Many Paths, Many Outcomes

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Dutch Youth Football players on their way to the senior level

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Master Thesis – Talent Development & Creativity

[*S3565033*]

[*July*] [*2022*]

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Abstract

Youth soccer players often strive to play at a high senior club level in the future. So far, little research has been conducted on the developmental career patterns and their outcomes in regard to the senior club level. We therefore examined 3640 players and analyzed their involvement in youth academies and youth national teams. Based on a Configural Frequency Analysis (CFA), which is characterized by a holistic and person-centered approach was conducted to map such trajectories and discover pathways that are overrepresented (Types), thereby indicating a tendency where such pathways may lead to. We found that a long and early academy career are associated with professional levels in football. Additionally, if a long national team career was observed such a pattern has a very high likelihood of reaching the highest level in professional football, namely that of International country (appearance at EURO or World Cup). Interestingly, players that have never played for a youth national team are very likely to only play non-professional football. It may be concluded that individual pathways are highly individual and idiosyncratic. It was observed that one pathway could lead to multiple levels of football and further that different pathways can ultimately lead to the same level. Such findings suggest that talent development programs should consider the different possible trajectories and avoid one-size-fits-all strategies.

Keywords: Development, Career patterns, Intra-individual, Longitudinal

Introduction

In sports it is about competition and trying to be the best among many others. This can be seen in almost every sport, from individual sports (e.g. Track & Field) to team sports (e.g. football). In the first one, athletes typically progress by performing according to regional standards, which allows them to participate in national tournaments, followed by international tournaments, where they compete against the best athletes in the world. Similarly, for team sports athletes try to become the best to be able to play for the best clubs in the world. Especially in football, due to its popularity and money involved (Ajadi et al., 2022), the question arises how players make it to high levels of senior football. Or to put it differently, what kind of developmental career patterns do youth football players follow on their way to the top? Is it possible to determine common patterns, or can patterns be very different? Two of such very distinctly different developmental career patterns into elite football can be exemplified in the case of the Dutch professional football players Frenkie de Jong and Virgil van Dijk. Both players played in Champions League semi-finals and are crucial parts in the Dutch national team. From the age of 8 years on Frenkie de Jong played for the youth academy of Willem II and made his senior professional debut at only 17 years of age. In comparison, Virgil van Dijk only joined a youth academy for the first time when he was 18 years old and made his professional debut with FC Groningen at the age of 20. In terms of their progression in regards to the national team both players have a very different developmental career patterns as well. Frenkie de Jong was consistently nominated to be part of every youth national team (from U15 to U21) and progressed further to the senior national team, in which he also represented the Netherlands in a major international tournament (EURO 2020). Whereas Virgil van Dijk has never been part of any youth national team and gave his debut for the senior national team when he was 24 years of age. As can be seen, the developmental patterns for Frenkie de Jong was a linear and steep progress to the top of

professional football (playing for Barcelona). In comparison, Virgil van Dijk`s progression was also linear yet, not as steep in terms of progression, as he needed more time to be at the top level of football (playing for Liverpool).

Although these are just two examples of developmental career patterns leading into the highest senior leagues, it suggests that there can be many different patterns a player can take to reach certain levels of senior football. The focus of this paper is to examine these developmental career patterns within a cohort of Dutch professional football players. By reconstructing their career patterns, we aim to better understand how youth players reach certain levels of senior football.

Previous research on talent development

The development of talented youth football players, and in more general terms the development of expertise, is a fiercely debated area in the scientific domain. So far, much research has been focused on investigating the reasons and factors for the success of some football players and the lack of others. As such, research resorted to the question of what differentiates those that are or become successful and those that do not. In general, one can differentiate two main areas in this field: the comparison of performance characteristics and the comparison of developmental activities.

Performance characteristics

In an attempt to tackle the question of what differentiates those that become successful and those that do not, one important aspect considered by scholars is that of performance characteristics (Huijgen et al. 2014; Elferink-Gemser et al., 2007; Figueiredo et al., 2009 & Lidor et al., 2005), which are qualities or traits hypothesized to be important for outstanding performance. For instance, Huijgen et al. (2014) investigated the differences of talented adolescent players in their physiological, technical, tactical and psychological characteristics.

Results indicated that for psychological and physiological characteristics no differences were found between players that got selected for a youth academy and those that did not. However, the technical characteristics did indicate a difference (Huijgen et al., 2014; see also Figueiredo et al., 2009 & Lidor et al., 2005; Elferink-Gemser et al., 2007). Further, tactical characteristics were also able to distinguish between selected and deselected players (Huijgen et al., 2014; Elferink-Gemser et al., 2007).

Taken together, on a group level, research has found that certain performance characteristics are able to differentiate well between selected and deselected players (technical and tactical), whereas others are not (physiological and psychological). These findings show that it is difficult to derive at consistent differences between selected and deselected players, especially on the group level. Accordingly, researchers who were involved in studies described above have also indicated that youth athletes have their own unique developmental career patterns which makes it difficult to draw general conclusions for the individual trajectories (Elferink-Gemser et al., 2011). Relatedly, other researchers have more critically examined developmental aspects and activities in order to find out more about how youth football players make it to the professional level.

