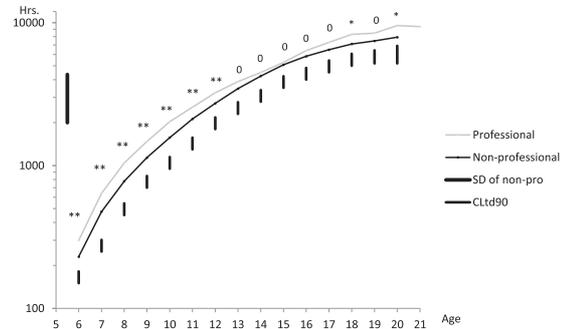


Fig. 1. The log-transformed dependent variable of accumulated hours of practice by groups of professional and non-professional players, transformed back to yearly accumulated hours of practice. The SD of non-professional players as reference group, and the standardized Confidence Limit for a 90% Confidence Interval. Explanation of superscripts denoting probabilistic inferences: ** Clearly small, * Unclear small, 0 clearly trivial.

$$\begin{aligned}
 \text{LNAccumFootball}_{it} = & \gamma_{00} + \gamma_{01}(\text{Contract2Gr}_i) + \gamma_{10}(\text{MI}_{it}) \\
 & + \gamma_{11}(\text{Contract2Gr}_i \times \text{MI}_{it}) + U_{0i} \\
 & + U_{1i}(\text{xVarP}) + U_{2i}(\text{xVarNonP}_i \times \text{MI}_{it}) + e_{it}
 \end{aligned} \tag{1}$$

To produce relative outcome scores, the dependent variable of accumulated hours of football-specific practice was log-transformed by a factor of 100 (LNAccumFootball). The fixed factors in the model were contract status (Contract2Gr), Measurement Index (MI), and the interaction between contract status and MI (Contract2Gr \times MI). Contract status was coded to represent the presence (1) or absence (0) of a professional contract. MI was a categorical variable representing each scores' measurement time from 6 to 21 years. The two random factors represented the variance of the two groups of players and were coded to represent the presence (1) or absence (0) of a professional (xVarP) or non-professional contract (xVarNonP), where the latter were interacted with MI (xVarNonP \times MI). This fixed slopes model with random intercepts was then used to present the accumulated scores of the two contract groups throughout different age categories (Fig. 1).

To ease the interpretation of the true differences between the two groups at each separate age category, the MI-variable was dummy-coded into 14 different variables representing each age of measurement from 6 to 20 years.² For each age category these variables were coded to identify the additional practice conducted by the professional players (1) compared to the non-professionals (0): For the age of 6 years, all professional players were coded into 1 and non-professional players to a 0, and similar for age 7, 8, 9... 20 years. These variables then replaced the (Contract2Gr) and the interaction of (Contract2Gr \times MI) as fixed effects in the fixed slopes model (Eq. (1)). The relative differences between the groups represented by the additional practice of the professionals were used to calculate the standardized magnitudes and the uncertainties of effects in relation to the standard deviation (SD) of the non-professionals as a reference group (Fig. 1).

To allow for individuals to randomly deviate from the overall average response within each group, random slopes were

Table 3
Multi-level model for LNAccumulated hours of practice.

	Model 1	Model 2	Model 3
Fixed effects			
γ_{01} Professional	796.0	570.1	539.7
γ_{01} Non-professional	758.7	543.8	526.9
γ_{10} Measurement Index ^a	—	—	—
γ_{11} MI \times contract status ^a	—	—	—
Random effects			
U_0 Residual intercept	11064.5	695.7	160.1
e Intercept between players	3780.3	5194.0	4266.8
U_1 xVarP	—	1211.9	4733.1
U_2 Measurement Index \times xVarNonP	—	122.7	30.3
U_3 (Measurement Index $- 13$)	—	—	110.3
Model fit			
$-2LL$	67,927.3	54,585.5	49,252.8

Note. Model 1: Empty model. Model 2: Fixed slopes (random intercept) model. Model 3: Random slopes model.

^a The year-by-year estimates for MI and MI \times contract status are presented in Table 4, only for Model 3.

² No group comparison was possible at the age of 21 years due to the lack of non-professional players at this age group.

included in the original fixed slopes model (Gueorguieva & Krystal, 2004). A new variable of MI that was adjusted to a mean value of zero at the age of 13 ($MI - 13$) was added as a random factor (Eq. (2)). This adjustment was made to ease the interpretation through SPSS of the actual estimates from within the overall estimates.

$$\begin{aligned} \text{LNAccumFootball}_{ti} = & \gamma_{00} + \gamma_{01}(\text{Contract2Gr})_i + \gamma_{10}(\text{MI})_{ti} \\ & + \gamma_{11}(\text{Contract2Gr} \times \text{MI})_{ti} + U_{0i} \\ & + U_{1i}(\text{xVarP}) + U_{2i}(\text{MI} \times \text{xVarNonP}_i) \\ & + U_{3i}(\text{MI}_{ti} - 13) + e_{ti} \end{aligned} \quad (2)$$

Similar procedures were then applied for each of the four types of football-specific activities as dependent variables, and in addition the absolute values of accumulated hours of football.

- (3) To identify between-group differences in the players' ratings of activities toward their development, an independent samples *t*-test was conducted through a linear mixed model procedure. Such a procedure made it possible to control for possible age-related differences, by adding age as a covariate. To compare the different activities to each other, a one-sample *t*-test was used to analyze difference-scores between activity ratings. The standardized effects were estimated through probabilistic magnitude-based inferences based on a 90% CI.

Results

Starting age

More than 90% of all players had begun participating in football by the age of 6 years. The most common start ages were the ages of 5 (33%) and 6 (38%) years. A few players ($n = 9$) reported a starting age of 10 years or higher with the highest being the age of 13 years ($n = 1$). On average, the players began participating in football at the age of 5 ($M_{\text{age}} = 5.4$, $SD = 1.4$). No significant differences in starting age were identified between professional ($M_{\text{age}} = 5.3$, $SD = 1.2$) or non-professional players ($M_{\text{age}} = 5.4$, $SD = 1.4$; $ES = -.06 \pm .16$).

Table 4

Year-by-year estimates of the random slopes model with relative (log-transformed) and absolute differences (90% CI) between groups of professional and non-professional players, and estimated absolute mean scores (90% CI) of the two groups combined.

Measurement index	Relative scores				Absolute scores						
	Differences pro. vs. non-pro	90% CI		<i>p</i>	Differences pro. vs. non-pro	90% CI		<i>p</i>	Estimated means of both groups	90% CI	
		LL	UL			LL	UL			LL	UL
Age 20	-5.1	-32.7	22.6	.76	1182	318	2045	.02	10730	10298	11162
Age 19	5.8	-18.7	30.4	.69	1215	420	2011	.01	9691	9293	10088
Age 18	4.0	-19.1	27.1	.78	1093	333	1854	.02	8955	8575	9336
Age 17	6.9	-15.3	29.0	.61	999	262	1735	.03	8050	7682	8418
Age 16	6.1	-15.4	27.6	.64	906	187	1626	.04	7188	6828	7548
Age 15	3.5	-17.5	24.6	.78	847	138	1556	.05	6307	5953	6662
Age 14	4.3	-16.7	25.2	.74	830	124	1536	.05	5430	5077	5783
Age 13	5.8	-15.3	26.9	.65	812	103	1522	.06	4582	4228	4937
Age 12	8.0	-13.5	29.5	.54	745	26	1464	.09	3761	3402	4121
Age 11	8.3	-13.8	30.5	.53	669	-66	1404	.13	3031	2663	3399
Age 10	11.9	-11.0	34.9	.39	569	-188	1327	.22	2362	1983	2741
Age 9	12.8	-11.2	36.8	.38	469	-317	1254	.32	1748	1355	2140
Age 8	14.9	-10.4	40.2	.33	361	-458	1179	.47	1232	823	1641
Age 7	15.8	-10.8	42.5	.33	252	-603	1108	.63	772	344	1200
Age 6	12.8	-15.3	41.0	.45	124	-773	1020	.82	360	-88	809

Note. CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit. Scores based on the multi-level model number 3 presented in Table 3.

Multi-level analysis

The results of the multi-level approach are presented in Tables 3 and 4, and in Fig. 1, and all results presented below are based on models with relative scores. The fixed slopes model in Fig. 1 showed clear small effects in favor of the professional players from the ages 6–12 years ($ES_{\text{range}} = .22-.38$, $LCL_{\text{range}} = -.02-.13$, $UCL_{\text{range}} = .46-.62$). On average the professional players reported to have accumulated about 20% more hours of football-specific practice throughout these age categories, compared to their non-professional counterparts. The random slopes model also showed that the professional players reported more hours of accumulated football practice than the non-professionals at all age categories up to the age of 19 years. However, none of the differences were significant at any age category ($CI = 0$). Looking at the four specific types of football-specific practice, the results showed no significant differences between the groups for goal-oriented individual or peer activity, or match play at any age category ($CI = 0$). The professionals reported, though, to have accumulated significantly more hours of play activities from 6 to 8 years ($CI \neq 0$). No significant differences were identified at any other age category, although the differences at the age of 9 ($CI_{\text{range}} = -.2-74$) and 10 ($CI_{\text{range}} = -3-63$) years approached significance. For coach-led practice, the professional reported to have accumulated significantly more hours at the ages 6 and 8 years ($CI \neq 0$). For the ages 7 ($CI_{\text{range}} = -1-48$), 9 ($CI_{\text{range}} = -3-43$), and 10 ($CI_{\text{range}} = -3-41$) years the differences approached significance, but no significant differences were identified for other age categories ($CI \neq 0$).

Players' ratings of activity contribution

Results showed that activities to deliberately improve a skill, overall, were rated higher for their contribution toward improving football-specific skills than just playing for fun ($ES = .97 \pm .07$). Similar differences applied to all four skill categories (see Fig. 2). The professional players rated the overall contribution of deliberate activities higher than the non-professional players ($ES = .26 \pm .17$).

Both groups rated the activities to deliberately improve a skill as more relevant than play for improving football-specific skills ($ES = .40 \pm .08$). The professional group rated deliberate activities to be more relevant than the non-professionals ($ES = .39 \pm .20$). Both groups reported to enjoy play activities more than deliberate

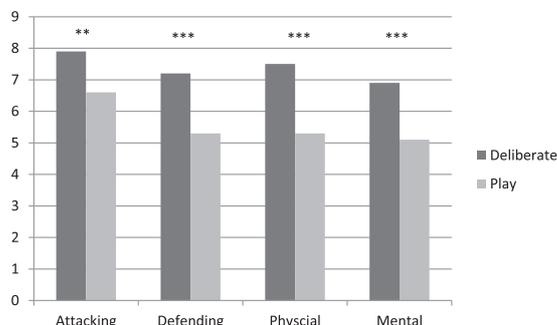


Fig. 2. Players' ratings of the contribution of activities with a deliberate intention to improve skills (deliberate) and activities for fun (play), toward improving football-specific skills in the last year. The scale ranged from 0 = not important to 10 = extremely important. Explanation of superscripts denoting probabilistic inferences: ** Clearly small, *** Clearly moderate.

activities ($ES = 1.0 \pm .08$), and the non-professional players reported to enjoy play more than the professionals ($ES = .24 \pm .16$). The professional players reported to enjoy deliberate activities more than the non-professionals ($ES = .40 \pm .22$). Both groups rated the required concentration higher in deliberate versus play activities ($ES = .99 \pm .08$), but no group differences were found in ratings of the respective activities.

