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Mechanisms explaining the birthplace effect for male elite football players

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ABSTRACT

Earlier research shows that wide regional variations exist in the success of athletes' talent development but is divided with respect to the role of urbanity: both low and high urbanity have been identified as settings that contribute to the presence of talent hotspots. In this article, we intend to provide more insight into the role of urbanity in talent development in Dutch football. We used public data on the regional background of male elite players (N = 825) and combined this with public data on municipal characteristics from Statistics Netherlands and other sources: urbanity, football participation, instructional resources and population composition effects (migration background and income of inhabitants). Linear regression analysis showed that football participation, the proportion of non-western migrants and median income predict "talent yield", i.e., the proportion of young people that reach an elite level in a municipality. Urbanity does not have an independent influence when the proportion of non-western migrants in the municipality is taken into account. The presence of instructional resources does not have an independent influence. The results suggest that characteristics of the built environment, such as indoor and outdoor play opportunities, may be less influential in talent development than previously assumed.

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KEYWORDS
Talent development; football; regional hotspots; urban environment; birthplace effect

Introduction

Geospatial variation in the development of elite athletes has been shown to exist across continents, countries, regions and cities: ranging from world-class speed skaters born in the Netherlands to long distance runners from the Kenyan Rift Valley (Coutinho et al., 2016). Elite football players appear to show such geospatial variation as well: mainstream media paint a picture of elite football players growing up in deprived neighbourhoods; for instance, on the outskirts of Paris and Sao Paulo. In Denmark, boys who grew up in dense cities were more likely to become elite football players than those who grew up in rural areas (Rossing et al., 2016). In the literature on talent development, places that yield an exceptionally high number of successful athletes for a sustained period of time have been named talent development hotspots (O'Neill et al., 2018; Rees et al., 2016). In recent years, many studies have analysed variations in the talent yield (i.e., the percentage of children that reach an elite level) suggesting the existence of so-called 'birthplace effects´ (for a review: see Rees et al., 2016). However, the magnitude and direction of these effects of the place of early development have been shown to differ across sports and countries. Specifically, the literature is inconsistent with respect to the effects of population size and density (Côté et al., 2006; Schorer et al., 2010). A positive birthplace effect for small and less urbanized places has been described and could be related to better opportunities to play and sample sports in rural areas (Côté et al., 2006; Kyttä, 2002). On the other hand, it has been argued that an urban setting might be beneficial, since smaller residences provide fewer opportunities for children to play inside (Kuper & Szymanski, 2009) and football can be played in small settings on a concrete surface. Moreover, an urban environment may be beneficial to long-term talent development because it provides opportunities for deliberate play and discovery learning (Ford et al., 2012). Indeed, as previously mentioned, Rossing et al. (2016) have found a positive association between growing up in dense cities and playing football at an elite level in Denmark. Apart from density of housing and the structure of the built environment, many other environmental characteristics might influence the success of the development of athletes (Rees et al., 2016).

The availability and proximity of instructional resources might be important (Baker & Horton, 2004), but the evidence is inconclusive. Curtis and Birch (1987) have shown that living in remote areas negatively impacts the chances of being spotted as a talent for the National Hockey League in the United States. Finnegan, Richardson et al. (2017) show that proximity to a talent school increases the probability of selection into that talent school. Danish research has shown that the presence or proximity of talent development clubs has a positive effect on the number of young players reaching elite status in both handball and football (Rossing et al., 2016, 2018). On the other hand, Farah et al. (2018) did not find a positive effect of the proximity of an elite club on the chances of Canadian players reaching the NHL.