Developmental activities

Much previous research has also focused on player's developmental activities or their practice history, by looking at how much time players invested in competition, deliberate practice and deliberate play (see Ford & Williams 2012; Erikstad et al., 2018; Haugaasen et al., 2014; Bruce et al., 2013; Ford et al., 2012, Roca & Ford, 2021; Güllich, 2017). It has been shown that all of these activities are important to engage with as it prepares young athletes for their further development in their field of expertise (Ford et al., 2009; Erikstad et al., 2018). However, these findings have to be interpreted carefully, as the study designs for such

investigations have mostly been of self-reported retrospective nature (Ford & Williams, 2012; Haugaasen et al., 2014; Roca et al., 2012; Güllich, 2017). As these self-reported retrospective questionnaires often date back multiple years, the reliability of such statements is difficult to assess.

Related to the amount of developmental activities players engaged with is the question of when to start with sport-specific practice and/or sampling other sports. More specifically, early specialization entails that mostly football-specific activities were engaged with in a player`s youth. Whereas early diversification is characterized by a player's engagement in other sports in addition to football followed by a later focus on the sport in question. Yet, no conclusive result can be made in terms of these two ideas (Bruce et al., 2013; Ford et al., 2012; Roca & Ford, 2021; Zibung & Conzelmann 2012). In this regard, Ford et al. (2009) coined the term of the early engagement hypothesis. This posits that no matter which pathway a player is on, there seems to be a general benefit from an early engagement with the specific sport in question and a general engagement in other sports as well. More specifically, Sieghartsleitner et al. (2018) argue that an "optimal model for the development of football talents is a specialized sampling model" (Sieghartsleitner et al., 2018, p. 1). With this notion they then combine parts of the two pathways (specialization versus early diversification) into a new one in which a player may specialize in football early on but still sample other experiences within the domain of sports to counter any possible drawbacks in the early specialization pathway, such as injuries, overload or burnout (Cote et al., 2009).

In sum, research suggests that engaging with sport-specific activities in football benefits players in the long-run, especially when they start to do so at an early age. This may be because they then have enough time to master the techniques and skills necessary to become a professional football player. In general, an early engagement in football but also

sampling other sports at an early age are seen as an important aspect when trying to reach the professional level in senior football.

Toward a longitudinal, intra-individual approach

Studies on performance characteristics and developmental activities most often focuses on group-level comparisons. In other words, elite players are being compared to non-elite players in terms of their developmental activities or their performance characteristics. Some studies have applied multidimensional approaches, considering a plethora of performance characteristics all deemed important for successful performance. Although this work is important to shed a light on which factors are associated with expert performance, they are limited in the explanation of how these factors are associated with expert performance *over time.* As previously mentioned, most studies done in this area are of retrospective nature with self-reported data or represent a momentary picture (Morris, 2000; Haugaasen et al., 2014; Roca et al., 2012). Hence more longitudinal approaches are warranted that take the developmental process into account.

So far, scholars have pointed out the need for longitudinal studies (Elferink-Gemser et al., 2011; Vaeyens et al., 2008; Gulbin et al., 2013) to investigate the importance of certain variables (especially physiologically and technically). Therefore, it is important to conduct longitudinal studies that look at a time span of a couple of years to see how such differences may play out in the end (see Huijgen et al., 2014). In this regard, it has been shown that, for example, ‘late bloomers’ may be disadvantaged in the beginning of their young careers due to their physiological disadvantage (Gulbin et al., 2013; Oldenziel et al., 2003). However, due to that, they may have developed further in a technical and tactical manner in order to be able to compete with the more physically advanced players. This benefited such players more in the long-run, after also going through their growth spurts, leading to them being more technically

advanced compared to their counterparts the ‘early bloomers’ that did not have to do so in their early career stage due to their physiological edge (cit).

In order to better understand how youth players reach the professional level in football, two important gaps need to be filled. First, to understand individual trajectories, there should be a focus on intra-individual differences rather than on interindividual differences. Second, researchers should focus on talent development career patterns that are shaped by performance characteristics and developmental activities of individual athletes. So far, only few studies have looked into individual developmental career patterns of athletes. Gulbin et al. (2013) investigated a multitude of different sports in order to model possible different trajectories. Their results indicate that such trajectories do not follow linear and predictable pathways, but rather are highly variable and seldomly follow a linear ascend. In addition, Schroepf & Lames (2018) were interested in identifying career patterns among German youth national team players. More specifically, they investigated which patterns are leading to professional careers or a career in the German senior national team by looking at the amount of time they spent in the youth national teams and at what age they entered. Their findings suggest that predominantly long and late careers in the youth national team lead to a professional career and even to a senior national team career. Accordingly, an important and logical next step on understanding how youth players reach certain levels of senior football is to further map the individual career pattern over time.

The current study

As can be seen from the literature above, previous work focused mainly on a static approach (Hoff, 2005; Gissis et al., 2006; Gil et. al., 2007) by selecting and isolating single variables and taking a retrospective approach with self-reported data or taking a momentary picture at the time of the assessment (Morris, 2000; Haugaasen et al., 2014; Roca et al., 2012). While

much research has been done so far there is still no conclusive evidence on what constitutes towards a successful development of youth athletes in general and in particular football players. Therefore, this study contributes to the ongoing research of talent development in football by conducting a large-scale study and using Configural Frequency Analysis (CFA), which is characterized by a holistic and person-centered approach. Additionally, as mentioned before scholars mostly relied on self-reported retrospective analyses, which might lead to biased answers of participants. Following up on these, this project takes a longitudinal approach by looking at yearly data of male Dutch youth football players. The following research question is: How can patterns of development of male Dutch football players on the progression to senior football be characterized? Using the CFA approach we expect that developmental pathways (Types) with different patterns may lead to the same level of professional level. Further we expect that developmental pathways (Types) with a similar pattern can lead to different levels of professional football.