Discussion

The main aim of this study was to provide an overview of the development of engagement in football-specific activities of elite youth players, in relation to current performance level. The results showed that although the professional players consistently reported to have accumulated more hours at all ages from 6 to 19 years than the non-professional players, none of these differences between the groups were significant. Within the overall amount of practice, we identified significant differences in the types of football-specific practice in some of the earliest age categories, where the professionals reported to have participated in more hours of play and organized practice than their non-professional counterparts. The results are in line with previous research that has highlighted the importance of (large quantities of) football-specific practice toward obtaining elite youth status, but also that some types of football practice may be more relevant for developing superior football skills than others (e.g., Ford et al., 2012; Ford & Williams, 2012; Ward et al., 2007; Williams & Hodges, 2005). However, the lack of significant differences between the groups also indicated that the quantity of practice should not singularly be considered a valid explanation for why some of the players have managed to obtain a senior professional contract.

The theory of deliberate practice has up to now represented one of the most influential frameworks for understanding the link between experience and performance level (Ericsson et al., 1993). Arising from this framework, it has been proposed that a volume of 10,000 h over at least 10 years is necessary to achieve expert levels (e.g., Berry et al., 2008). Later sport studies, though, have shown that elite athletes rarely accumulate such amount of practice before reaching international levels (for a review, see Tucker & Collins, 2012). Similar findings have also been identified specifically for football, where available research on elite players consistently have reported the overall accumulation of football practice to be lower than 10,000 h (for a review, see Haugaasen & Jordet, 2012). In the present study, the players overall were actually estimated to have reached 10,000 h of football-specific practice. It may not be

surprising that these elite players have spent much time practicing football throughout their career, as it has been stated that football-specific activities are the main contributor to the development of expert performance in football (Ford & Williams, 2008; Ward et al., 2007). Still, it is interesting to find that these players reported to have engaged in about 3500 h more of football-specific practice at the age of 18 years than the Belgian International players in the study of Helsen et al. (1998), some of whom actually were involved in the 1994 World Cup. This difference could be explained by differences in data collection (i.e., the inclusion of school practice in the present study) or statistical procedures, or potential cultural differences between countries (Ford et al., 2012). An additional explanation, could be related to that the global development of football in terms of resources, competence, and access to players have increased the demands at the top levels over the last 15 years, which in turn have affected the demands needed to get there (e.g., Elferink-Gemser, Huijgen, Coelho-E-Silva, Lemmink, & Visscher, 2012; Haugaasen & Jordet, 2012).

With respect to the lack of significant differences between the professionals and non-professionals in the accumulated amount of football practice throughout age categories, it seems pertinent to approach additional explanations for differences in attainment rather than simply addressing the number of hours. Still considering the quantity of practice, it could be relevant to note that the relative differences between the two groups were larger in favor of the professionals in the youngest years of participation and then decreased throughout the ages. In actual hours, these differences accounted for about 2.5 h additional practice per week for the professionals at the age of 6 years compared to the non-professionals, a difference that decreased to about 1.5 h per week at the age of 15 years. This may support a view of the professionals showing a larger motivation or commitment to practice from earlier ages than their non-professional counterparts where some superior underlying motivation and determination to succeed in the long term, "(...) a burning desire (...), a passion for it to go that extra mile" (Mills, Butt, Maynard, & Harwood, 2012, p. 1598), actually has been manifested as putting in a little bit extra over a long period of time. Players who show such a commitment at younger ages have been hypothesized to attain a higher level of performance than players who practice equally hard but commit at later ages, because it would be "(...) impossible for an individual with less accumulated practice at some age to catch up with the best individuals, who have started earlier and maintain maximal levels of deliberate practice" (Ericsson et al., 1993, p. 393; see also Wiersma, 2000). One needs to keep in mind, however, that these differences in participation were small and non-significant, and it may therefore be more relevant to view the motivation to persist in practice in relation to the relatively large overall amount of practice rather than those few extra hours per week.

In the youngest age categories we identified some indications that the professional players had spent more time in play and coach-led practice than the non-professionals. Even though they were small, these age-related differences in the amount of practice and types of activities may be important to address from a broader perspective of skill acquisition: There exists some indications that there may be periods during an individual's maturation and development that are more sensitive for acquiring certain skills (see e.g., Ford et al., 2011; Knudsen, 2004; Steele, Bailey, Zatorre, & Penhune, 2013). Janacek, Fiser, and Nemeth (2012) suggested that:

"(...) acquiring fundamentally new skills that cannot be derived from skills already possessed is the most effective before adolescence [where] an early (~before 12 years) start of learning some sports, music instruments, second language, etc. often leads to higher level of competence" (p. 9).

It could therefore be that the differences in participation at the youngest age categories have provided the professional players with a motoric and cognitive advantage for future learning and performance, compared to the non-professionals. Such a view of the existence of key developmental periods in an athlete's development is in congruence with influential theoretical frameworks of expertise development, such as the theory of deliberate practice (Ericsson et al., 1993), the DMSP (e.g., Côté, 1999; Côté et al., 2007), and dynamical systems theory (Phillips, Davids, Renshaw, & Portus, 2010). To go into depth of such a topic would be beyond the scope of this paper. However, such underlying critical periods for learning may be important to take into consideration for explaining why some of the players at later ages have managed to obtain a senior professional contract.

The quantity of practice, the motivation to persist in practice, and suggestions of critical periods for cognitive and motoric development, were all considered important elements within the initial theory of deliberate practice (Ericsson et al., 1993). For Ericsson et al. (1993), though, superior performance does not automatically develop through extensive experience, but through activities and approaches that are specially designed to improve the quality of practice. Although it seems apparent that it is important to ensure the highest possible quality of one's practice, a general application of this framework into sports has proven difficult due to the large variations among sports concerning for instance what skills are most prominent in each sport, each sports' unique characteristics, and athletes' and coaches' strategies toward practice (see e.g., Baker et al., 2003; Baker, Horton, Robertson-Wilson, & Wall, 2003; Starkes, Deakin, Allard, Hodges, & Hayes, 1996). For football, specifically, it therefore seems pertinent to look into the quality of practice more closely by addressing the three levels highlighted by Ford et al. (2012); the player, the coach, and the activity characteristics.

The individual's deliberate intention to improve was emphasized by Ericsson et al. (1993) as one important mediator toward increasing the quality of practice. These deliberate processes have been suggested to be important in developing football-specific skills through diverse and play activities (Haugaasen & Jordet, 2012; Ward et al., 2007) and football-specific practice (Toering, Elferink-Gemser, Jordet, & Visscher, 2009; Toering, Elferink-Gemser, Jordet, Pepping, & Visscher, 2012). More specifically, deliberate processes have been related to self-regulative behavior, which means that a player explicitly is aware of his/her strengths and weaknesses, knows how, and takes action, to improve. Consequently, these processes are supposed to help players learn more effectively (Toering et al., 2011).

Coaches have a significant impact on "(...) the behaviors, cognitions, and affective responses of players, influencing markedly whether and what they learn and achieve" (Cushion, Ford, & Williams, 2012, p. 1631). It could be that players learn what and how to improve through coach organization and feedback and bring this as direction and motivation for supplementary practice. This may represent a valid explanation for why the amount of time spent in coach-led and play activity at younger ages, both previously and in the present study seems to coincide with higher levels of attainment (Ford et al., 2012; Ford & Williams, 2012; Ward et al., 2007). In the present study, the professional players rated deliberate activities higher on relevance and found play activities less enjoyable than non-professionals. It may therefore appear surprising that the professionals' supplementary individual or peer practice manifests itself in play rather than in more deliberate activities. One explanation could be related to the implementation of deliberate intentions in play, which is covered by Côté et al. (2007,

2009) definition of "deliberate play". Herein lies a challenge for players, and consequently researchers, in terms of separating individual or peer activity based on the presence or absence of a deliberate intention to improve: "(...) how do children make the move from enjoying playful experiences with a field to becoming more deliberate, precise, and intense in their involvement?" (Sosniak, 2006, p. 297). For researchers, this dynamic switch between deliberate intentions or not may provide a challenge for categorizing different types of activities, and would probably be even more present in retrospective data collection compared to longitudinal designs. Another explanation could be that play activities represent an effective way of improving skills just by its characteristics. Williams and Hodges (2005) provided argumentation in favor of small-sided games and street football because of their variable and random conditions, and frequent situational repetitions. These variations allow players to experience similarities from more complex situations in a less complex environment (Aguiar et al., 2012), and have been related to developing superior perceptual skills and decision making (Ward et al., 2007; Williams, Ward, Bell-Walker, & Ford, 2012). The advantage of participating in football-specific play activities does therefore not necessarily reflect a superior explicit approach to learning, but rather a more implicit effect through the interaction between the player and the activities' characteristics. This view is one of the key elements in the ecological dynamics approach, which represents an oppositional approach to "(...) the role of cognition, information processing, and attentional processes" (Seifert et al., 2013, p. 168) emphasized by the theory of deliberate practice.

The inclusion of multi-level modeling (MLM) in the present study represents important methodological considerations toward prior and future research on practice history. First, the strength of using an MLM for longitudinal data compared to analyses of variance (i.e., independent samples *t*-test or ANOVA), relates to the MLM being able to address each individual's pattern of change over time whereas the latter procedures emphasize between-group differences across separate time points (Krueger & Tian, 2004). Consequently, a *t*-test or an ANOVA ignores "(...) trends over time and does not allow for direct comparison of (...) groups over time" (Gueorguieva & Krystal, 2004, p. 311). An average view of a phenomenon may, at worst, not represent any of the actual individuals' within-group scores. As the individual variation within each group is of crucial significance, failing to accompany these variations would lead to an uncertainty whether the relationship between practice and performance applies to every individual (Tucker & Collins, 2012). This is underlined in the present study by the differences between the fixed and random slopes models; when we allowed for individuals to randomly deviate within each group, the differences we found through the fixed slopes model also disappear. Second, the MLM is flexible and robust toward handling randomly missing data, as could be the case in data set with repeated measures in large populations, because it allows for subjects with incomplete responses to be included in the calculations (Quene & van den Bergh, 2004). A *t*-test or an ANOVA, similar to repeated measures (r)ANOVA or multivariate growth-curve analyses (r)MANOVA, are more vulnerable to missing values because they require complete data for all subjects (Gueorguieva & Krystal, 2004). One needs to keep in mind, though, that the treatment of missing data is not necessarily a straightforward issue within MLM, and researchers should apply recommended procedures in such cases (see Snijders & Bosker, 2012). Third, in opposition to single-level analyses, MLM allows researchers to "pose hypotheses about relations occurring at each level and across levels and also to assess the amount of variation at each level" (Bosselut, Heuze, Eys, Fontayne, & Sarrazin, 2012, p. 348). The decision to include or exclude variables at different levels

may affect parts of the within-group variances, which in turn could affect the results (Hopkins et al., 2009). In other words, addressing variables at different levels and across levels may provide more realistic and accurate effect and standard error estimates, compared to single-level analyses, which in turn helps control for Type I error (Gueorguieva & Krystal, 2004). It is important to note that because of the statistical procedures used in the present study, the results may therefore not be directly comparable to previous research. Fourth, even though we believe that the implementation of MLM in data sets similar to the one examined in the present study should represent an important consideration for future researchers within the field of practice history and the use of relative scores represents a more reliable presentation of the data compared to absolute scores, one must consider the practical implications of interpreting such results. Absolute scores may present a practitioner with more understandable values than addressing relative group differences, and consequently these represent a higher ecological validity toward understanding the contribution of the quantity of practice.