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Following Bronfenbrenner (1979), we define the place of early development as the environment wherein a developing person forms his or her relations and undertakes activities in. Examples are the activities and relationships within a family, school and sport clubs but also within the neighbourhood (e.g., the peers that kids play with on the street). Factors that may explain talent development are often interrelated (Gulbin et al., 2013). For instance, urbanity may be expected to be related to sports participation and to the availability of instructional resources, since successful sport clubs and sport arenas tend to be located in larger cities (Curtis & Birch, 1987). When studying environmental effects, it is necessary to parse out composition effects as much as possible. People are not randomly distributed over the country, and talent "hotspots" may be the result of individual characteristics of the inhabitants of the hotspots rather than an effect of the environment itself. One possible composition effect can be due to the socioeconomic characteristics of the population. Again, the literature is divided with regard to the direction of the effect. On the one hand, there is some evidence for a positive relation between sports participation and the socioeconomic position of parents (Carlson, 1988; Kirk, 2005). Generally, the help and (financial) support of parents is important for success in sports (Bloom & Sosniak, 1985). On the other hand, football is considered a relatively cheap sport, certainly for children at a younger age. In fact, it has been suggested that compared to children with an average socioeconomic position, children with a low socioeconomic position may be more motivated to pursue a professional career in sports, and football in particular (Agergaard & Sørensen, 2009; Bourke, 2003).

Cultural diversity of communities is a second composition effect that may have an influence on the talent yield. Surveys done by Statistics Netherlands and the Dutch public department of health, show that at least in the Netherlands people with a migration background (i.e., immigrants and children of immigrants) participate less in sports than non-migrants. However, when they do participate in sports they tend to choose football more often, at least the males do (Tiessen-Raaphorst et al., 2014). Similarly, in France, people with an immigration background tend to be overrepresented in football (Drut & Duhautois, 2015). Beau and Noiriel (1990) link immigration to higher yields in the development of elite talent in football since the 1950's in France. In the United States, African Americans have been shown to be overrepresented in elite sports such as basketball, baseball, American football, and running (Entine, 2000; Harrison & Bimper, 2014). Van Yperen (2009) found that, in a sample of football-players from the youth academy of a well-known Dutch football club, those who had a non-Dutch background reached an elite level significantly more often than those who had a Dutch background. As for people with a low socioeconomic position, a perceived lack of career options might explain an above average motivation to pursue a career in football. In the Netherlands, people with a non-Dutch background are overrepresented in larger cities (CBS, 2018).

In this study, we explore the existence of geospatial "talent hotspots" in football in the Netherlands. Furthermore, we aim to provide insight into factors that explain those hotspots in all Dutch municipalities. We used the talent yield of municipalities as the outcome variable of interest: how high is the "yield" of elite football players from a certain municipality in relation to what may be expected from its number of youth club members? First and bivariately, we expect urbanity to be positively related to the talent yield of the municipality. Then, we expect a number of variables to act as mediators for this relation, meaning that they fully or partially account for the effect of urbanity. Football participation, the presence of instructional resources, and cultural diversity (proportion of people with a migrant background) in the municipality are all expected to be higher in urban areas and expected to be related to a higher talent yield. Median income in the municipality is expected to be lower in urban areas, and again expected to be related to talent yield, but the direction of the relationship could be either way. Finally, we investigate whether an effect of urbanity still remains net of the mediating variables.

Materials and methods

Data on origin of elite players

Biographical data were collected on 1097 male football players who played at least one of the five seasons in the highest football division in the Netherlands (Eredivisie, season 2013/14, 2014/15, 2015/15, 2016/17 and 2017/18) and 243 male Dutch players who played at the highest level elsewhere in the world during these seasons. The data on place of birth, date of birth and the first youth club that they played for was collected from Wikipedia by web scraping using the Python programme*Beautiful Soup* and put together in a spreadsheet. We eliminated duplicates and restricted the analysis to those players in the highest football-division who started their career at a youth club within the Netherlands (N = 825, Median birth year = 1991, range = [1970, 2001], *SD* = 5.1). Following Baker et al. (2009), we chose the municipality of the first youth club of elite players as a proxy for their place of early development and not their place of birth. We judged this a more accurate reflection of the place where they grew up, the place of early development, since a significant proportion of people are born in hospitals outside their place of actual residence. All characteristics of municipalities were collected from Statline, the open data bank of Statistics Netherlands. The study was approved by the Central ethics Review Board non-WMO studies of the The University Medical Centre Groningen (CTc UMCG; Research Register number: 201900602).