Method

Sample

The data used for the analysis was comprised of a total of 3640 male Dutch Football players. All these players were part of a professional academy related to a club in one of the two Dutch professional leagues (i.e., the Eredivisie and the Eerste Divisie). To be included in the sample, players had to be at least 21 years or older at the end of the season 2020/2021 and made their debut between the seasons of 2010/2011 and 2020/2021. In order to be considered a Dutch player he had to play in the Netherlands for at least one season when growing up, as determined by the Centre International d'Etude du Sport (CIES) (Poli et al., 2016). Additionally, only complete cases are considered for the analysis. The current age of players

ranges from 21 – 36 years with a mean age of 26.06 and a standard deviation of 2.86 years in 2020 (see Table 1 in Appendix).

Procedure & Measure

We reconstructed the individual developmental career patterns of players based on their involvement with a youth academy and the youth national team. This involvement was determined for each year at the start of the season and was retrieved from the official match data repository of the Royal Netherlands Football Association – Koninklijke Nederlandse Voetbalbond – (KNVB) (http://www.knvb.nl) and checked for consistency with other sources such as the Transfermarkt database (www.transfermarkt.co.uk) (retrieval April 2022). The data is structured in a way that every player has one measurement point for every season. For youth academy there are a total of 11 data points with an age range from 11–21. Since the youth national team starts from the age of 14, we get eight data points for the variable of youth national team with an age range from 14-21. These two dichotomous variables indicate whether a player is selected each year for a youth academy or national team. In the case of selection, this is coded with a 1 and if not selected it is coded by a 0. These variables were further used to create three new variables respectively. Namely, these were Length, which indicates the maximum length of continuously being selected for the academy and the national team. Interspersion indicates how often a player got deselected and afterwards selected again for a youth academy and the national team thereby, reflecting non-linear dynamics of a players' developmental pathways. Entry indicates the age of first selection for a youth academy and the national team.

In total six independent variables (IV's) and one dependent variable (DV) were used for the analysis and will be reviewed in more detail below.

Academy Length

The IV Academy Length (AL) indicates the maximum amount of years a player has continuously been selected for a youth academy of a professional football club. This IV was coded in an ordinal fashion with 1, 2 or 3. Where 1 indicates the presence in an academy for one year and is described as a 'One-Show Academy Career'. Coded as a 2 indicates the continuous presence in an academy for two to five years and is described as a 'Short Academy Career'. Ultimately, 3 indicates the continuous presence in an academy for six to eleven years and is described as a 'Long Academy Career'.

Academy Entry

The IV Academy Entry (AE) indicates at what age a player first was selected to play in an academy. This IV was coded in an ordinal fashion with 1, 2 and 3. Where 1 indicates an academy entry between the ages of 11-14 and is described as an 'Early Adolescence Academy Career'. Coded as 2 indicates an academy entry between the ages 15 – 18 and is described as a 'Middle Adolescence Academy Career`. Ultimately, 3 indicates an academy entry between the ages 19-21 and is described as a 'Late Adolescence Academy Career'.

Academy Interspersion

The IV Academy Interspersion (AI) indicates whether a player has been deselected at one point but reselected at a different point in his career and therefore being coded as 1 and described as an 'Interspersed Academy Career'. When a player has never been deselected and reselected at a later point this was coded as 0.

National Youth Team Length

The IV National Youth Team Length (NTL) indicates the maximum amount of years a player has continuously played in a national youth team. This IV was coded in an ordinal

fashion with 0, 1, 2, and 3. Where 0 indicates not being selected for the national youth team at all. Being coded as 1 indicates a selection for a national youth team for one year and is described as a 'One-Show National Career'. Coded as 2 indicates being selected for a national youth team for two to four years and described as a 'Short National Career'. Ultimately, coded as 3 indicates being selected for a national youth team for five to eight years and described as a 'Long National Career'.

National Youth Team Entry

The IV National Youth Team Entry (NTE) indicates at what age a player first was selected to play for a national youth team. This IV was coded in an ordinal fashion with 0, 1, 2 and 3. Where 0 indicates never being selected for a national youth team. Coded as 1 indicates being selected between ages 14-16 and is described as an 'Early Adolescence National Team Career'. Further, coded as 2 indicates being selected between ages 17-19 and is described as a 'Middle Adolescence National Career'. Ultimately, 3 indicates being selected between ages 20-21 and is described as a 'Late Adolescence National Career'.

National Youth Team Interspersion

The IV National Youth Team Interspersion (NTI) indicates whether a player has been deselected at one point but reselected at a different point in his career and therefore being coded as 1 and described as an 'Interspersed National Career'. When a player has never been deselected and reselected at a later point this was coded as 0.

Senior Club Level

The DV Senior Club Level (SCL) indicates the different competitive levels within football. The variable is coded in an ordinal fashion from 1-5, where 1 indicates a non-professional level of football. When coded as 2, it indicates the lowest level of professional

football, which represents the second Dutch league (Eerste Divisie) in our sample. The next level is that of the first Dutch league (Eredivisie), which is coded as 3. The second highest level, coded as 4 indicates playing on an international club level (UEFA Champions League or Europa League). The highest level of professional football is coded as 5 and represents playing Senior international team matches (i.e., appearances at World Cups or European Championships).