Our study has some methodological limitations. In regards to the sample, we cannot be sure whether some of the younger players eventually turn professional. One should therefore keep in mind that the future development of such players may add nuances to the current results. Although the data collection method in the current study proves reliable even when increasing the time between test and re-test to as much as three months, one should be careful to determine causality between engagement history and performance level. The possible memory inference related to remembering what was being practiced several years ago needs to be taken into account when interpreting the results. This issue does not only relate to the number of hours but also the categorization of activities. Future researchers should therefore seek to address practice engagement through more longitudinal designs to avoid memory error and inference. Such designs would also allow for closer dialog between researcher and participant in more precisely identifying and accounting for relevant factors contributing to the developmental process, such as coaches' and players' intentions and structural variations within practice sessions.

Conclusion

In line with previous practice history research, the results provide support for engaging in large amounts of football-specific practice from early ages. However, more research is necessary to address to what extent different variables may affect the developmental process. We argue that multi-level modeling, as used in the present study, represents an important first step for practice history research toward addressing the dynamical developmental process of football players over time. Such procedures would also allow for more closely accounting for the effects of different variables within this process.

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Article 3

From childhood to senior professional football: elite youth players' engagement in non-football activities

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Abstract

Despite the large amount of research available on how engagement in football practice relates to future performance level among football players, similar information about the contribution of non-football activities is scarce. Based on data from 745 elite youth players this study aimed to identify the characteristics and contribution of diverse participation towards elite youth and senior professional status. The data were collected using a retrospective questionnaire where the players reported the amount of time spent in other sports than football, in addition to their perceived contribution of different non-football activities for developing football skills. The accumulated hours of time spent in other sports of players who had obtained a senior professional contract were compared to non-professional players, using multilevel modelling ($n = 558$), while a t -test compared the activity ratings to each other. No significant differences were identified between professional and non-professional players' engagement history, but overall, the players rated sports similar to football to be significantly more relevant for developing football skills than other sports. The results suggests that spending time in non-football activities did not contribute to present differences in performance attainment in football, but also that potential advantages of such activities may be related to their characteristics.

Keywords: *soccer, specialisation, diversification, sampling, expertise*

Introduction

There exists a continuous debate over the benefits and the costs associated with various types of training performed during different stages of an athlete's development (Baker & Côté, 2006). One central topic in this debate has been the relationship between early specialisation and diversification, where both approaches have received support from various research (for a review, see Baker, Coble, & Fraser-Thomas, 2009). The advantages of early specialisation towards proficiency root from one of the most robust findings in behavioural research, which is the positive relationship between the amount of practice and level of achievement (see e.g., Wiersma, 2000). Ericsson, Krampe, and Tesch-Römer (1993) argued that, independent of domain, a long period of intensive preparation is necessary to reach international levels of performance. The participation was recommended to coincide with crucial periods of motoric and cognitive development, which consequently led to the proposed advantage of early engagement in domain-specific deliberate practice.

Contrary to early specialisation, participating in diverse or play activities has more recently been highlighted as important in the early phases of development, where the variation in activities is assumed to provide a motoric or cognitive basis for future learning of sport-specific skills (Côté, Lidor, & Hackfort, 2009). Consequently, this may circumvent the need for some of the many hours of domain-specific practice assumed to be needed to reach expertise (Baker, Côté, & Abernethy, 2003; Côté, Baker, & Abernethy, 2007). This view has found support in studies that have identified that expert performers do not singularly engage in domain-specific activities from early ages, but rather engage in various sports and activities that are also inherently enjoyable (Baker et al., 2003; Berry, Abernethy, & Côté, 2008; Côté, 1999). The advantages of diversification have also been extended outside simply providing a wider motoric basis for skill development: While early specialisation has been linked with negative consequences such as isolation, injuries, compromised growth and maturation, overdependence on others, burn-out and drop-out (Côté, Lidor et al., 2009; Malina, 2010), diversification have

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been assumed to provide more healthy developmental environment in terms of prosocial behaviour, identity, social capital, life skills and diverse peer groups (Côté, Horton, MacDonald, & Wilkes, 2009). That being said, recent reviews on this topic have stated that the literature available is inadequate to draw clear conclusions about the potential negative or positive effects of specialisation versus diversification (Baker et al., 2009; Malina, 2010).

In football there is relatively solid evidence for the importance of participating in large amounts of football-specific practice to reach elite youth and senior levels (Ford, Ward, Hodges, & Williams, 2009; Ford & Williams, 2012; Ford et al., 2012; Haugaasen, Toering, & Jordet, 2014; Helsen, Starkes, & Hodges, 1998; Ward, Hodges, Starkes, & Williams, 2007). In their review of expertise development in football, Haugaasen and Jordet (2012) pointed out that the knowledge about how participating in other activities may contribute to football players' development is inadequate to draw clear conclusions. To this date, only three studies on football players' practice history have addressed this issue (Ford & Williams, 2008; Ford et al., 2009, 2012). Ford et al. (2012) did only report the number of sports outside football and did not report number of hours spent in other sports. Both the study of Ford et al. (2009) and Ford and Williams (2008) had relatively low group-samples of 11 and 10, respectively, which make it difficult to generalise to larger populations. This study therefore sought to determine the extent of elite youth football players' participation in non-football activities, and the potential contribution of this participation towards obtaining a senior professional contract.

Materials and methods

Participants

The participants in this study were 745 elite football players within the ages 14 to 21 years ($M_{age} = 16.2$, $s = 1.8$). The players represented all clubs participating in the 2011 Norwegian PL. Ten players were removed due to failing to report any of the variables included in the analyses, leaving 735 players for the initial, descriptive analyses. For all analyses comparing groups based on contract status, two exclusion criteria were applied: First, all players younger than the age of 15 years ($n = 164$) were removed, the age at which a player first is eligible to sign a professional contract. Second, 13 players were removed due to missing contract status, leaving a total of 558 players divided into one group of 86 professional ($M_{age} = 18.7$, $s = 1.3$) and one group of 472 non-professional players ($M_{age} = 16.5$, $s = 1.3$).

Procedure

Before the start of the data collection, consent for conducting the project and storing data was collected from the National Data Protection Authority (NSD). This study followed all ethical guidelines provided by the NSD and the Regional Ethical Committee. An information letter was distributed by the clubs to all coaches, the players and their parents, and all players who agreed to participate in the project signed a written consent. For players younger than the age of 18 years a written consent from their parents was collected. The data were collected at the clubs' training or match facilities, as part of a larger project, with representatives from the research group present for supervision and guidance.

The questionnaire. Within the domain of football, the use of retrospective participation history questionnaires to identify athletes' engagement profiles during their development has been a common method of data collection (e.g., Ford & Williams, 2012; Ford et al., 2009, 2012; Haugaasen et al., 2014; Helsen et al., 1998; Ward et al., 2007). The original questionnaire demonstrated good test-retest reliability ($r = .84-.94$; Helsen et al., 1998). Ward et al. (2007) showed that the correlation between test and re-test was stronger for the last 5 years prior to collection ($r = .95-.92$), and weaker and non-significant for the previous years ($r = .68-.62$, $P > .05$). The reliability and concurrent validity of the questionnaire used in two of the most recent studies (Ford & Williams, 2012; Ford et al., 2012) were shown in Ford, Low, McRobert, and Williams (2010): They found a large Intraclass Correlation Coefficient (ICC) of .87 between test and re-test, and an ICC of .76 between players' and parents' responses.

The questionnaire used in the present study was adapted from the one used in studies of Ford et al. (2012) and Ford and Williams (2012), and adjusted and translated to Norwegian. A pilot study was conducted including 19 players ($M_{age} = 17.6$, $s = 1.0$) from a local amateur club, and minor adjustments were made on the translation. Haugaasen et al. (2014) tested the reliability of the present version of the questionnaire; the authors identified a large ICC of .86 (95% CI = .77-.93) between the test and a re-test that were conducted three months apart. No consistent differences across age categories were identified. They also collected a training diary from a sample of players where parents and coaches confirmed the content, where the ICC between test and diary were reported to be .71 (95% CI = .30-.80).

Specifically, the questionnaire contained three sections. (1) In the first section the players were asked to report the amount of time spent in football-

Table I. The categorisation and definitions of sports outside football.

Categorisation	Definition
Team sports similar to football	Team sports that share similarities with football in terms of organisation, rules, tactical/technical solutions, etc. (e.g., handball, ice-hockey, bandy, rugby, basketball, etc.)
Team sports dissimilar to football	Team sports that do not share the abovementioned similarities with football (e.g., volleyball, cricket)
Individual sports	Individual sports (cross-country skiing, athletics, gymnastics, tennis, golf, badminton etc.)

Note: Categories developed based on suggestions made by Baker et al. (2003).

specific activities throughout age-categories (presented in detail in Haugaasen et al., 2014). (2) The second section contained similar information for activities outside football. The players were asked to report the total number of leisure-time sports (organised by club or with peers) they had participated in for more than 3 months for all age categories, which sport it was, the age-span for participation, and the main reason for participation. Then the players reported the amount of hours spent in each sport which were then combined into a yearly sum, categorised into three activity categories based on suggestions made by Baker et al. (2003; see Table I). (3) Finally, the players were asked to rate the three activity categories' relevance, required concentration, and perceived enjoyment towards football-specific skill development on a scale from 0 to 10.

Statistical analysis

All data was analysed in SPSS 18. The professional and non-professional players' longitudinal development of accumulated hours of practice in activities outside football was investigated by using multilevel modelling (MLM) through a linear mixed model procedure. This procedure was adopted to account for hours of accumulated practice as repeated measurements and individual variations within each group (e.g., Gueorguieva & Krystal, 2004; Hopkins, Marshall, Batterham, & Hanin, 2009; Krueger & Tian, 2004).