Dependent and independent variables

Ideally, we would measure characteristics of the municipalities as they were during the elite players' youth, or more specifically the year that the elite players started at their first youth clubs at an estimated average age of six (Ford & Williams, 2012). Considering the mean birth year of our sample, 1997 is the optimal year for measuring municipal characteristics. Unfortunately, not all data were publicly available for that year. In those cases, we chose proxy years that were as close as possible to 1997. Detailed information on all variables can be found in Table 1.

Table 1. Definitions and descriptive statistics of dependent and independent variables. M and SD are used to represent mean and standard deviation, respectively.

variable (unit)	Definition	M	SD
Talent yield (dependent)	Number of elite players (in the five seasons mentioned above) that started their career at a youth club within the municipality, for every thousand youths (0–20 year olds) living in that municipality in 2001	0.16	0.24
Urbanity	Number of inhabitants per square kilometre in 1997, divided by 1000.	756.16	919.05
Football participation	The percentage of inhabitants that were a member of the Dutch football association KNVB in 2017 (from *www.volksgezondheidenzorg.info*).	8.23	2.25
Professional talent school	A professional football club from the highest Dutch division (seasons 2013–2018) is present in the municipality: yes or no	0.05	0.22
Top 200 amateur youth club	One of the best 200 amateur youth clubs is present in the municipality: yes or no in 2017.	0.35	0.48
Median income	The median income, divided by 1000, of all households except student households in 2017.	25.63	2.14
% western migrants	The percentage of people with a western background in 1997. Following Statistics Netherlands, these are defined as inhabitants of the Netherlands of whom at least one of the parents was born in countries in Europe (excluding Turkey), North-America, Oceania, Indonesia and Japan (CBS, 2019).	7.41	4.66
% non-western migrants	The percentage of people with a non-western background in 1997, defined as inhabitants of the Netherlands of whom at least one of the parents was born in Africa, Latin-America, or Asia excluding Indonesia and Japan.	3.77	3.65

The variables professional talent school and top 200 amateur youth club are used to operationalize the availability of instructional resources. As a proxy for the presence of a professional talent school in a municipality we use the presence of a club from the highest football division in the season 2017/18. For the qualification top 200 amateur youth club we used a ranking from the same season, based on the level of competition of first teams and youth teams for players aged 12 to 18 (Voetbaltrainer.nl, 2018). Cultural diversity is operationalized using the variables % western migrants and % non-western migrants. As a proxy for the socioeconomic population composition in municipalities during the years of development we take median income of households in a municipality, excluding student households (2017).

Data analysis

To verify the quality of our data, we compared the dataset with data on these clubs' websites and data from the commercial website *www.transfermarket.nl* for the youth clubs and the municipality where those are based. Compared to the other sources, scraped data on birthplace and birthdate showed to be 99% identical. Data on the first youth clubs matched 100%.

For the descriptive results on the existence of hotspots we calculated talent yield location coefficients, dividing the talent yield in the municipality by the mean talent yield within the Netherlands (i.e., the total number of elite players in our sample divided by the total number of 0–20 year olds in 2001). Municipalities with location coefficients of more than 2 were qualified as hotspots.

To test our hypotheses on the role of urbanity and its mediators in talent development, we used linear regression with municipalities as the unit of analysis, starting with a base model using only urbanity (model 1), then introducing the other variables that we expect to have an effect on the talent yield. This stepwise regression enables us to establish if variables that are introduced into our successive models act as mediators to urbanity and possibly to other variables, following the procedure described by Baron and Kenny (1986).

Results

There are 38 talent hotspots in the Netherlands, as shown in Figure 1. The results of our linear regression models are shown in Table 2. In model 1, the average talent yield in the Netherlands is 0.16 male elite players for every 1000 young people in the municipality. The talent yield increases by 0.03 for every thousand more inhabitants per square kilometre. In subsequent models, we added the characteristics of the municipalities step by step. Median income in the municipality and the proportion of non-western migrants are highly and significantly related to the talent yield (Model 5), and the proportion of non-western migrants acts as a mediator for other effects as well. Football participation is not related to talent yield in Models 2–4, but becomes significant ($p < 0.05$) after correcting for cultural diversity in Model 5. The talent yield increases significantly when a professional talent school is present in a municipality (Model 3 and 4), but this effect disappears when corrected for cultural diversity (Model 5). Models 4 and 5 show that the socioeconomic population composition of people living in a municipality is also positively related to the talent yield. When median income increases by 1000 euro, the talent yield in this municipality increases by 0.02 in the final model. Model 5, the full model, shows that a 10% point increase in the proportion of non-western migrants corresponds to a 0.2 increase in the predicted talent yield. The effect of urbanity on the talent yield is fully mediated via the variables football participation, median income and proportion of non-western migrants. The regression coefficient of urbanity is no longer significant in the final model.