Analysis

Configural Frequency Analysis (CFA) was performed in order to answer the research question of how different developmental pathways may look like for different levels of football that can be reached. This method was chosen as it fits best to the purpose of the study, which is a focus on a holistic interactionist approach, centering around the person (Bergmann & Magnusson, 1997). In this study the analysis is approached by using a vector that corresponds to a single player and his unique developmental career pattern across the variables to be analyzed (e.g., 0110013). The first three digits represent the variable of youth academy, where the first digit shows the maximum length of continuously being selected for a youth academy, the second at what age he first entered an academy and the last digit whether he was deselected or not at some point. The next three digits follow the same principle, yet represent the variable of national youth team. The last number corresponds to the DV of senior club level. This vector results in a total of 2880 unique possible pathways that a youth player can follow, on his way to senior club football. A first-order CFA is constructed as base model which calculates the expected frequencies for every possible pathway and compares these with the observed frequencies. Afterwards, a global chi-square test is administered to test the null hypothesis that there is no relationship between the variables. If the null hypothesis is rejected local chi-square tests with α protection via the Holland–DiPonzio Copenhaver procedure are used in order to identify Types (patterns that occur more often than

expected by chance). The analysis is performed using the R package *confreq* (Heine, 2022) for the R language and environment for statistical computing (R Core Team, 2020).

Results

We conducted analyses to assess how developmental patterns of male Dutch football players may be characterized. To determine whether the base model of the CFA was appropriate we conducted a global chi-square test χ^2 (2861, 3640) = 7743.00, $p < 0.001$. This result indicates that the trajectories a player can follow in the corresponding variables (youth academy and youth national team) are associated with the outcome (level of football). As a next step, the CFA was performed, which was done by multiple local chi-square tests to see whether there are configurations that significantly deviate from their expectancy, resulting in Types. In total we see 19 configurations that may be classified as Types (see Table 2), which were further aggregated to a total of 14 statistically significant patterns. We expected that developmental pathways with different patterns lead to the same level of football, which was found to be the case. Five out of the emerged patterns led to the non-professional level of football (Graph 1). For reaching the Eerste Divisie we found six possible pathways (Graph 2) to do so and for the Eredivisie there was one unique pathway (Graph 3) leading up to this level of football. For the second highest level it was shown that in order to reach the international club level there were four pathways (Graph 4) emerging and three for the highest level of professional football, namely the International country level (Graph 5).

We further expected that developmental pathways with similar patterns lead to different levels of football, which was also found to be the case. With a total of eleven out of fourteen different pathways the majority of these led to a different outcome in terms of the level of football. Yet, a multitude of different outcomes was found for three of the emerged patterns. The first one may be described by a long early academy career with a short (interspersed) early adolescence national team

Table 2.

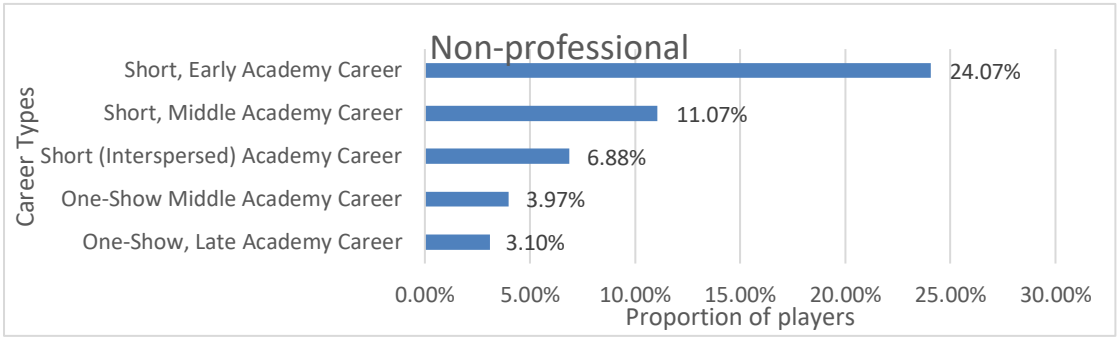
P-values of local chi-square tests for the prediction configural frequency analysis of Types and Antitypes

AL	AE	AI	NTL	NTE	NTI	SCL	*obs*	*exp*	Type / Antitype
1	1	0	0	0	0	2	0	24	Antitype
1	2	0	0	0	0	1	109	27	Type
1	3	0	0	0	0	1	85	21	Type
2	1	0	0	0	0	1	661	578	Type
2	1	0	0	0	0	2	1	105	Antitype
2	1	0	0	0	0	3	0	37	Antitype
2	1	0	0	0	0	4	0	21	Antitype
2	1	0	2	1	0	1	0	19	Antitype
2	1	0	2	2	0	1	0	23	Antitype
2	1	1	0	0	0	1	189	69	Type
2	2	0	0	0	0	1	304	121	Type
3	1	0	0	0	0	1	872	882	Antitype
3	1	0	1	2	0	2	22	4	Type
3	1	0	1	3	0	2	18	2	Type
3	1	0	2	1	0	2	29	6	Type
3	1	0	2	1	1	2	13	1	Type
3	1	0	2	1	1	4	10	0	Type
3	1	0	2	1	1	5	7	0	Type
3	1	0	2	2	0	2	40	8	Type
3	1	0	2	2	0	3	25	3	Type
3	1	0	2	2	0	4	15	2	Type
3	1	0	2	2	1	2	17	2	Type
3	1	0	2	2	1	4	20	1	Type
3	1	0	2	3	0	4	13	1	Type
3	1	0	3	1	0	5	19	0	Type
3	1	0	3	2	0	5	12	0	Type
3	1	1	0	0	0	1	51	106	Antitype
3	2	0	0	0	0	1	51	185	Antitype
3	2	1	0	0	0	1	0	23	Antitype