In preparation for the analyses, within-subject modelling was applied, where each participant's scores were combined into a single unit of analysis. Such a procedure is recommended to avoid interdependence of observations (Hopkins et al., 2009). To estimate the overall means of the accumulated hours of practice of the two groups, a two-level random slopes model with the longitudinal measurements (level 1) nested within individuals (level 2) was created. The dependent variable in the model was the absolute values of the accumulated hours of practice in sports outside football (AccumOtherSports). The fixed factors were contract status (Contract2Gr), Measurement Index

(MI) and the interaction between contract status and MI (Contract2gr \times MI). The contract status variable was coded to represent the presence (1) or absence (0) of a professional contract, while MI was a categorical variable representing each scores' measurement time from 6 to 21 years. The random factors in the model were the intercept, the variance represented by the professional players (xVarP), the variance represented by non-professional players (xVarNonP \times MI) and a new variable of MI that was adjusted to a mean value of zero at the age of 13 (MI - 13). The variables xVarP and xVarNonP were coded to represent the presence (1) or the absence (0) of the players' respective contract statuses. To determine the model's fit (Model 3), it was compared with the base line model (Model 1) and a fixed slopes model (Model 2), through the values of -2LL (see Table II).

To ease the interpretation of the differences between the two groups throughout the different age-categories, an adjustment was made to the MI-variable: The MI was dummy-coded into 14 separate variables to represent the additional practice conducted by the professionals (1) compared to the non-professionals (0) at each separate age-category

Table II. Multilevel model for accumulated hours of practice in sports outside football.

	Model 1	Model 2	Model 3
Fixed effects			
γ_{01} professional	297.0	11.7	11.7
γ_{01} non-professional	263.7	17.2	19.1
γ_{10} measurement index ^a		—	—
γ_{11} MI \times contract status ^a		—	—
Random effects			
U_0 residual intercept	136241.3	102966.3	6749.7
e intercept between players	195442.6	177619.0	426910.9
U_1 xVarP		159509.9	532458.9
U_2 measurement index \times xVarNonP		0	2541.1
U_3 (measurement index - 13)			8160.2
Model fit			
-2LL	89768.4	87912.3	77319.7

Notes: Model 1: Empty model. Model 2: Fixed slopes (random intercept) model. Model 3: Random slopes model.

^aThe year-by-year estimates for MI and MI \times contract status in Model 3 are presented in Table 4.

from 6 to 20 years (no group comparison was possible at the age of 21 years due to the lack of non-professional players at this age group). These 14 variables then replaced the (Contract2Gr) and (Contract2Gr \times MI) as fixed factors in the random slopes model, from which the differences between the two groups were identified for each separate age-category. These differences were investigated with both absolute and relative values of the dependent variable. The first were used to evaluate the actual differences in the amount of practice between the two groups. The latter were included as a relative (percentage) representation of these differences, where the dependent variable was log-transformed by a factor of 100 (LNAccumOtherSports). For all analyses, the lower (LL) and upper (UL) values of a 90% CI values were used to evaluate the true positive or negative differences, while the *P*-values were added to supplement these differences with a measure of statistical significance (Gardner & Altman, 1986). Similar procedures were then conducted for each of the three activity categories (see Table I) as dependent variables.

An independent samples *t*-test was conducted to analyse group differences (professional and non-professional) in the starting age, finish age and mean age-range of non-football participation. To compare the ratings between the three different types of non-football activities, a one-sample *t*-test was used to analyse difference scores of the activities' ratings. A MANCOVA was used to determine differences in the activity ratings between the two groups of players, where age was added as a covariate to control for potential age-differences. A one-sample *t*-test was conducted to analyse difference-scores in the players' overall participation in football versus other sports, and the three categories of sports outside football towards each other. An independent samples *t*-test was used to compare the amount of football-specific practice engaged in by players who reported to have participated in other sports and those players who only participated in football. The α -limit was set to .05 for both the *t*-tests and the MANCOVA, and the *P*-values were Bonferroni-adjusted for the latter. The effect sizes of Cohen's *d* were used to determine the relative effect of the differences.

Results

Number of sports and participation age-span

Overall, 63% of the players reported to have participated in one or more sports outside football some time during their career, while 37% of the players reported to have only participated in football (see Table III). The mean reported age-range for participating in other sports was 8.8 ($s = 2.3$) to 12.2 ($s = 2.1$) years. No significant differences were identified between professional and non-professional players in the amount of years in which they participated in other sports. The professional players reported to have started ($M = 9.3$, $s = 2.4$) and finished ($M = 13.1$, $s = 1.9$) their participation in sports outside football later than non-professionals ($M = 8.8$, $s = 2.2$ and $M = 12.1$, $s = 2.2$). However, only the age-difference at which they finished was significant ($d = .49$, $P < .05$).

Most common sports

Among those players who reported to have spent time in other sports, the most popular team sports were team handball (27%), ice-hockey (5.1%) and floor bandy (2.3%). The most popular individual sports were cross-country skiing (11.9%), gymnastics (8.4%) and athletics (8.1%). Categorised by the sports' similarities to football, 40% of the players responded to have spent time in team sports similar to football, 58% in individual sports and only 2% in team sports dissimilar to football.

Reasons for participating in other sports

Of the players participating in other sports, the main reported reason for participation was because of *fun and enjoyment* (50.4%). Other reasons were categorised into *social reasons* (16%), *try something new or different* (9.9%) and *perceived pressure from a family member* (2.4%). Some players participated to *improve football-specific skills* (9.6%), while 7.5% of the players reported to have had *specific goals towards the respective sport* itself; 4.2% of the responses were categorised as *other reasons/don't know*.

Table III. Percentages of players (of within-group total) practicing other sports than football at some point during career.

Level	n	0 sports	1 sport	2 sports	3+ sports	Mean number of sports
Professional	86	36.8	23.0	29.9	10.3	1.1 ($s = 1.0$)
Non-professional	472	36.2	34.6	18.7	10.5	1.0 ($s = .99$)
All players	735	37.3	32.3	20.1	10.3	1.0 ($s = 1.0$)

Multilevel analysis of accumulated hours spent in other sports

The step-wise build-up of the multilevel model is presented in Table II. This table also shows the effect estimates of included variables and how the model improves (-2LL) through the different steps. The estimated means for the two contract groups (professional and non-professional) combined, and the estimated relative and absolute differences between the two groups are presented in Table IV. No significant differences were identified between the two groups of players at any age category for the overall accumulated hours of non-football participation (CI = 0), although the professional players reported lower engagement than the non-professionals for most age-categories. No significant

differences between the groups were identified for neither the absolute nor the relative scores for accumulated hours of participating in team sports similar to football (CI = 0), team sports dissimilar to football (CI = 0) or individual sports (CI = 0).

Football-specific versus non-specific practice

The one-sample *t*-test revealed that the players, overall, spent significantly more time in football than in other sports at all age categories from 6 to 21 years, both compared to the overall average of non-football participation (all *d* > 1.4, *P* < .05) and the average of only those players who responded to have participated in others sports (all *d* > 1.3, *P* < .05; Figure 1).

Table IV. Year-by-year estimates of the random slopes model with relative (log-transformed) and absolute differences (90% CI) between groups of professional and non-professional players, and estimated absolute mean scores (90% CI) of the two groups combined.

Measurement index	Relative scores					Absolute scores					
	Differences (prof. and non-prof.)	90% CI		<i>P</i>	Differences (prof. and non-prof.)	90% CI		<i>P</i>	Estimated means of both groups	90% CI	
		LL	UL			LL	UL			LL	UL
Age 20	-9	-100	59	.67	-44	-127	38	.38	637	578	837
Age 19	-3	-94	57	.69	20	-60	100	.68	603	516	758
Age 18	7	-96	47	.57	38	-46	121	.46	587	488	718
Age 17	5	-112	23	.28	39	-53	130	.49	563	477	698
Age 16	-9	-123	5	.13	4	-98	106	.95	535	456	671
Age 15	-9	-102	20	.27	-9	-123	104	.89	490	429	640
Age 14	-19	-100	16	.24	-23	-150	103	.76	441	387	594
Age 13	-39	-95	16	.24	-24	-165	116	.77	386	338	545
Age 12	-42	-73	35	.57	-24	-179	130	.80	319	282	490
Age 11	-41	-61	43	.78	-24	-193	146	.82	251	214	425
Age 10	-59	-61	42	.76	-24	-208	160	.83	185	144	359
Age 9	-45	-47	56	.88	-19	-218	181	.88	125	74	295
Age 8	-24	-46	60	.83	-19	-234	197	.89	80	11	240
Age 7	-18	-60	53	.92	-27	-258	204	.85	43	-39	199
Age 6	-21	-74	56	.82	-35	-282	211	.81	15	-81	167

Notes: CI = confidence interval; LL = lower limit; UL = upper limit. Scores based on the random slopes model presented in Table II.

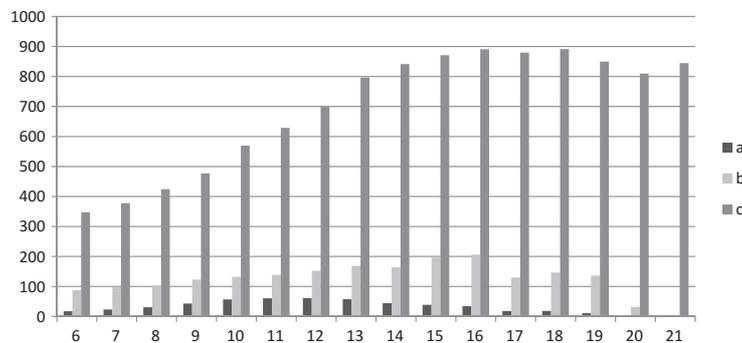


Figure 1. The average sums of hours per year from 6 to 21 years of (a) practice in sports outside football including all players, (b) practice in sports outside football including only those players who responded to have participated in other sports and (c) football-specific practice including all players.

The independent samples *t*-test revealed that players who spent time in other sports at one age also spent more time in football-specific practice at that specific age than players who only participated in football. However, these differences were non-significant (all $P > .05$), except for the ages 10 and 13 years ($d_{10} = .24$, $d_{13} = .12$; $P < .05$). Only from the ages 18 to 20 years did the players who only participated in football score higher on the amount of football-specific practice compared to players who participated in other sports. The differences were non-significant for the ages 18 and 19 years ($P > .05$) but significant for the age of 20 years ($d > 1.4$; $P < .05$).

Activity ratings

Overall, the one-sample *t*-test revealed that the players rated team sports similar to football to be more relevant towards improving football-specific skills ($d = 1.4$, $P < .05$), required higher concentration ($d = .71$, $P < .05$) and represented more enjoyment ($d = .84$, $P < .05$) than team sports dissimilar to football. Similarly, the players rated team sports similar to football to be more relevant ($d = .23$, $P < .05$), required higher concentration ($d = .30$, $P < .05$) and represented higher enjoyment ($d = .42$, $P < .05$) than individual sports. The players rated individual sports to be more relevant than team sports dissimilar to football ($d = .97$, $P < .05$), required higher concentration ($d = .29$, $P < .05$) and was more fun ($d = .23$, $P < .05$). The MANCOVA, however, showed no significant differences between the professional or non-professional players, concerning the different activities' relevance, required concentration and enjoyment ($P > .05$).

