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Mapping talent pathways: A comparative study of developmental activities and practice structure in Brazilian and Spanish U-18 elite youth male soccer players

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Abstract

The purpose of this study was threefold: (1) to compare the engagement in various types and amounts of soccer activities during childhood and adolescence between Brazilian and Spanish elite youth soccer players; (2) to test what talent development pathway characterizes youth development in elite soccer in Brazil and Spain and (3) to compare the practice structure between elite youth soccer in Brazil and Spain. Participants were 131 U-18 elite male soccer players from Brazil ($n = 68$) and Spain ($n = 63$) competing in the national league. The Participant History Questionnaire was used to measure the soccer activities undertaken by players. Developmental activities were analyzed for two age periods: childhood (6–12 y/o) and early adolescence (13–15 y/o). In Spain, players started their involvement in practice and competition in soccer earlier compared to Brazilian players ($p < .05$). Brazilian players were more involved in structured activities, such as practice in soccer and futsal, and participated in a greater number of sports in childhood and early adolescence ($p < .05$). We found a very similar percentual practice structure (individual, pair, drills, group tactics and collective tactics activities) between Spain and Brazil, although Brazilian players accumulated a greater practice volume. It is concluded that Spanish and Brazilian U-18 elite youth male soccer players were differentiated by their milestones in soccer and their engagement in practice activities during childhood and early adolescence. Talent development pathway of male soccer players in Spain was characterized by the early engagement pathway, while the Brazilian system was characterized by the specialized sampling model.

Keywords

Adolescence, association football, childhood, deliberate play, deliberate practice, drills, Developmental Model of Sport Participation, tactics

Introduction

Talent development and the attainment of superior performance in soccer are multidimensional processes in which players' experience and participation in different developmental sports activities play important roles in becoming elite.[1] According to talent development literature, an elite player is usually considered the one who participates in the highest competitive level of their age group, either in youth or adult level.[2] The type, quantity and quality of sports activities that players engage in usually will vary depending on the different phases of sports development.[3] Regarding the stages of sports development, the theoretical model proposed by Côté and collaborators,[4–6] known as the Development Model of Sport Participation (DMSP), has been widely used in the world to understand and promote the process of talent development, including several studies in soccer.[7,8]

The DMSP divides talent development pathway into three different main stages, which are classified as (a) sampling years (6–12 years old); (b) specialization years (13–15 years old) and (c) investment years (from 16 years old to adulthood). These different stages are characterized

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by the age of the individuals, the number of sports practiced and the type of activities involved in the practice of sport(s) (i.e., deliberate play and deliberate practice). On the one hand, deliberate play is a form of intrinsically motivating sports activity that provides immediate gratification and is specifically designed to maximize satisfaction (e.g., playing soccer with friends in the park).[5] On the other hand, deliberate practice is characterized by activities performed to improve performance, and not necessarily to generate satisfaction, being positively associated with developing specific abilities (e.g., team practice led by the coach).[9]

Research using this model on talent development and identification usually seeks to identify what sport pathway and developmental activities contribute most to participation in elite performance.[1,10] It usually shows that sports participation in soccer has a major influence of cultural aspects, such as players born in different countries and continents. Studies carried out in England, Norway and Germany[11–13] showed that hours accumulated in soccer-specific team practice and play in childhood are associated with expert levels of achievement. This pattern of sports participation in childhood characterized by high amounts of involvement in deliberate play and practice in the primary sport (soccer) and low sampling (participation) in other sports is known as the early engagement pathway.[14]

More recently, a new pathway in soccer development, known as the specialized sampling model, was identified in Swiss soccer players by Sieghartsleitner et al.[15] This pathway is characterized by engaging in high amounts of both deliberate play and deliberate practice activities in childhood – as in the early engagement pathway.[14] However, it also includes diversification of soccer activities in different contexts (e.g., street soccer, beach soccer, structured team practice and futsal). The foundation of this new pathway came with an update on the concept of sports diversification during childhood proposed by Côté and Erickson.[16] As a result, the understanding of this term came to be related to the diversification of the types of activities in different sporting contexts and not just between different sports, as first proposed within the DMSP. In Brazilian culture, the integration of futsal and beach soccer into this specialized sampling model accentuates their pivotal roles as dynamic contributors to soccer development compared to other sports. However, futsal has greater importance considering its presence in every city in Brazil, while beach soccer is much less practiced since only around 20% of the Brazilian population live on the coastline.[17]