Note: AL: Academy Length; AE: Academy Entry; AI: Academy Interspersion; NTL: National Team Length; NTE: National Team Entry; NTI: National Team Interspersion; SCL: Senior Competitive Level (1 = nonprofessional; 2 = 2nd tier professional; 3 = 1st tier professional; 4 = international club professional; 5 = international country professional; *Obs*: observed frequency of configuration; *Exp:* expected frequency of configuration.

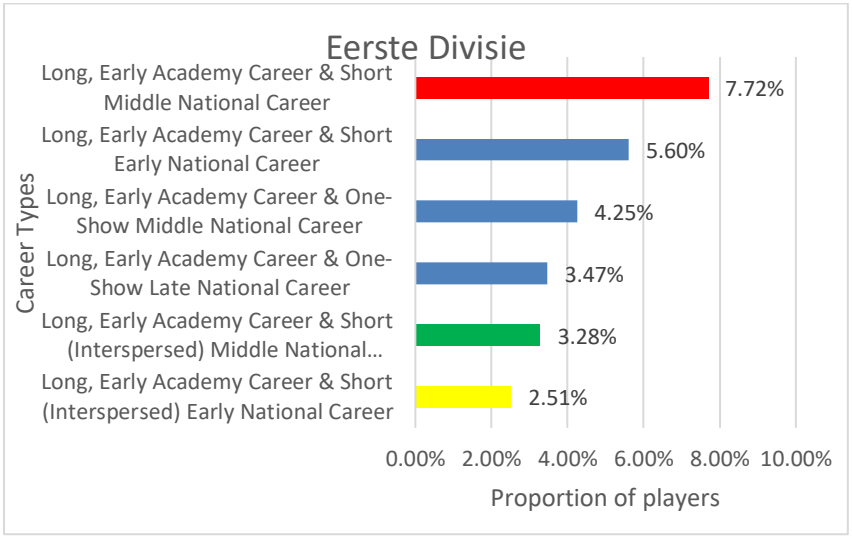
Graph 1.

Emerged patterns leading to non-professional level of Senior football



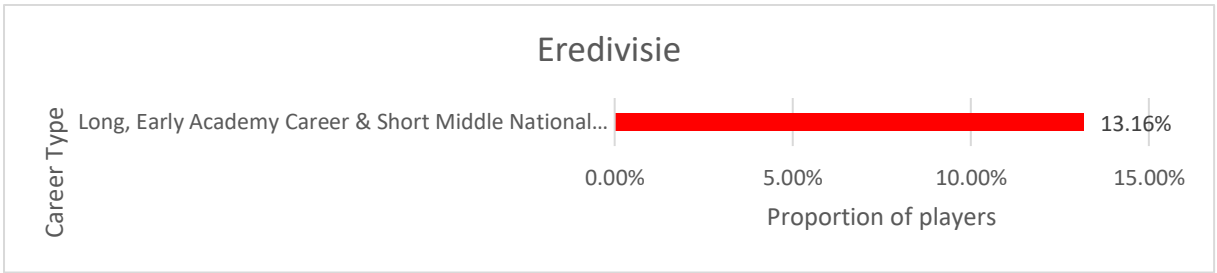
Graph 2.

Emerged patterns leading to Eerste Divisie



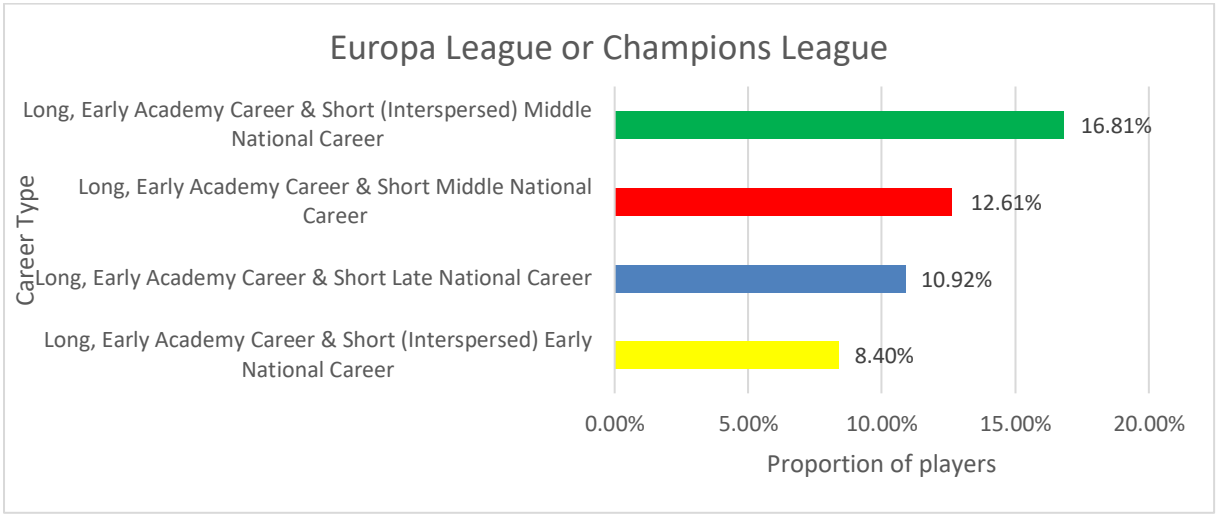
Graph 3.