Discussion

The main aim of this study was to identify to what extent elite youth football players engage in other sports outside football from childhood and up to a potential senior professional contract, and how this participation may affect their performance level attainment. We found that about 2/3 of the players in our sample reported to have participated in additional sports outside football at some point during their career, although the amount of hours spent in these activities was small compared to the hours spent in football-specific activities. We identified no significant differences at any age between professional and non-professional players in the amount of accumulated hours spent in sports outside football. Still, the players, overall, reported that they perceived sports similar to football to be more relevant for developing football skills than sports dissimilar to football.

Early sport sampling or diversification is represented by participating in multiple sports and/or play activities in early stages of development, where the variation in activities is suggested to provide athletes with important fundamental personal, physical and mental skills for continued participation in sport (Côté, Horton et al., 2009). Aside with early specialisation, both of these approaches have been suggested to be potential pathways towards later elite performance within the Developmental Model of Sport Participation (DMSP; see e.g., Côté et al., 2007). As 63% of the players in the present study reported to have participated in sports outside football and 37% only have participated in football, both pathways of the DMSP seem to be present within this elite group. However, such a dichotomous model does not necessarily reflect the athletes' individual variations in development or the underlying variables that could affect this development, because it is "likely that these variables can combine into a number of developmental pathways" (Ford & Williams, 2012, p. 349; Gulbin, Weissensteiner, Oldenzel, & Gagné, 2013). Such variables could include sports' similarities (Baker et al., 2003), number of hours spent in different activities (Ford & Williams, 2012), variation in the content of different activities (Ford et al., 2009) or the level at which an athlete practices and competes (Gulbin et al., 2013). Through earlier studies on elite youth football players, for instance, the early engagement hypothesis emerged as an alternative pathway to the two originally included in the DMSP, to cover the large amount of time such players have spent in football-specific play rather than multiple sports or deliberate practice (e.g., Ford & Williams, 2012; Ford et al., 2009). It therefore seems pertinent to address some of these potentially underlying variables more closely.

Implemented within the pathways of the DMSP is the assumption that an athlete would progress through different stages and transitional periods (for an overview see e.g., Stambulova, Alfermann, Statler, & Côté, 2009). The average age-range of non-football participation in the present study (about 9 to 12 years), reflected the upper age-categories of the sampling stage within the early diversification pathway (Côté, Horton et al., 2009). The professional players reported to have started and finished their non-football participation somewhat later than their non-professional counterparts, although the age at which they finished was the only significant difference. There were no significant differences between the two groups in the amount of years spent in such activities, and in combination, these results could indicate an advantage of later rather than earlier diversification. It must be noted, though, that the difference in finish age was only one

year on average between the two groups and even less for starting age, so one should maybe not put too much emphasis on such a difference in participation ages.

By engaging in various activities, athletes could develop a wide basis of skills that both could contain transferable elements to other activities but also represent a “‘movement vocabulary’ which they can use as the basis for subsequent sport-specific development” (Abbott & Collins, 2004, p. 402; see also Gulbin et al., 2013). Consequently, early sport diversification may circumvent the need for some of the many hours of sport-specific practice needed to reach top levels of performance (Baker et al., 2003). In the present study we did not find support for the argument that the amount of time spent in other sports reduced the amount of football-specific practice. On the contrary, those players participating in other sports actually participated in more football practice within the same year, compared to those who only participated in football. Additionally, time spent in sports outside football was significantly smaller compared to their engagement in football-specific practice at all ages. Even within the average age-range in which the players most commonly participated in other sports they spent from 75% to 100% of their time in football-specific practice. These results would indicate that football practice has been an important contributor towards developing football-specific skills, which is in line with previous practice history research in football (for a review, see Haugaasen & Jordet, 2012). Furthermore, the estimates from our MLM showed no significant differences at any ages between the professional and non-professional players in the accumulated hours spent in sports outside football, although the non-professionals almost consistently reported a higher amount of such engagement. If some players (i.e., professionals) should have gained an advantage from participating in other sports, this was not possible to determine through simply addressing the amount of hours.

Even though we did not identify any significant differences within this elite group of players in the amount of time spent in other sports, this does not necessarily mean that they would not or could not have gained some advantage through such participation. First, Baker et al. (2003) stated that the potential transfer of skills acquisition in one sport to performance or learning of sport-specific skills in another could be related to similarities between the activities (see also Weigelt, Williams, Wingrove, & Scott, 2000). We did find some support for such a view, as our players, overall, rated team sports that share a number of characteristics with football (i.e., handball and ice-hockey) to be significantly more relevant for developing football-specific skills than

other sports. However, as there were no significant differences between professional and non-professional players in the amount of time spent in sports similar to football, we were not able to relate the players’ perceived advantages of participating in such sports to any actual difference in participation. The potential transfer of skills may therefore represent a more complex issue than simply addressing different sports’ shared characteristics, and other factors thought to affect this process are for instance the presence of athletes’ deliberate intention to improve sport-specific skills, the difficulty of the task, the level of the athletes and the type of skills being practiced (Abbott & Collins, 2004; Ferrari, 1999; Fischman, Christina, & Vercruyssen, 1981). Second, it has been suggested that the potential advantages of participating in other sports may be identified in social or psychological adaptations, and not only sport-specific motor skill development (e.g., Baker et al., 2003; Côté, Horton et al., 2009). With specific relevance for the present study it has been highlighted that sport sampling, especially with the absence of deliberate practice, could provide “enjoyable experiences for young athletes and potentially foster motivation to continue in sports throughout development and later in life” (Côté, Horton et al., 2009, p. 8). In this study, approximately 76% of the players participating in other sports than football did so for fun, social reasons, or to try something new, and not to deliberately improve specific skills. It may therefore be that participating in other sports could represent one important reason for why many of the players have continued their participation in football, by reducing the potential risks associated with specialising in one single sport (i.e., burnout, drop out) and/or increasing the gains or presence of constructs that are thought to positively affect the underlying motivation for continued sport involvement (i.e., enjoyment) (Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993; Wiersma, 2000). However, as this sampling of sports was not representative for all the players in the present study one should be careful to draw generalisable conclusions for such an elite group.

A common conception of analysing the developmental processes of top level athletes has been that understanding the mechanisms underpinning their development is considered relevant when designing recommendations for those involved with youth athletes (Williams & Ford, 2008). Recommendations founded within such an elite focus, however, often come at the expense of the values that should be considered representable for the vast majority of sport participants (Malina, 2010; Miller & Kerr, 2002): The processes of talent identification and development get occupied with developing successful adult athletes by implementing the values and

characteristics of adult performance onto youth development and competitions (Pankhurst & Collins, 2013), fragmenting sport-specific skill development from the holistic development of young children, whose “goal is to ‘grow up’ – biologically grow and mature and behaviourally develop” (Malina, 2010, p. 369). Miller and Kerr (2002) argued that practitioners need to adopt a philosophy where sport is conceptualised as an arena where the development of sport excellence occurs as emergent to personal development rather than a goal in itself. Such a consideration would be especially important for football practitioners where many young players devote their lives to an activity where the chances of success are limited (Haugaasen & Jordet, 2012), and de Vasconcellos Ribeiro and Dimeo (2009) actually go as far as stating that “it does seem somehow immoral (or least, questionable) to allow so many to pursue a fantasy” (p. 731).

Maybe practitioners not necessarily should be occupied with what kind of activities children engage in but rather embrace and nurture this engagement as a manifestation of an underlying commitment to practice (see e.g., Haugaasen et al., 2014). First, such motivation and commitment are considered essential for long-term engagement in sports (Scanlan et al., 1993), and consequently potential long-term health benefits but also as important precursors to expertise (Williams & Hodges, 2005). Second, this may counter the lack of consensus among researchers and practitioners with respect to when children should engage in different activities (Ford, Hodges, & Williams, 2014). With respect to the latter, Ford et al. (2014) also suggested that one solution for practitioners is to apply evidence-based theories and principles from motor learning literature (i.e., practice and instruction, and motivation), rather than engaging in a discussion whether athlete’s engagement fit into generic terms such as “early specialisation” or “early diversification.”

There are some methodological limitations related to this study which should be taken into account when interpreting the results. First, the retrospective recall data may be limited by memory error and inference which in turn could affect the results. Even though such procedures and data have been shown to be both valid and reliable (e.g., Ford et al., 2010; Haugaasen et al., 2014), one should be careful to determine casual effects. As the present study, though, has used data-collection procedures similar to previous football-specific practice history studies, the discussion of the role of non-football engagement may still be considered relevant with respect to the findings in such studies. Second, the population included players at various age groups, and even though some of these players have obtained a professional contract we cannot be sure whether other

players will achieve the same at later career stages. The future development of players may therefore affect the current results. Third, one needs to be careful to draw generalisable recommendations from such an exceptional minority of elite youth players to the overwhelming number of football players world-wide who may neither have the ability nor desire to reach such a level (FIFA, 2007; Malina, 2010).

Many authors have underlined the lack of consensus about the potential benefits or negative consequences of early specialisation (Gould, 2010; Kaleth & Mikesky, 2010; Malina, 2010; Mattson & Richards, 2010). Haugaasen and Jordet (2012) highlighted the need for implementing more sport-specific nuances to such a debate, where both sport-specific studies, such as the present study, but also comparative studies across sports would represent important contributions (e.g., Baker et al., 2003). Inter-disciplinary and longitudinal designs could be a natural progression of the necessity of analysing individual developmental patterns of athletes achieving various levels of performance. Potentially such research could offer more sport-specific and nuanced recommendations for when youth athletes should be exposed to different activities.

Conclusion

The present results indicate that it is possible to reach elite youth and senior professional status by engaging in other sports in addition to football in the early years of development. Although it still is possible that participation in non-football activities can be linked to motivational, emotional and social benefits, the amount of time spent in different non-football activities seems to have represented a limited contribution to present differences in performance attainment specifically in football. On the contrary, it appears that one valid explanation for why some players have managed to obtain a professional contract may lie within the football-specific practice, where these elite players have spent the majority of their practice time.

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Information letter clubs, senior project

Information letter players, senior project

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Sheik Safdar

Permissions Coordinator

Email: ssafdar@wiley.com



Geir Jordet
Seksjon for coaching og psykologi
Norges idrettshøgskole
Postboks 4014 Ullevål Stadion
0806 OSLO

Vår dato: 27.04.2011

Vår ref: 26657 / 3 / LT

Deres dato:

Deres ref:

TILRÅDING AV BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 09.03.2011. All nødvendig informasjon om prosjektet forelå i sin helhet 19.04.2011. Meldingen gjelder prosjektet:

26657

Behandlingsansvarlig
Daglig ansvarlig

Tippeligaen 14-21

Norges idrettshøgskole, ved institusjonens overste leder
Geir Jordet

Personvernombudet har vurdert prosjektet, og finner at behandlingen av personopplysninger vil være regulert av § 7-27 i personopplysningsforskriften. Personvernombudet tilrår at prosjektet gjennomføres.