In this line, recent research advocates the potential of engagement in futsal practice to contribute to talent development in soccer[18–20]. Futsal can be described as an indoor version of soccer, composed by teams of four outfield players and a goalkeeper that plays in a court of 20×40 m. In this regards, Yiannaki et al.[18] found that a large majority (~90%) of soccer coaches interviewed in their study considered futsal useful in soccer talent development and would consider using it in their coaching provision. Moreover, there is empirical evidence that futsal practice promotes the transfer of tactical–technical skills (e.g., passing skills) to soccer.[19] This potential for positive transfer between futsal skills to soccer skills has been attributed to similarities between perceptual-cognitive and perceptual-motor skills of both sports. Additionally, the characteristics of futsal, such as fewer players and dimensions compared to soccer, may contribute to a wide range of technical and tactical abilities development and decrease the game's complexity.[20] Therefore, research about talent development could assess players' previous futsal participation to further understand its role in soccer players' sports formation pathway.[3]

Another important aspect considered within talent development and sport pedagogy research is the quality of practice.[21] Some research has tried to identify the microstructure of training settings used in different contexts in soccer formation, such as various performance levels and countries.[21,22] The microstructure is related to specific practice characteristics, such as what activities are engaged in (e.g., drills, individual, pairs, group and collective activities)[23,24] and more recently, the level of decision-making specificity the activity has with the formal game.[21] This type of information has been used to identify whether practice has been designed according to the extensive scientific literature on sports pedagogy and coaching. In this regards, it was identified that practice structure in soccer clubs is influenced by skill level,[22] age group[22] and country culture.[21] Over the last 10 years, literature identified that practice structure has changed a lot for a more evidence-based design, such as the increasing percentage of training spent in group and collective activities that allow more active decision-making opportunities for players, although empirical evidence in this theme is still limited to a few European countries.[21,22]

There is therefore a need to expand the body of knowledge in the area of microstructure of practice and talent development in soccer to more European countries and different continents, especially those with high-performance traditions in soccer. Various soccer stakeholders, such as coaches, clubs and federations, could benefit towards the goal of elite talent development. The knowledge about the microstructure of practice and sport pathway development could help understand how the practice has been organized within their sport formation context and provide insights into where it could be improved with more evidence-based approaches or even serve as a benchmark for developing soccer nations. In this regards, and to the best of our knowledge, we have neither found any academic study that analyzed the developmental activities of elite soccer players in Spain nor a study that analyzed the practice structure of Brazilian elite soccer players. Thus, the purpose of this

study was threefold: (a) to compare the engagement in various types and amounts of soccer activities during childhood and adolescence between Brazilian and Spanish elite youth soccer players; (b) to test what talent development pathway characterizes youth development in elite soccer in Brazil and Spain and (c) to compare the practice structure between elite youth soccer in Brazil and Spain.

Materials and methods

Participants

The sample comprised a total of 131 U-18 elite male soccer players from Brazil ($n = 68$; $M = 16.2 \pm 1.1$ years of age; minimum age = 15.8; maximum age = 17.9) and Spain ($n = 63$; $M = 17.7 \pm 0.9$ years of age; minimum age = 16.0; maximum age = 18.4). The eligibility criteria for participant selection includes regular training (minimum of four training sessions per week) in the club and competing in the first national league for their age group. They participated in four to six training sessions per week with a duration between 80 and 100 minutes and participated in competition matches of 90 minutes. Data was collected from three clubs in Brazil from different regions (southwest, northwest and south) and from three clubs in Spain from different regions (Castilla-La Mancha and Murcia). Players born in different countries than the club for whom they were playing were excluded from the sample ($n = 4$ in Spain). Data collection was carried out with previous approval from club officials and athletes' legal guardians. The present study was approved by the Ethics Committee for Research with Human Beings from the leading institution and is in accordance with the norms established by the Declaration of Helsinki (2013) for research with human beings. Participants and their legal guardians provided signed and informed consent.