Emerged pattern leading to Eredivisie



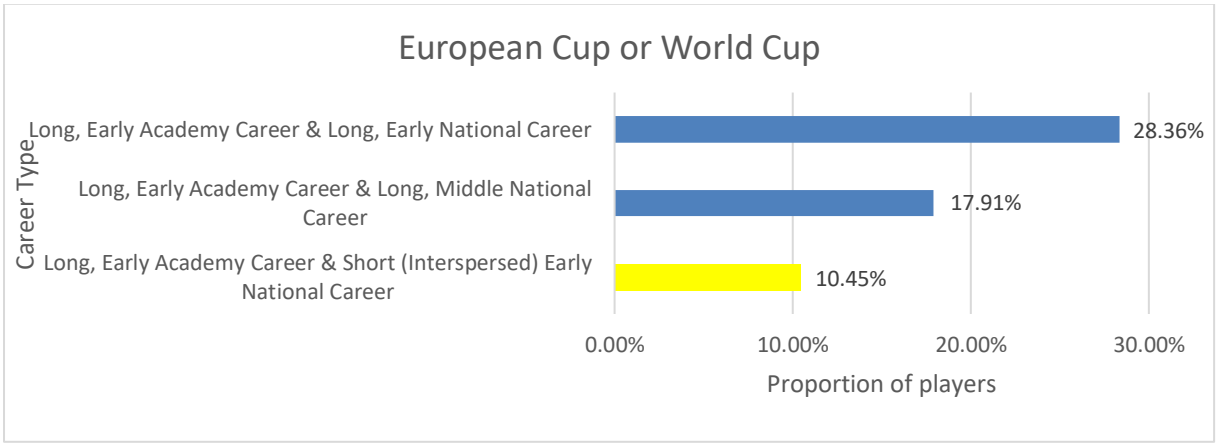
Graph 4.

Emerged patterns leading to Europa League or Champions League



Graph 5.

Emerged patterns leading to European Cup or World Cup



career (depicted by yellow bar in Graphs 2, 4 & 5) leading to the two highest outcomes of international club and country levels, as well as to the Eerste Divisie. The next pattern leading to different outcomes may also described by a long early academy career with a short and middle adolescence national career (depicted by red bar in Graphs 2, 3 & 4) leading to the

Eerste Divisie, Eredivise and the International club level. The last pattern is also characterized by a long early academy career with a short (interspersed) middle adolescence national career (depicted by green bar in Graphs 2 & 4). Even though there are also Antitypes emerging from the analysis, we focus only on the overrepresentation of patterns as these indicate an occurrence of players greater than chance alone.

Discussion

The aim of this study was to characterize the developmental career patterns among male Dutch football players on their road to certain levels of senior football. We assumed that Types with different patterns may lead to the same level of football. Additionally, we expected that Types with similar patterns may lead to different levels of football. Overall some interesting results were found that will be discussed in more detail, namely (a) specific patterns that led to non-professional level, (b) academy career patterns leading to professional level, (c) the influence of national team patterns and (d) patterns of late bloomers.

These results fit with previous research indicating that developmental career patterns are idiosyncratic and individual (Gulbin et al., 2013; Elferink et al., 2011). It can further be seen that out of the 14 developmental patterns that emerged when aggregating the different Types, five of these led to the non-professional level of football. What is striking is that these are all characterized by a short or one-show academy career, regardless of the age of entry into an academy. These are also overall the only patterns in which a player did not appear in a youth national team. This makes sense, as such players are shown to not possess the qualities to stay in the academies and are therefore deselected at some point (Elferink-Gemser et al., 2007). When players are not playing in an academy, the chances of this player being selected for the youth national team is very low, as the KNVB only looks at the youth academies to select those good enough to play for the youth national team.

Results also show that an early and long academy career is necessary to achieve the International (club and country) level of football. Indeed, 92.5% of the players who ended up in the international country level were playing at an academy from an early age on and 91% had a long academy career (see Table 3 in Appendix). Additionally, 89.1% of players who ended up in the international club level played in an academy from an early age and 93.3% had a long academy career (see Table 3 in Appendix). This is an interesting finding, as it lines up with the research that follows the early engagement hypothesis for sports (Ford et al., 2009; Hendry & Hodges, 2018). However, these results only support the notion of the early engagement pathway but is not able to shed light on the discussion of an early specialization versus early diversification (Bruce et al., 2013; Ford et al., 2012; Roca & Ford, 2021) as this goes beyond the scope of this study.