Personvernombudets tilråding forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, eventuelle kommentarer samt personopplysningsloven/helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/forsk_stud/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, <http://www.nsd.uib.no/personvern/prosjektoversikt.jsp>.

Personvernombudet vil ved prosjektets avslutning, 31.12.2025, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen


Bjørn Henrichsen


Lis Tenold

Kontaktperson: Lis Tenold tlf: 55 58 33 77
Vedlegg: Prosjektvurdering

Personvernombudet for forskning



Prosjektvurdering - Kommentar

Prosjektnr: 26657

Utvalget omfatter alle mannlige unge elitefotballspillere i alderen 14-21 år, og trenerne deres, som er en del av en elitesatsing i en tippeligaklubb i 2011, totalt ca. 1200 personer.

Førstegangskontakten til klubbene opprettes av prosjektleder, mens førstegangskontakten til spillere, foresatte og trenere skjer gjennom den enkelte klubb.

Opplysningene samles inn gjennom spørreskjemaer til spillere og trenere.

Det gis skriftlig informasjon og innhentes skriftlig samtykke for alle deler av prosjektet. For barn/ungdom under 16 år innhentes samtykke fra foresatte.

Personvernombudet finner skrivene mottatt 19.04.2011 tilfredsstillende.

Personvernombudet finner at det samles inn og registreres sensitive personopplysninger om helseforhold, jf. personopplysningsloven § 2 nr. 8 bokstav c.

Prosjektslutt er angitt til 31.12.2011 men prosjektleder ønsker å oppbevare datamaterialet frem til utgangen av 2025 for å ha mulighet for å gjennomføre oppfølgingsundersøkelser. Utvalget blir informert om dette og samtykker skriftlig til oppbevaring av innsamlede opplysninger.

Ved publisering vil ingen enkeltpersoner kunne gjenkjennes.

Personvernombudet minner om at en eventuell oppfølgingsundersøkelse må meldes i god tid før oppstart.



UNIVERSITETET I OSLO
DET MEDISINSKE FAKULTET

Førsteamanuensis Geir Jordet
Seksjon for coaching og psykologi
Norges idrettshøgskole
Postboks 4014 Ullevål Stadion
0806 Oslo

**Regional komité for medisinsk og helsefaglig
forskningsetikk sør-øst B (REK sør-øst B)**
Postboks 1130 Blindern
NO-0318 Oslo

Telefon: 22 84 46 24

Dato: 10.03.11
Deres ref.:
Vår ref.: 2011/119-1

E-post: post@helseforskning.etikkom.no
Nettadresse: <http://helseforskning.etikkom.no>

2011/119b Utvilking av unge elite fotball spillere

Prosjektleder: Geir Jordet
Forskningsansvarlig: Norges Idrettshøgskole, ved øverste ledelse

Vi viser til søknad om forhåndsgodkjenning av ovennevnte forskningsprosjekt. Søknaden ble behandlet av Regional komité for medisinsk og helsefaglig forskningsetikk, REK sør-øst B, i møte 09.02.2011.

Saksfremstilling:

Prosjektet er et ph.d-prosjekt. Formålet er å utvikle kunnskap om hvordan unge norske elite- fotballspillere utvikler sine fotballmessige ferdigheter under psykisk press. Målgruppen for studien er 800 unge gutter og menn i aldersgruppen 14 – 21 år som skal rekrutteres gjennom elitesatsingen i norske tippeligklubber pr. 2011.

Forskningsspørsmålene fokuserer på hvordan de unge spillerne takler psykisk press og hvordan dette presset påvirker deres utvikling, hva som kan identifiseres som risikofaktorer og hvordan de opplever å takle stresset. Dataskaping skal skje gjennom ulike internasjonale og nasjonale selvrappoterende deskriptive spørreskjemaer. Spørreskjemaene kartlegger deres sosiale bakgrunn, treningsprofil, prestasjonsnivå, selvoppfatning, emosjonelt stress og selvregulering. Studien er samtykkebasert. Opplysningene som registreres i prosjektet er direkte personidentifiserende med navn, adresse og fødselsdato. Alle data i studien er planlagt lagret på Norges idrettshøgskoles forskningsserver i prosjektperioden.

Forskningsetisk vurdering

Formålet med studien er å studere stress og selvregulering i læringsprosesser hos unge elitefotballspillere, basert på egenrapporterte data via spørreskjema.

Komiteen oppfatter prosjektet til å være samfunnsvitenskapelig idrettsforskning som ikke vil gi ny kunnskap om helse eller sykdom. Det faller dermed utenfor lovens virkeområde jf.

helseforskningsloven § 4 a sammenholdt med § 2 første ledd og er derfor ikke fremleggelsespliktig.

Vedtak

Prosjektet faller utenfor helseforskningslovens virkeområde jf. helseforskningsloven § 2 og er dermed ikke fremleggelsespliktig, jf. helseforskningsloven § 10 jf. forskningsetikkloven § 4 annet ledd.

Prosjektleder anbefales å ta kontakt med NSD for en eventuell gjennomføring av prosjektet etter regelverket som gjelder for behandling av personopplysninger i samfunnsvitenskapelige forskningsprosjekter.

Komiteens vedtak kan påklages til Den nasjonale forskningsetiske komité for medisin og helsefag, jfr. Helseforskningsloven § 10, 3 ledd og forvaltningsloven § 28. En eventuell klage sendes til REK sør-øst B. Klagefristen er 3 uker fra mottak av dette brevet, jfr. Forvaltningsloven § 29.

Vi ber om at alle henvendelser sendes inn via vår saksportal:
<http://helseforskning.etikkom.no> eller på e-post til post@helseforskning.etikkom.no.

Vennligst oppgi vårt referansenummer i korrespondansen.

Med vennlig hilsen,

Stein Opjordsmoen Ilner (sign.)
Professor dr. med
Komiteleder


Katrine Ore
Komitéssekretær/Rådgiver

Kopi:

- Pierre-Nicolas Lemyre, Seksjonsleder, Norges Idretthøgskole, nicolas.lemyre@nih.no

Oslo, juni 2011

FORESPØRSEL OM DELTAGELSE I PROSJEKTET: Tippeligaen 14-21

Til foreldre og foresatte

Norsk Toppfotballsenter (NTFS) har sammen med Norges idrettshøgskole (NIH) startet et prosjekt som vil skaffe verdifull informasjon om unge elitespillere i aldersgruppen 14-21 år.

Gjennom prosjektet søker vi å finne hvordan man bedre kan hente ut prestasjonspotensialet blant unge elitespillere i Norge. Dette gjøres ved blant annet å kartlegge spillernes treningshistorikk, treningshverdag, læringsstrategier, motivasjon, samt håndtering av med- og motgang.

Vi vil samle inn denne informasjonen gjennom et spørreskjema, der vi kommer ut til den enkelte klubb for å administrere dette.

Prosjektdeltagelse for din sønn innebærer deltagelse i en 2 timers samling hvor han skal fylle ut et spørreskjema. Etter en time blir det en pause hvor vi sponser pizza og brus. Dette vil skje i klubbens lokaler på ettermiddagstid hvor treneren vil være tilstede. En representant fra forskningstemaet vil administrere prosessen i sin helhet.

Vi ønsker også at treneren til din sønn skal fylle ut et spørreskjema hvor de skal gi deres anbefaling av din sønns posisjon på banen samt gi en rangering (skala 1-5) av din sønns fysiske og mentale egenskaper, hans tekniske/taktiske ferdigheter og hans livsstil. Opplysninger treneren gir vil bli sammenstilt med de opplysninger sønnen din gir i spørreskjemaet. For at vi kan be treneren om å gi disse vurderingene må du/dere samtykke til dette. Dette gjøres ved at du/dere på samtykkeerklæringen og skriver navnet på treneren til din sønn.

Enkelte lag, trenere og spillere vil bli bedt om fortsatt deltagelse og oppfølging senere i 2011 sesongen.

Utfyllingen av spørreskjemaet og eventuelle oppfølgingsundersøkelser er frivillig.

Alle data vil behandles fullstendig konfidensielt der kun forskerteamet vil ha innsyn i spilleres/treneres identitet.

Utfyllingen av spørreskjemaet og eventuelle oppfølgingsundersøkelser er frivillig. Du/dere kan trekke deg fra prosjektet når som helst uten å måtte begrunne det. Allerede innsamlete opplysninger om deg vil så fall bli anonymisert.

Prosjektet forventes å være avsluttet til utgangen av 2012, men vi ønsker å oppbevare innsamlete opplysninger foreløpig frem til utgangen av 2025 for å ha mulighet for å foreta oppfølgingsundersøkelser. Senest ved utgangen av 2025 vil alle innsamlete opplysninger bli anonymisert. Ved en oppfølgingsundersøkelse vil du motta ny informasjon og ny forespørsel om å delta. Datamaterialet vil bli oppbevart på en sikker server på NIH hvor kun prosjektleder har tilgang.

Resultatene av studien vil bli publisert i en rapport uten at den enkelte kan gjenkjennes. NTFS og klubben din vil motta en rapport, som beskriver resultatet av undersøkelsen på sentrale variabler, men heller ikke her kan den enkelte spiller gjenkjennes.

Prosjektet er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S.

Dersom du ønsker å delta i undersøkelsen, er det fint om du signerer den vedlagte samtykkeerklæringen og returnerer den til klubben.

Alle resultater til NTFS og de respektive klubber vil være anonyme.

Med vennlig hilsen

Geir Jordet
Prosjektleder

Fagansvarlig fotballmentalitet Norsk Toppfotball Senter

Førsteamanuensis ved seksjon for coaching og psykologi Norges idrettshøgskole

Spørsmål?

Ta gjerne kontakt hvis du har spørsmål omkring prosjektet:

Erik Hofseth: 95 92 17 78 / erik.hofseth@nih.no

Mathias Haugaasen: 90 58 91 88 / mathias.haugaasen@nih.no

Utviklingen av unge elitespillere i fotball

SAMTYKKEERKLÆRING

Jeg/vi har mottatt skriftlig informasjon om studien *Tippeligaen 14-21*. Ved å signere samtykkeerklæringen bekrefter jeg/vi at min/vår sønn har tillatelse til å delta i prosjektet og til at treneren kan fylle ut et spørreskjema om min/vår sønn.

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FORESPØRSEL OM DELTAGELSE I PROSJEKTET: Tippeligaen 14-21

Til spiller

Norsk Toppfotballsenter (NTFS) har sammen med Norges idrettshøgskole (NIH) startet et prosjekt som vil skaffe verdifull informasjon om unge elitespillere i aldersgruppen 14-21 år.