Measures and procedures for data collection

Developmental activities: Participant History Questionnaire. The Participant History Questionnaire (PHQ), used in several studies,[8,24–26] was used to measure the soccer activities undertaken by players. We used the Portuguese version of the questionnaire already used in previous studies with Brazilian youth samples[24,26–28]. Reliability and validity of such retrospective methods in general, and the use of similar variables as in the current investigation, have been shown to be acceptable for different cultures (i.e., English, German, Norwegian and Swiss participants)[15,25,29–31] including the original version in English of this questionnaire[25] and its Norwegian version.[31] This questionnaire provided information about milestones in soccer (e.g., start age of playing soccer) and engagement in different soccer developmental activities (e.g., participation in soccer practice or competition). The milestones related to the age participants started to engage in different activities in soccer (see chart 1). Furthermore, seven variables related to developmental sports activities were assessed (see chart 1). All those variables have been included in previous studies,[12,32] with exception of 'total practice'. This variable is a composite metric calculated based on variables collected through the questionnaire, which comprises the time spent in soccer practice plus futsal practice. We proposed the inclusion of this variable, considering two main points: (a) the new interpretation of sports diversification through the opportunity to play activities related to the primary sport in different settings and contexts[15,16]; and (b) the cultural aspects in Brazil and Spain, where futsal is a popular sport, and both countries are the two most successful nations in the sport.[33] We also calculated the number of hours per week spent playing and practicing soccer, considering a 40-week sports season. Moreover, the final questionnaire section sought to obtain details regarding the organization of soccer training (microstructure) during the final two seasons of the early adolescence phase, specifically the U-15 and U-14 seasons in which the player was involved. The activities are described in chart 1. The subdivision of activities in low- and high- decision-making opportunities was performed considering the degree of complexity of each one of those activities and its similarity with the demands and components of the actual game.[21,22]

In order to complete the questionnaire, participants provided the number of hours per week and the number of months per year spent in each of the soccer activities. Additionally, they recorded in weeks any time away from soccer (i.e., injured and unable to participate) that occurred across the course of the season. This information was given retrospectively, from the present season/year, going backward in a one-year interval up to five years of age, or the age at which they started participation in soccer activities. The calculation of the accumulated hours in soccer activities was performed by multiplying hours reported per week by weeks per year, minus weeks per year that players reported injuries that prevented them from participating in soccer activities.

This retrospective questionnaire was applied online, using a mobile phone, tablet or computer with internet access, in small groups of up to five players where the researcher in charge (GM) explained how to fill out the questionnaire. After the initial explanation, the participants answered the questionnaire, while the researcher was available to answer any questions that arose during the completion of the form. The application took approximately 60 minutes per player during a specific session on a day they were not training.

Statistical analysis

Descriptive analysis was calculated for milestones, developmental activities and practice structure. Developmental activities data were analyzed for two age periods: (a) 6–12 years of age (i.e., childhood); and (b) 13–15 years of age (i.e., early adolescence) to match the developmental stages outlined by

Chart 1.

Variables	Explanation
Milestones (starting age)	
Participation in soccer	Kicking a ball around.
Supervised training with an adult	Participation in structured training with an adult.
Competition in soccer tournaments	Participation in soccer tournaments.
Play 11 × 11 format	Participation in matches with 11 × 11 format.
Developmental Activities	
Play in soccer	Play activities (i.e., deliberate play) in soccer are related to play-type games with specific rules created and supervised by participants, in which the primary goal is enjoyment (e.g., playing a soccer game with friends in the park).
Practice in soccer	Practice in soccer was related to soccer activities under the supervision of coaches or adults in which the goal is to enhance performance (e.g., training with the team).
The percentage of time in play	The 'percentage time in play' was calculated considering the percentual time spent in play activities in soccer, considering the total amount accumulated in practice and play in soccer.
Competition in soccer	Amount of participation in soccer tournaments.
Practice in futsal	Practice in futsal was related to futsal activities under the supervision of coaches or adults in which the goal is to enhance performance (e.g., training with the team).
Total practice (soccer + futsal)	Composite metric suming up the hours accumulated on practice in soccer and practice in futsal.
The number of other sports	The number of other sports considered the participation in other sports than soccer, where participants were involved for more than three months in contexts that were not physical education classes.
Practice structure	
Individual	E.g., dribbling the ball alone.
Pairs	E.g., passing or 1 × 1.
Drills	E.g., situations that were re-enacting isolated simulated game incidents, such as going to a designated area to another.
Group tactics	E.g., small-sided and conditioned games of 2 × 2 up to 4 × 4.
Collective tactics	E.g., small-sided and conditioned games of 5 × 5 or higher configurations.
Low decision-making opportunities	Composed by individual, pairs and drills activities.
High decision-making opportunities	Composed by group and collective tactics activities.