We have checked if assumptions for linear regression are met (Berry, 1993; Field, 2005). Our final Model 5 has an average VIF of 1.6 showing that some multicollinearity is present in our data (Bowerman & O'Connell, 1990). The maximum VIF-score of 2.5 is well below the threshold of 10 that Bowerman et al. have established as a cause for concern. Our final model meets the assumption of independent errors (Durbin-Watson value = 2.11). Visual inspection of residual plots showed that the relationships in our models are approximately linear. A quantile-quantile plot

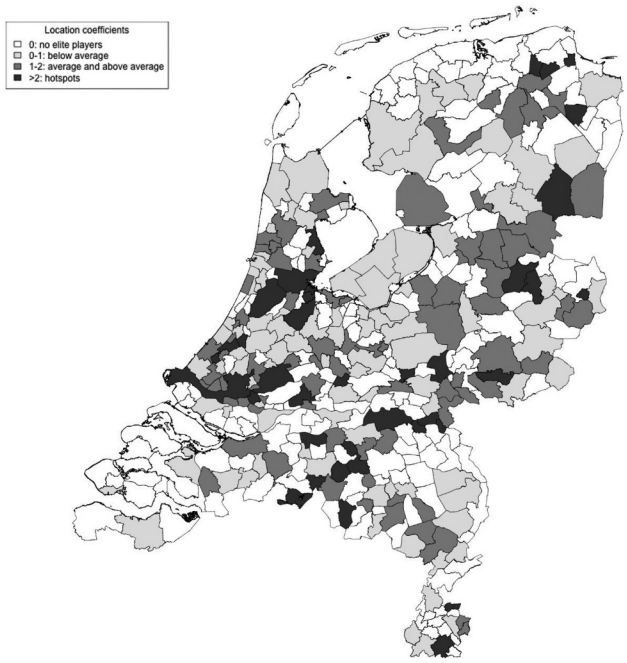

Figure 1. The local talent yield, divided by the average talent yield (location coefficients). Many municipalities with a location coefficient of 0 are located along the borders of the Netherlands. There are 38 talent hotspots. Apart from Amsterdam, located to the southwest of the big white spot of the IJsselmeer, the bordering municipalities of Diemen, De Ronde Venen, Haarlemmermeer and Ouder-Amstel are all hotspots too. Three of these municipalities are situated close to the southeast of Amsterdam, the location of Ajax, a Dutch football club that is well known for having educated many players that reached an elite level nationally and internationally.

Table 2. Linear regression, dependent: talent yield. All continuous independent variables are centred before entering them in the model.

	Model 1, urbanity	Model 2, urbanity, participation	Model 3, urbanity, participation, professional talent school, top 200 amateur youth club	Model 4, urbanity, participation, professional talent school, top 200 amateur youth club, median income	Model 5, urbanity, participation, professional talent school, top 200 amateur youth club, median income, % western migrants, % non-western migrants
R^2	0.017	0.018	0.036	0.052	0.083
Intercept	0.16(***)	0.16(***)	0.14(***)	0.14(***)	0.15(***)
	[0.14, 0.18]	[0.14, 0.18]	[0.11, 0.17]	[0.11, 0.17]	[0.11, 0.17]
Urbanity	0.03(**)	0.04(*)	0.03	0.03(*)	−0.01
	[0.01, 0.06]	[0.01, 0.07]	[−0.00, 0.06]	[0.00, 0.06]	[−0.04, 0.03]
Football participation		0.004	0.005	0.005	0.01(*)
		[−0.01,0.02]	[−0.01, 0.02]	[−0.01, 0.02]	[0.00, 0.03]
Professional talent school in municipality			0.13(*)	0.16(**)	0.09
			[0.01, 0.24]	[0.04, 0.27]	[−0.03, 0.21]
Top 200 amateur youth club in municipality			0.03	0.04	0.03
			[−0.02, 0.08]	[−0.02, 0.09]	[−0.02, 0.08]
Median income				0.01(*)	0.02(**)
				[0.00, 0.03]	[0.01, 0.03]
% Western migrants					0.00
					[−0.00, 0.01
% Non-western migrants					0.02(**)
					[0.01, 0.03]