Gjennom prosjektet søker vi å finne hvordan man bedre kan hente ut prestasjonspotensialet blant unge elitespillere i Norge. Dette gjøres ved blant annet å kartlegge spillernes treningshistorikk, treningshverdag, læringsstrategier, motivasjon, samt håndtering av med- og motgang.

Vi vil samle inn denne informasjonen gjennom et spørreskjema, der vi kommer ut til den enkelte klubb for å administrere dette.

Prosjektdeltagelse for deg innebærer deltagelse i en 2 timers samling hvor du skal fylle ut et spørreskjema. Etter en time blir det en pause hvor vi sponser pizza og brus. Dette vil skje i klubbens lokaler på ettermiddagstid hvor treneren din vil være tilstede. En representant fra forskningsteamet vil administrere prosessen i sin helhet.

Vi ønsker også at treneren din skal fylle ut et spørreskjema hvor de skal gi deres anbefaling av din posisjon på banen samt gi en rangering (skala 1-5) av deg i forhold til dine fysiske og mentale egenskaper, dine tekniske/taktiske ferdigheter og din livsstil. Opplysninger din trener gir vil bli sammenstilt med de opplysninger du gir i spørreskjemaet. For at vi kan levere skjema til din trener må du samtykke til dette. Dette gjøres ved at du på samtykkeerklæringen skriver navnet på treneren din.

Enkelte lag, trenere og spillere vil bli bedt om fortsatt deltagelse og oppfølging senere i 2011 sesongen.

Alle data vil behandles fullstendig konfidensielt der kun forskerteamet vil ha innsyn i spilleres/treneres identitet.

Utfyllingen av spørreskjemaet og eventuelle oppfølgingsundersøkelser er frivillig. Du kan trekke deg fra prosjektet når som helst uten å måtte begrunne det. Allerede innsamlete opplysninger om deg vil i så fall bli anonymisert.

Prosjektet forventes å være avsluttet til utgangen av 2012, men vi ønsker å oppbevare innsamlede opplysninger foreløpig frem til utgangen av 2025 for å ha mulighet for å foreta oppfølgingsundersøkelser. Senest ved utgangen av 2025 vil alle innsamlede opplysninger bli anonymisert. Ved en oppfølgingsundersøkelse vil du motta ny informasjon og ny forespørsel om å deltakelse. Datamaterialet vil bli oppbevart på en sikker server på NIH hvor kun prosjektleder har tilgang.

Resultatene av studien vil bli publisert i en rapport uten at den enkelte kan gjenkjennes.

NTFS og klubben din vil motta en rapport, som beskriver resultatet av undersøkelsen på sentrale variabler, men heller ikke her kan den enkelte spiller gjenkjennes.

Prosjektet er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S.

Dersom du ønsker å delta i undersøkelsen signerer den vedlagte samtykkeerklæringen. Alle resultater til NTFS og de respektive klubber vil være anonyme.

Med vennlig hilsen

Geir Jordet
Prosjektleder

Fagansvarlig fotballmentalitet Norsk Toppfotball Senter

Førsteamanuensis ved seksjon for coaching og psykologi Norges idrettshøgskole

Spørsmål?

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Erik Hofseth: 95 92 17 78 / erik.hofseth@nih.no

Mathias Haugaasen: 90 58 91 88 / mathias.haugaasen@nih.no

Utvikling av unge elitespillere i fotball

SAMTYKKEERKLÆRING

Jeg har mottatt skriftlig informasjon om prosjektet *Tippeligaen 14-21*. Ved å signere samtykkeerklæringen bekrefter jeg at jeg vil delta i prosjektet og til at min trener kan fylle ut et spørreskjema om meg.

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**FORESPØRSEL OM DELTAGELSE I PROSJEKTET:
Tippeligaen 14-21**

Til trener

Norsk Toppfotballsenter (NTFS) har sammen med Norges idrettshøgskole (NIH) startet et prosjekt som vil skaffe verdifull informasjon om unge elitespillere i aldersgruppen 14-21 år.

Gjennom prosjektet søker vi å finne hvordan man bedre kan identifisere utviklingspotensial og hente ut prestasjonspotensialet blant unge elitespillere i Norge. Dette gjøres ved blant annet å kartlegge spillernes treningshistorikk, treningshverdag, læringsstrategier, motivasjon, samt håndtering av med- og motgang.

Vi vil samle inn denne informasjonen gjennom et spørreskjema, der vi kommer ut til den enkelte klubb for å administrere dette.

Prosjektdeltagelse for deg innebærer tilstedeværelsen ved en 2 timers samling hvor du og spillerne dine skal fylle ut et spørreskjema. Etter en time blir det en pause hvor vi sponser pizza og brus. Dette vil skje i klubbens lokaler på ettermiddagstid. En representant fra forskningstemaet vil administrere prosessen i sin helhet.

Basert på spørreskjemaet (treneres og spilleres) vil klubben motta en rapport, som beskriver resultatet av undersøkelsen på sentrale variabler.

Enkelte lag, trenere og spillere vil bli bedt om fortsatt deltagelse og oppfølging senere i 2011 sesongen.

Dataen som samles inn vil lagres inntil 20 år anonymt på en sikker server på NIH hvor kun prosjektleder har tilgang.

Prosjektet er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S. Alle data vil behandles fullstendig konfidensielt der kun forskerteamet vil ha innsyn i spilleres/treneres identitet.

Utfyllingen av spørreskjemaet og eventuelle oppfølgingsundersøkelser er frivillig. Du kan selvsagt trekke deg fra forsøket når som helst. Du trenger ingen grunn for å gjøre dette. Alle data vil i så fall bli slettet.

Alle resultater til NTFS og de respektive klubber vil være anonyme.

Har du spørsmål til oss om dette?

Med vennlig hilsen

Geir Jordet
Prosjektleder

Fagansvarlig fotballmentalitet Norsk Toppfotball Senter

Førsteamanuensis ved seksjon for coaching og psykologi Norges idrettshøgskole

Spørsmål?

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Erik Hofseth: 95 92 17 78 / erik.hofseth@nih.no

Mathias Haugaasen: 90 58 91 88 / mathias.haugaasen@nih.no

Utviklingen av unge elitespillere i fotball

SAMTYKKEERKLÆRING

Jeg har mottatt skriftlig informasjon om studien *Tippeligaen 14-21*. Ved å signere samtykkeerklæringen bekrefter jeg at jeg vil delta i prosjektet.

Vi ønsker ikke å bli kontaktet ved en senere anledning med tanke på oppfølgingsstudier

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12.03.2011



Informasjonsskriv til klubb

Forespørsel om tilgang til intervjupersoner

Jeg er en student på trenerrollen med fordypning i fotball ved Norges idrettshøgskole. Som en del av undervisningen skal vi i løpet av dette semesteret gjennomføre et vitenskapelig arbeid innenfor et selvvalgt tema for å få en økt teoretisk innsikt.

Temaet som jeg har valgt er selvregulering. Kort fortalt så handler selvregulering om hvordan man kontrollerer tanker, følelser og atferd. Det dreier seg altså om hvordan lære og utvikle seg mest effektivt.

Formålet med mitt studie er å studere selvreguleringsferdigheten til norske eliteserie spillere og se hvordan de har brukt disse ferdighetene til å utvikle seg gjennom oppveksten. Det vil altså si at jeg ønsker å finne ut hva slag tanker og følelser spillerne har hatt rundt kamp og trening.

For å finne svar på min problemstilling har jeg valgt å intervju norske eliteserie spillere. Jeg har som mål å klare å intervju 3-4 frivillige spillere fra 2-3 ulike klubber. Intervjuene vil vare i ca 35 min pr person og samtalen vil bli tatt opp på en lydopptaker. Svarene vil være anonymisert.

For å gjøre intervjuet mest effektiv og kvaliteten på lydopptaket bra, bør intervjuet foregå i et lukket rom uten forstyrrelser av lyd og støy.

Skulle det være noen spørsmål, vennligst ta kontakt!

Mvh

Magnus Espeland Meling

magnus.meling@gmail.com

Tlf: 47 26 50 83

12.03.2011



Info-skriv til intervjupersoner

Hei og takk for at du vil stille opp til intervju!

Jeg er en student på trenerrollen ved Norges idrettshøgskole. For tiden så skriver jeg en oppgave om selvregulering hos norske eliteseriespillere i fotball. Kort fortalt så handler selvregulering om hvordan man kontrollerer tanker, følelser og atferd. Det dreier seg altså om hvordan lære og utvikle seg mest effektivt.

I intervjuet som jeg skal ønske jeg å finne ut hva slags tanker og følelser du har og har hatt rundt trening og kamper gjennom oppveksten. Det finnes overhodet ingen fasit svar, det er du som er ekspert. Jeg ønsker bare å finne ut hva du har tenkt og gjort for å bli så god som du er.

Intervjuet vil vare i ca. 35 min og samtalen vil bli tatt opp på en lydopptaker. Svarene du gir vil være anonyme og de vil bare bli brukt til min oppgave.

Skulle det være noen spørsmål, vennligst ta kontakt!

Mvh

Magnus Espeland Meling

magnus.meling@gmail.com

Tlf: 47 26 50 83

Retrospective questionnaire

This part of the questionnaire focuses on how much time you have spent on football related activity from the time you started playing football and until this year.

In each of the six categories we want you to fill in how much time you have spent on them every year you have played football. Start with the age you turn or have turned this year, and subsequently every year back to the year you started playing football.

We have categorized the activities into the following options:

- Match:** organized matches, managed by adults, like league- or cup matches
- Organized training:** training that is organized by a coach/adult (can also be school practice)
- Play activity:** football activity that is just for fun, like street football or futsal.
- Individual training:** training alone for deliberate improvement, for instance juggle with the ball, shooting practice and so on. (can also be school training)
- Other activity:** watch football matches, read about football, watch football on video/TV/PC, football games on TV/PC
- Injury/illness:** long-lasting break from football (not vacations, trips etc.)

EXAMPLE:

Matches

(organized matches managed by adults, like league- or cupmatches)

1. How many matches did you play a week?
2. How many months during the year did you play matches (how long was the season)?

Age	Matches	Months
21	_____	_____
20	_____	_____
19	_____	_____
18	_____	_____
17	_____	_____
16	_2_	_9_
15	_2_	_9_
14	_2_	_9_
13	_2_	_9_
12	_1_	_8_
11	_1_	_8_
10	_1_	_8_
9	_1_	_8_
8	_1_	_8_
7	_____	_____
6	_____	_____

Matches

(organized matches managed by adults, like league- or cup matches)

1. How many **matches a week** did you play?
2. How many months of the year did you play matches (how long was the season)?