Côté.[5] The analysis considered the total number of years of each stage (i.e., seven years for childhood and three years for early adolescence). Distributions were checked with a Kolmogorov–Smirnov test. Afterwards, we verified the between-group differences in all the variables measured by the PHQ using a Mann–Whitney *U* test due to non-normal data distribution. The effect size used for Mann–Whitney tests was calculated through the formula described by Fritz et al.[34] as ($r = Z/\sqrt{n}$). The interpretation of the effect size value was made as small effect (.1–.29); medium effect (.3–.49) and large effect (>.5). For statistical procedures were utilized the software Statistical Package for Social Sciences 25.0.

Results

Milestones

The results showed main effects for the four milestones variables assessed (see Table 1). Spanish players started earlier their participation activities in soccer such as play (ES = 0.328, *medium effect*, $p < .001$), practice (i.e., supervised training with an adult) (ES = 0.512, *large effect*, $p < .001$) and competition (ES = 0.565, *large effect*, $p < .001$) compared to Brazilian players. In turn, Brazilian players started earlier playing 11 × 11 format (ES = 0.337, *medium effect*, $p < .001$) compared to Spanish players.

Childhood (6–12 years)

Main effects for three variables were found in this developmental stage (see Table 1). Brazilian players accumulated more hours in futsal practice (ES = 0.506, *large effect*, $p < .001$) and total practice (ES = 0.200, *small effect*, $p = .022$) compared to Spanish players. Considering participation in futsal, most of Brazilian players participated 67.6% ($n = 46$), while only 19.0% ($n = 12$) of Spanish players were involved. Moreover, Brazilian players participated in a greater number of other sports (ES = 0.237, *small effect,* $p = .007$) compared to Spanish players.

Table 1. Comparisons between Brazilian and Spanish players on their milestones and sports developmental activities in childhood and early adolescence.

	Brazil (M ± SD; $n = 68$)	Spain (M ± SD; $n = 63$)	*P*	Mann–Whitney *U* test	Effect size
Milestones					
Start playing soccer (y/o)	6.2 ± 2.6	4.6 ± 1.4	<.001***	U = 1345.5, z = 3.75	0.328 (medium)
Start practice in soccer (y/o)	8.4 ± 2.6	5.8 ± 2.1	<.001***	U = 864.0, z = 5.86	0.512 (large)
Start competition in soccer (y/o)	8.8 ± 2.2	6.1 ± 1.8	<.001***	U = 734.0, z = 6.47	0.565 (large)
Start playing 11 × 11 (y/o)	10.5 ± 2.0	11.4 ± 1.3	<.001***	U = 1300.5, z = 3.86	0.337 (medium)
Developmental Activities					
Childhood (6–12 years)					
Play in soccer (h)	1810.7 ± 1787.3	1234.0 ± 1172.4	.114	-	-
Play in soccer/week (h)	6.0 ± 5.9	4.1 ± 3.9	.114	-	-
Practice in soccer (h)	1000.0 ± 971.6	919.4 ± 720.3	.868	-	-
Practice in soccer/week (h)	3.3 ± 3.2	3.1 ± 2.4	.868	-	-
% time in play[a]	57.9 ± 25.0	51.8 ± 21.1	.097	-	-
Competition (h)	525.5 ± 868.7	474.8 ± 637.5	.053	-	-
Practice in futsal (h)	486.5 ± 534.5	88.6 ± 237.6	<.001***	U = 978.0, z = 5.79	0.506 (large)
Total practice (soccer + futsal) (h)	1491.2 ± 1231.5	1008.0 ± 748.4	.022*	U = 1620.0, z = 2.29	0.200 (small)
Number of other sports	1.3 ± 0.9	0.9 ± 1.0	.007**	U = 1587.0, z = 2.71	0.237 (small)
Early adolescence (13–15 years)					
Play in soccer (h)	438.0 ± 539.1	364.8 ± 360.2	.632	-	-
Play in soccer/week (h)	3.4 ± 4.2	2.8 ± 2.8	.632	-	-
Practice in soccer (h)	928.3 ± 503.9	491.6 ± 258.5	<.001***	U = 1019.0, z = 5.17	0.452 (medium)
Practice in soccer/week (h)	7.2 ± 3.9	3.8 ± 2.0	<.001***	U = 1019.0, z = 5.17	0.452 (medium)
% time in play[a]	28.4 ± 23.5	36.4 ± 20.2	.030*	U = 1670.0, z = 2.17	0.190 (small)
Competition (h)	359.7 ± 431.4	231.9 ± 173.9	.250	-	-
Practice in futsal (h)	86.2 ± 151.0	28.1 ± 101.5	<.001***	U = 1463.5, z = 3.90	0.341 (medium)
Total practice (soccer + futsal) (h)	1005.4 ± 506.1	519.7 ± 277.6	<.001***	U = 910.5, z = 5.59	0.488 (medium)
Number of other sports	0.8 ± 0.7	0.4 ± 0.7	<.001***	U = 1448.5, z = 3.53	0.309 (medium)