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
Square brackets are used to enclose the lower and upper limits of a 95% confidence interval.

of Model5 shows that our standard errors do not fully fit a normal distribution.

Bootstrapping allows us to relax the assumption of a normal distribution, by estimating an empirical distribution function (Field, 2005). We tested the significance of these indirect effects (i.e., the effect of urbanity via football participation, median income and proportion of non-western migrants) using bootstrapping procedures (Tingley et al., 2014). We tested both models with and without covariates. The bootstrapped unstandardized indirect effect for football participation was −0.02 ($p < 0.01$) for income this indirect effect was −0.01 ($p < 0.05$) and for the proportion of non-western migrants this indirect effect was 05 ($p < 0.001$). In the model without covariates, the proportion of non-western migrants was the only significant mediator (results available upon request).

Discussion

Our study introduces an innovative approach to deepen our understanding of talent development hotspots. We have shown that it is fruitful to combine possible environmental influences on talent development such as urbanity into one model with other, interdependent environmental characteristics as well as data on the regional composition of a population. Our results show that regional hotspots for the development of football talent do exist in the Netherlands: the number of elite players per 1000 young people is unequally distributed over the country. A model combining the effects of urbanity and regional characteristics such as the percentage of football players, median income and the percentage of non-western migrants explains approximately 8% of the success of football talent development in Dutch municipalities.

Rather than finding an independent effect of urbanity itself, this study has shown that the composition of the population is related to the presence of hotspots in Dutch football. Specifically, a higher median income and a higher proportion of people with a non-western background are related to a relatively high probability of male youth club players reaching an elite level. These act as mediators to urbanity, explaining the correlation between urbanity and the talent yield as well as the correlation between instructional resources and the talent yield. Earlier conclusions about positive (Rossing et al., 2016) and negative (Côté et al., 2006) effects of the urban environment on successful talent development may have been premature. Variables correlated with urbanity may in fact drive differences in talent yields instead of city sizes or densities themselves. This result is consistent with earlier notions suggesting that research into talent development should look into contextual and cultural factors to explain the birthplace effect (Bruner et al., 2011).

It is important to realize that these results are group-level associations and cannot be extrapolated directly to individual level-associations (the "ecological fallacy"). For instance, the result that median income in a municipality is related to the average talent yield in the municipality does not necessarily mean that children from richer families have higher chances of making it as an elite player. Most of the discussion below focuses on potential individual-level explanations for our results, but this reservation should always be kept in mind.

Our finding that high median income municipalities have a higher talent yield in elite level football players, is in line with earlier research emphasizing the important role of financial support from the family for success in sports (for a review: see Knight, 2017). It is also in accordance with the fact that Dutch elite young football players were more often enrolled in pre-university education than in pre-vocational education (Jonker et al., 2010). However, our result seemingly contradicts the notion that a low socioeconomic position might predict success in football due to superior motivation (Bourke, 2003) or a lack of other career opportunities (Agergaard & Sørensen, 2009).

Our finding that talent schools and top amateur clubs do not have an independent effect is surprising, considering the earlier research done in Ireland and Denmark (Finnegan, Richardson et al. 2017; Rossing et al. 2018).

There could be various explanations for this result. First, the Netherlands is a small country and it has excellent infrastructure. Therefore, professional talent schools may be easily accessible even when they are located somewhat further away. Second, many steps are involved to make it from a talent school to an elite level. Earlier research shows that talent programmes in German football have a high turnover and that a very high percentage of players selected into youth academies and national youth teams, do not proceed to an elite level (Güllich, 2014). In the Netherlands, a high percentage of players at an elite level have spent some time in reputable professional talent schools, but this effect may be explained by the selection of successful young players instead of superior education. Finally, the Danish study does not consider composition effects of the population. It would be interesting to find out if income and migration background act as mediators in Denmark as they do in the Netherlands.