Age	Matches	Months
21	_____	_____
20	_____	_____
19	_____	_____
18	_____	_____
17	_____	_____
16	_____	_____
15	_____	_____
14	_____	_____
13	_____	_____
12	_____	_____
11	_____	_____
10	_____	_____
9	_____	_____
8	_____	_____
7	_____	_____
6	_____	_____

Play activity

(football activity just for fun, like street football or futsal)

1. How many **hours** of football as play activity a week did you do?
2. How many months during the year did you do this?

Age	Hours of play activity	Months
21	_____	_____
20	_____	_____
19	_____	_____
18	_____	_____
17	_____	_____
16	_____	_____
15	_____	_____
14	_____	_____
13	_____	_____
12	_____	_____
11	_____	_____
10	_____	_____
9	_____	_____
8	_____	_____
7	_____	_____
6	_____	_____

Organized training

(training organized by a coach/adult (can also be school-training))

1. How many **hours** of organized training a week did you do?
2. How many months during a year did you do this?

Age	Hours of training	Months
21	_____	_____
20	_____	_____
19	_____	_____
18	_____	_____
17	_____	_____
16	_____	_____
15	_____	_____
14	_____	_____
13	_____	_____
12	_____	_____
11	_____	_____
10	_____	_____
9	_____	_____
8	_____	_____
7	_____	_____
6	_____	_____

Individual training

(training alone for deliberate improvement, for instance juggling with the ball, shooting practice etc., can also be school-training)

1. How many **hours** of individual training a week did you do?
2. How many months during a year did you do this?

Age	Hours of training	Months
21	_____	_____
20	_____	_____
19	_____	_____
18	_____	_____
17	_____	_____
16	_____	_____
15	_____	_____
14	_____	_____
13	_____	_____
12	_____	_____
11	_____	_____
10	_____	_____
9	_____	_____
8	_____	_____
7	_____	_____
6	_____	_____

Translated interview guide

Introductory questions

When did you start playing football?

Why did you start playing football?

Did you participate in other sports?

Initial engagement to investment phase

1. How much time did you spend on (playing) football during childhood and adolescence?
2. What were the most important reasons for spending time in football?
 - a. Did you have any specific aims or goals?
 - b. What was your focus?
3. Who did you usually play with?
 - a. Older/younger peers? Why?
 - b. In what way has this affected your development?
4. Did you have any idols or someone you looked up to?
 - a. How do you think this has affected your development?
5. What do you remember best from team sessions?
 - a. How did you perceive these sessions?
 - b. What was your approach toward sessions?
 - c. What was your focus during sessions?
6. What do you remember best from playing matches?
7. How did you perceive matches?
8. What was your approach toward matches?
9. What was your focus during matches?
 - a. What was most important for you when playing matches (e.g., the result, the team's performance / your own performance)?
10. How did you respond if the opposition was better than you?

Do you have any situations from your development that you remember in particular?

Are there any stories or situations from your development that you consider to have been of importance toward your career?

Investment phase

How old were you when you decided to become a professional football player or that you perceived the possibility as realistic?

11. What kind of goals did emerge from this decision to invest?
 - a. Long-term, short-term, specifically towards sessions?
 - b. Did you have/make plan for how to reach these goals?
12. What kind of consequences did this decision get?

- b. Did you have to prioritize football in front of other aspects of your life (e.g., school, friends, other sports, etc.)?
- 13. How did this decision affect your practice?
 - c. The amount or types of training
 - d. What did you practice on? How?
- 14. Were you aware of your strengths and weaknesses?
 - e. If so, how did this awareness develop? (e.g., own experiences?)
 - f. What skills did you spend most time practicing?
- 15. What was your main aim or focus for practicing?
 - g. E.g., learning and development, fun and excitement?
- 16. How conscious were you of challenging yourself/deliberately seeking challenges when practicing?
 - h. Why or why not?
- 17. What did you do when the session was finished?
 - i. Did you reflect on what you had done?
 - j. How focused were you on learning and improving?
 - k. Did you think about what you could improve toward next session?
- 18. What do you remember best from matches during this period?
- 19. How did you perceive matches during this period?
 - l. What was most important for you?
 - m. How did you approach matches (winning / learning)?

During this period, are there any stories or situations that you consider to have been of importance for your career?

Professional phase

What did it mean to you to get a professional contract?

How did this affect your training?

- a. Amount and types
- b. Approach toward

How did this affect you in your daily life?

What was the biggest difference between before and after you became a professional?

Team sessions:

- 20. Do you have any specific goals going into sessions?
 - a. What kind of goals?
 - b. Do you have any specific strategies for how to reach these goals?
- 21. During different drills or exercises, what is your focus?
 - a. E.g., passing drills; technical execution, tempo.
- 22. What is usually your main focus after sessions?
 - a. Do you evaluate your performance?

- b. Do you evaluate whether you reached specific goals?
 - c. Do you use experiences to reflect on how to improve until next session?
 - d. What is your main focus?
 - e. What do you remember best?
 - i. E.g., Good or poor involvements, results or outcomes
23. How focused are you on adapting to what the coaches are saying?
- a. Are you reflective or critical toward such feedback?

Additional practice:

24. Do you spend any time practicing on your own in addition to team sessions?
- a. How often?
 - b. Why?
 - c. What do you do? Do you have a plan for how and what to improve?
 - d. Do you focus mostly on your strengths or weaknesses?
 - e. How do you practice when you try to learn new skills?
 - f. What kind of practice do you like best?

Matches:

25. Do you have any specific goals going into matches?
- a. What kind of goals?
 - b. Do you have any specific strategies for how to reach these goals?
26. During a match, do you have any specific strategies to remain focused?
- a. Has your focus during matches changed after you became professional?
 - b. What do you do or think after making a mistake? Any particular strategies to stay focused?
27. What do you remember best from matches?
- a. What kind of situations?
 - b. Good or poor performances?
 - c. What means most to you (e.g., result, team or individual performance)?
28. What do you do after a match?
- a. Do you evaluate your performance?
 - b. Do you evaluate your performance together with others (e.g., coach, teammates)?
 - c. What consequences emerge from this evaluation?
 - ii. E.g., how you approach upcoming sessions or matches

Additional questions

What do you think is the main reason for why you have become a professional footballer?

Has there been anything special that facilitated your progression to professional status?

Is there anything you would have done differently throughout your development to become an even better football player?

A brief overview over analytic categorization of Article 4

Developmental phase			
Main section	Higher order categories (description/definition italicized)	Lower order categories (main points italicized)	Raw text units (examples)
Motivation	Intrinsic motivation <i>Immediate or inherent rewards of participating</i>	Enjoyment (n=7)	Enjoyed to play football Have fun
	Determination to succeed <i>Long-term reward of engagement</i>	Social interaction (n=7)	Being with friends Getting new friends Everyone could participate
	Performance and learning orientation <i>Attribution of success</i>	Commitment to become pro (n=7) <i>Making sacrifices</i> <i>Increased effort</i>	Long-term dream and goal A drive/desire to become pro Being determined to become pro
Activity engagement	Effort into play and practice <i>The amount of time spent in different football activities</i>	Commitment to team performance (n=7) <i>Team result important</i>	A drive to win Winning most important when playing matches Getting annoyed if losing
		Commitment to individual performance (n=7) <i>Self-centered</i> <i>Pride</i>	Being selfish or egoistic towards own performance Want to perform well individually Want to score goals
		Commitment to learning and development (n=7) <i>Facilitated through coach and peer interaction</i>	Focus on learning from idols or peers Focus on mastering skills Focus on improving
		Coach-led team sessions <i>Gradual increase</i>	Team sessions first introductory activity into the game of football (n=3) Less frequent in the youngest ages, gradually more and more
		Self- or peer organized play for fun <i>Large amounts in early ages</i> <i>Gradual decrease</i>	Playing alone or with friends/siblings first introductory activities into the game of football (n=4) Large amounts of play in early ages Gradually reduction in favor of more deliberate activities with fewer friends
		Self-or peer organized goal-oriented activities <i>Gradual increase</i> <i>Sharp increase when deciding to become pro</i>	Gradual increase Sharp increase when deciding to become pro

<p>Deliberate practice strategies</p>	<p>Self-regulated learning strategies <i>Self-directed learning strategies by which players proactively regulate their learning process.</i></p> <p>Adopting drills <i>Adopting drills in self- or peer-organized practice</i></p> <p>Seeking challenges <i>Actively seeking challenging arenas for own improvement</i></p>	<p>Awareness of strengths and weaknesses (n=6) <i>Gradual development through maturation, experience, and interaction with adults (coaches, parents)</i></p> <p>Planning, monitoring, evaluation (n=6) <i>Gradual implementation Related to maturation and experience Mostly facilitated by adults More used in individual practice than at team sessions</i></p> <p>Adopting drills (n=4)</p> <p>Seeking challenges (n=3)</p>	<p>Not conscious about strengths and weaknesses at young ages, just playing for fun Naturally comes as one gets older Coach/parent feedback increased awareness of strengths and weaknesses Coach/parent feedback helped understand what to improve and how</p> <p>No explicit strategies at young ages, just playing for fun Naturally comes as one gets older Learned specific strategies through coach interaction Team sessions important arena for learning strategies Strategies often used more frequently in individual practice than team sessions</p> <p>Adopting drills from team sessions in own practice Adopting drills from peers in own practice</p> <p>Prefer playing against older kids Enjoy the challenge of playing with older kids</p>
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Professional phase			
Main section	Higher order categories	Lower order categories	Raw text units (examples)
Motivation	Intrinsic motivation Determination to succeed Performance and learning orientation	Enjoyment (n=5) <i>Enjoyment as subordinate</i> Commitment to long-term goals (n=5) Commitment to team performance (n=7) <i>Result oriented</i> <i>Putting the team in front of oneself</i> Commitment to individual performance (n=7) <i>Self-centered</i> <i>Pride</i> Commitment to learning and development (n=7) <i>Self-critical towards own performance</i> <i>Focus on improving skill-specific aspects</i>	Enjoying football Important to do what is not perceived as fun Plan further ahead Set higher goals Winning is most important It is the 3 points that matter The team is most important Contribute as much as possible to the team Own performance is important Own performance needs to be good Not fun to win but to have played poorly Getting annoyed of mistakes Being self-critical of performance to identify individual performance aspects to improve Being professional towards practice Focused on learning
Deliberate practice strategies	Self-regulated learning strategies	Planning <i>General goals of focus and concentration</i> <i>Setting internal challenges</i> Self-observation <i>Focus on concentration and effort</i> <i>Drill-specific variations</i> <i>Seek automaticity</i>	Stay focused Stay concentrated Do your best Setting challenges to themselves Keep intensity Keep up the quality Try not to drop in performance Situations where things 'flow' automatically as desirable
Activity engagement	Additional individual practice	Evaluation <i>Session specific</i> <i>Centered on performance</i> <i>Monitoring more important than evaluating</i> Sense of obligation towards match performance (n=7) <i>Stabilizing skill execution</i> <i>Mental preparation</i>	Feeling the need of improving things that didn't go well Trust that you have done your best Need for relaxing after sessions Get the good feeling Feeling confident Feeling safe/secure Get the good touch