In regard to the length of national team career it can be said, that overall long national team careers occur only seldomly, yet if such a pattern occurs, they indicate that such players will end up in the international country level. Among those ending up at this level, 47.8% (see Table 3 in Appendix) have a developmental career pattern characterized by a long national team career. Additionally, in regard to length of national team careers it is more common to have a short or one-show trajectory, with the short trajectories having a good chance of ending up in the international club or country level. These findings relate to those of Schroepf & Lames (2018) who found that among German youth national players the length of being selected for the national team usually lasts one to two years and similarly to our findings they suggest that long careers are only apparent for a minority of players. This is a very interesting finding and might suggest that often times players that perform well get the chance to prove themselves within the youth national team. However, of those players only a few are good enough to continue their trajectory within the national team for a long time. Most players only get to play at such a level for a short time.

Another interesting finding relates to the interspersion variable. From the emerging patterns it can be seen that an interspersed career, it may happen for the academy or for the national team. However, it may be noted that among the emerging Types, there is no pattern in which a player has an Interspersion in an academy and the national team.. When looking at the outcomes for these patterns it can be seen that these tend to correspond to the non-professional level and to the international club and country level. The latter finding can be related to that of Gulbin et al. (2013) who found that reaching the international country level was seldomly linear, but rather achieved by an irregular trajectory, characterized by going down a level before going up again. This can be related in a way that the interspersion signals a player is deselected and therefore 'goes down' in his trajectory. However, Gulbin (2013) additionally reported that such an interspersed (or irregular) trajectory may lead to a high level of professional football, which is also the case in the current study. This could indicate that players who got deselected at some point in their youth career are eager to get back to their previous performance level and therefore do all they can to achieve this (Collins et al., 2016). On the other hand, the finding that players with an interspersed career do not make it further than the non-professional level might suggest that these do not put in a similar amount of work or are simply not good enough to be selected again. Such interspersed careers are also characterized by an early academy and national team entry, thereby indicating an early specialization pathway (Ford et al., 2009) which may lead to burnout or overuse injuries (Cote et al., 2009) from which players are not able to bounce back. However, it may also be that other factors in the players life or environment hinders them to get back. This should be investigated in future studies to understand the effect of an interspersed career in more detail.

Even though we see the tendency that being in a youth academy and in the national team from an early age on is important for later success at the senior level, we still see patterns with a late entry into either of the variables that may still result in playing at the

international club and country level. These findings may be explained by the notion of late bloomers, which are players characterized by having their growth spurt at a later time compared to their average cohort (Oldenziel et al., 2003). Such players may be disadvantaged in the beginning of their career as they are physically inferior to early bloomers and therefore are often unable to make it into an academy or the national team at an early stage. In order to stay competitive, late bloomers need to be more advanced in technical and tactical characteristics compared to their peers. When going through their growth spurt late bloomers will then have similar physical characteristics as early bloomers (Gulbin et al., 2013; Oldenziel et al., 2003) but additionally have a better sense of technique and tactics. This may be an explanation for why players with developmental career patterns characterized by late entries for either variable are also able to make it to the highest levels of professional football. Even though true for both variables it can be seen that such a pattern is more represented among the variable of national team entry.

Altogether, this is the first study that looks at career patterns of Dutch academy players. Thereby, the current study offers exploratory insights into the characteristics of developmental patterns of football players. In addition, the study uses a person-centered approach, treating the selection status of players as intensive longitudinal data and characterizing career patterns as such. It thereby takes on a different approach than that of previous literature by applying a longitudinal and intra-individual approach. Indeed, the main body of literature revolving around the development of football players focuses on an inter-individual approach by comparing elite vs non-elite players (Bruce et al., 2013; Ford & Williams, 2012; Haugaasen, 2014; Hendry et al., 2019). Further, scholars often used self-report data with a retrospective approach to investigate the developmental activities of players (see Ford & Williams et al., 2012; Erikstad et al., 2018; Haugaasen et al., 2014), which is

complemented in this study by using a longitudinal approach and therefore giving more support to the early engagement hypothesis.

Previous research has shown that individual trajectories of athletes are highly individual (Gulbin et al., 2013; Elferink-Gemser et al., 2011), which was also shown to be the case in this study. The current findings further suggest that the majority of players following a pathway that is characterized by a long and early academy career plus playing in the youth national team for a short or long period (almost) regardless of the age they enter have good chances of playing in the professional level of football or even at the international club or country level.

A strength of this study was the form of analysis used during the investigation. The CFA enabled us to analyze an intensive longitudinal data set in a comprehensive and understandable way, by taking a person-centered and holistic approach. Another strength of this study is the big sample size that was available, which results in more accurate values and is not as much influenced by possible outliers as it would be the case with a smaller sample size.

Even though our study has led to some interesting and new insights into the characteristics of developmental career patterns of football players, there are still limitations to our investigation that can be addressed in future research. More specifically, we only examined the pathways of male Dutch football players. This limits the findings applicability solely to the already highly overrepresented male domain (Johnston et al., 2018). Additionally, it is difficult to draw an overall conclusion for the whole world of football, as every country has their own values and approaches to the structures of their national team and respectively their youth academies. Instead, future research should consider similar investigations of developmental career patterns of football for other countries, as already done

by Schroepf & Lames (2018) for Germany, and also for female football players in order to see whether there are differences in developmental patterns between genders or whether we would see similar pattern, in line with the idea that talent development can take different forms (Phillips et al., 2010).