The role of migrants in (European) football has been studied from several perspectives. Ingersoll et al. (2017) have established that cultural diversity contributes to the football success in top-level football. In general, studies of migration and cultural diversity in football have focused on players that have reached an elite position and not on the developmental years (Taylor, 2006). In a study focusing on the underrepresentation of minorities in coaching and management positions at elite football clubs, Bradbury et al. (2014) estimate that in England, France and the Netherlands between 25% and 40% of players at these clubs are from "visible" minority backgrounds, defined as "ethnically distinct populations drawn from non-European heritage who reside in countries in Europe in which they make up a numerical minority". This percentage is high compared to the estimate that the same authors provide for the proportion of people from these backgrounds in those three countries (14%).To our knowledge the overrepresentation of players with a migrant background has not been studied before.

In the Netherlands, non-western migrants play football more often than people from Dutch descent (Tiessen-Raaphorst et al., 2014). However, higher football participation is probably not the explanation, since the percentage of non-western migrants in a community is negatively correlated to the percentage of football players in these communities ($r = -0.51$, analyses available upon request). From the perspective of the literature on the importance of deliberate play for talent development (Ford et al., 2012) it is interesting that non-western migrants play football in informal settings far more often than the native Dutch (Tiessen-Raaphorst et al., 2014). Future research would benefit from investigating whether these informal settings could be beneficial for talent development, for example, in terms of stimulation of players' self-regulation of learning (Jonker et al., 2019).

Our study has limitations. First of all, 92% per cent of the variance in the success of football talent development is not accounted for by our model. This can be explained, because variables that have been taken into account in this study, all have an indirect influence, acting through primary variables such as genetic attributes, the number of training hours and psychological characteristics (Baker & Horton, 2004). Also, the

relative age of football players within their competitive group has been shown to explain performance (Helsen et al., 2005). In other words, an athlete's multidimensional performance characteristics such as anthropometric, physiological, technical, tactical, and psychological skills can explain additional variance of the development of sport performances (Elferink-Gemser et al., 2011, p. 2018). Furthermore, not all secondary influences have been incorporated in our model. As an example, the intensity of competition may also explain some of the local variation in football talent yield. Second, to study the effects of urbanity as described in the literature, the level of the municipality is rather crude: outdoor and indoor playing opportunities vary considerably within cities and villages. To reduce the amount of unexplained variance in our model, a study of these environmental factors may be needed at the more detailed level of neighbourhoods. Third, conclusions from this study should be drawn cautiously, because our study is confined to the Netherlands. An international extension of our analysis would be most useful: are the effects of income and cultural diversity consistent across cultural, political and social contexts in other countries? Fourth, our variables are necessarily proxies for underlying latent variables. The years of measurement of the municipal data that we use in our study do not always match the years of early development of the elite players. This is a limitation of our study, even though municipal characteristics are relatively robust and stable over time. And last, our analyses were performed at the level of municipalities. This has the aforementioned disadvantage that group-level associations cannot be extrapolated to associations on the individual level.

It would be interesting to investigate to what extent socioeconomic status and migration background are related to the way of practising as well as to other factors that have been shown to be relevant for academic success, such as the home environment, parental expectations and expectations of children themselves (Thomson, 2018). A case-study of a hotspot may be suitable to further extend our insight into the environmental and socioeconomic factors that explain a high talent yield in football (Flyvbjerg, 2006). To get more insight into the relationship between migrant background, household income and success in football, an individual-level analysis of football careers is advised, with longitudinal, multidimensional data (Elferink-Gemser et al., 2011).

Conclusion

Hotspots of talent yield exist in Dutch football. On average, urban municipalities have a higher yield of elite players than rural areas. This is explained by population composition rather than being an effect of urbanity -i.e., aspects of the built environment-itself. Football participation (club membership) played a role as well, but the presence of talent schools or top 200 amateur youth clubs had no independent effects.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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