[a]Time in play was calculated considering the percentual time spent in play activities in soccer, considering the total amount accumulated in practice and play in soccer.
*$p < .05$; **$p < .01$; ***$p < .00$.

Early adolescence (13–15 years)

It was in this developmental phase where we found the greatest number of differences among Brazil and Spain (see Table 1). Brazilian players accumulated more practice hours in soccer (ES = 0.452, *medium effect*, $p < .001$), futsal (ES = 0.341, *medium effect*, $p < .001$) and in total (ES = 0.488, *medium effect*, $p < .001$), and participated in a greater number of other sports (ES = 0.309, *medium effect*, $p < .001$) than Spanish players. Additionally, in Brazil the 'percentual time in play' was lower (ES = 0.190, *small effect*, $p = .030$) compared to Spain. Considering the involvement in futsal, 41.2% ($n = 28$) of Brazilian players were involved, while only 9.5% ($n = 6$) of Spanish players took part. Figure 1 depicts the average hours per year between 6 and 15 years of age that Brazilian and Spanish players participated in three soccer activities (play, practice and competition).

Practice structure

Considering the practice structure in soccer (see Table 2), we found that Brazilian players accumulated more hours than Spanish players in every activity assessed: individual (ES = 0.234, *small effect,* $p = .008$), pair (ES = 0.204, *small effect,* $p = .020$), drills (ES = 0.242, *small effect,* $p = .006$), group tactics (ES = 0.414, *medium effect,* $p < .001$), collective tactics (ES = 0.354, *medium effect,* $p < .001$), low decision-making (ES = 0.301, *small effect,* $p = .001$) and high decision-making activities (ES = 0.412, *medium effect,* $p < .001$). However, when we compared the percentual time spent in each activity, we found many similarities between Brazil and Spain. The only activity that showed difference was group tactics (ES = 0.189, *small effect*, $p = .031$), where Brazilian players showed a greater percentual than Spanish players.

Discussion

The purpose of this study was threefold: (a) to compare the engagement in various types and amounts of soccer activities during childhood and adolescence between Brazilian and Spanish elite youth soccer players; (b) to test what talent development pathway characterizes youth