Another limitation of this study concerns the variables used and the CFA itself. More specifically, we only inspected youth academy and national team careers, which were considered relevant based on previous research (Schroepf & Lames 2018; Güllich, 2019; Hornig et al., 2016). Only adopting such a small number of variables for such a highly complex matter is difficult as it only enables us to draw conclusions to a limited degree. However, simply adding more variables to the CFA approach is difficult as this results in an abundance of possible configurations, thereby also decreasing the alpha value making less patterns significant. Therefore, future research should address this by considering more factors that are shown to be relevant in order to determine what characterizes a developmental career patterns for athletes and more particular for football players. Further, a meta-analysis could then be conducted taking all the findings of the different variables into account to find out which ones are the most important ones and what kind of influence they have on each other.

Conclusion

The main idea of this study was to investigate the characteristics of developmental career patterns of male Dutch football players. Little research has been devoted to describe the individual pathways of athletes or specifically football players (Schroepf & Lames, 2018 & Gulbin, 2013). Rather, research focused on the differences between elite and non-elite players in order to determine the important characteristics of becoming a professional football player (Figueiredo et al., 2009; Huijgen et al., 2009 & Lidor et al., 2005) and on the developmental

activities via a self-reported retrospective approach (Ford & Williams, 2012; Haugaasen et al., 2014; Roca et al., 2012; Güllich, 2017). Thus, the current study maps players pathways with a longitudinal and intra-individual approach. Overall, the results suggest highly individual and idiosyncratic pathways, going in accordance with prior research (Gulbin et al., 2013; Elferink-Gemser et al., 2011). Additionally, the developmental career patterns found in this study leading to an elite level of professional football (international club or country level) may be described by an early and long academy career and additionally, a short or long national team career regardless of the age of joining the national team. However, this is not exclusively the case as such a level may also be achieved through different patterns. This finding may be of importance to (inter)national football associations such as the KNVB. It could lead to the maximization of talent development in the sense that players on a promising pathway could receive extra attention to make sure they develop into world class players, just like Virgil van Dijk and Frenkie de Jong.

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Appendix

Table 1.

Descriptive statistics of the cohort of Dutch academy soccer players and subgroups

Future senior competitive level	N	Age (years)			% Missing
		(M ± SD)	Min	Max	
Nonprofessional	2746	25.2 ± 2.82	21.0	32.4	36.65
2nd Tier professional	518	24.7 ± 2.77	21.0	32.4	2.51
1st Tier professional	190	25.5 ± 3.09	21.0	32.4	2.62
International club	119	27.6 ± 3.08	21.0	32.5	5.69
International country	67	27.4 ± 3.29	21.6	32.5	1.47
Total	3640	25.2 ± 2.90	21.0	32.5	30.78

Note: International country: Appearances at World Cups or European Championships); International club: appearances in the UEFA Champions League or Europa League; (c) 1st Tier professional: appearances in the top tier in the Netherlands, (d) 2nd Tier professional: appearances in the second tier in the Netherlands, or (e) Nonprofessional: Did not play professional football.

Table 3.

Descriptive statistics of the cohort of Dutch academy soccer players and subgroups

	Senior competitive level				
	Non prof	**2nd tier**	**1st tier**	**Int. club**	**Int. country**
Career variables (level)	N (%)	N (%)	N (%)	N (%)	N (%)
Academy Length (AL)					
One-show (1)	302 (11)	8 (1.5)	2 (1.1)	0 (-)	0 (-)
Short (2)	1277 (46.5)	86 (16.6)	30 (15.8)	8 (6.7)	6 (9)
Long (3)	1167 (42.5)	424 (81.9)	158 (83.2)	111 (93.3)	61 (91)
Academy Entry (AE)					
Early adolescence (1)	2059 (75)	415 (80.1)	157 (82.6)	106 (89.1)	62 (92.5)
Middle adolescence (2)	516 (18.8)	76 (14.7)	18 (9.5)	11 (9.2)	2 (3)
Late adolescence (3)	171 (6.2)	27 (5.2)	15 (7.9)	2 (1.7)	3 (4.5)
Academy Interspersion (AI)					
No interspersion (0)	2433 (88.6)	444 (85.7)	165 (86.8)	114 (95.8)	63 (94)
Interspersion (1)	313 (11.4)	74 (14.3)	25 (13.2)	5 (4.2)	4 (6)
National Team Length (NTL)					
No selection (0)	2537 (92.4)	321 (62)	95 (50)	23 (19.3)	2 (3)
One-show (1)	99 (3.6)	65 (12.5)	32 (16.8)	17 (14.3)	0 (-)
Short (2)	107 (3.9)	118 (22.8)	53 (27.9)	66 (55.5)	33 (49.3)
Long (3)	3 (0.1)	14 (2.7)	10 (5.3)	13 (10.9)	32 (47.8)
National Team Entry (NTE)					
No selection (0)	2537 (92.4)	321 (62)	95 (50)	23 (19.3)	2 (3)
Early adolescence (1)	100 (3.6)	65 (12.5)	19 (10)	22 (18.5)	26 (38.8)
Middle adolescence (2)	89 (3.2)	102 (19.7)	53 (27.9)	50 (42)	24 (35.8)
Late adolescence (3)	20 (0.7)	30 (5.8)	23 (12.1)	24 (20.2)	15 (22.4)
National Team Interspersion (NTI)					
No interspersion (0)	2721 (99.1)cou13	478 (92.3)	165 (86.8)	81 (68.1)	53 (79.1)
Interspersion (1)	25 (0.9)	40 (7.7)	25 (13.2)	38 (31.9)	14 (20.9)

Note: ….