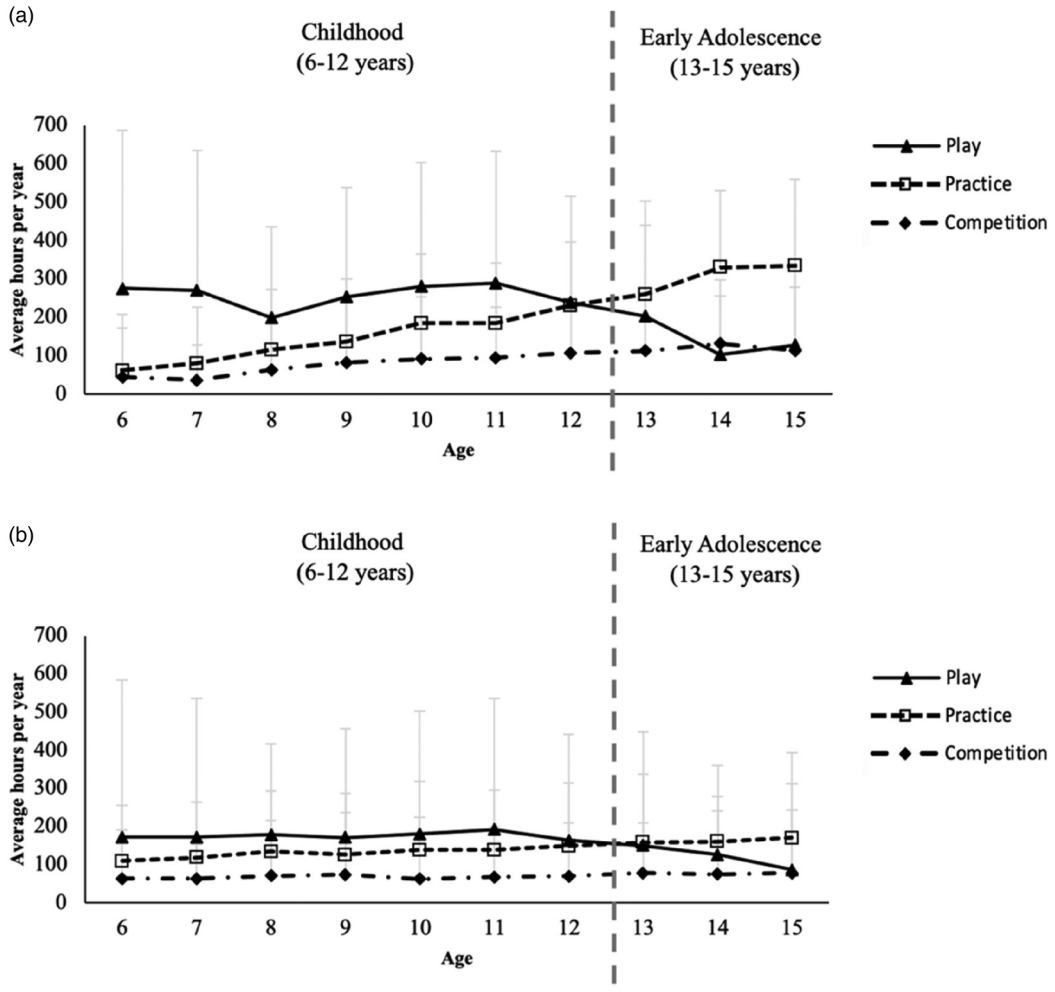

Figure 1. The average hours per year between 6 and 15 years of age in three soccer activities (play, practice and competition) for (a) Brazilian players; and (b) Spanish players.

Table 2. The statistical and descriptive analyses for the practice structure between Brazilian and Spanish players.

	Brazil (M ± SD; $n = 68$)	Spain (M ± SD; $n = 63$)	p	Mann–Whitney U test	Effect size
Practice structure (hours)					
Individual (h)	170.0 ± 268.7	74.0 ± 83.0	.008**	U = 1562.5, z = 2.67	0.234 (small)
Pairs (h)	180.6 ± 276.7	82.5 ± 75.4	.020*	U = 1636.5, z = 2.33	0.204 (small)
Drills (h)	202.1 ± 277.6	90.9 ± 64.1	.006**	U = 1541.0, z = 2.77	0.242 (small)
Group tactics (h)	314.0 ± 319.6	120.6 ± 89.6	<.001***	U = 1114.5, z = 4.73	0.414 (medium)
Collective tactics (h)	317.9 ± 332.9	133.0 ± 91.0	<.001***	U = 1262.0, z = 4.05	0.354 (medium)
Low decision-making (h)	552.7 ± 777.5	247.4 ± 197.3	.001**	U = 1394.5, z = 3.44	0.301 (medium)
High decision-making (h)	631.8 ± 643.7	253.6 ± 170.8	<.001***	U = 1119.5, z = 4.71	0.412 (medium)
Practice structure (%)					
Individual (%)	14.4 ± 13.9	14.7 ± 10.1	.369	-	-
Pairs (%)	14.2 ± 8.7	15.9 ± 6.2	.060	-	-
Drills (%)	17.9 ± 13.6	18.7 ± 7.0	.099	-	-
Group tactics (%)	26.8 ± 9.8	23.8 ± 7.7	.031*	U = 1713.5, z = 2.00	0.189 (small)
Collective tactics (%)	26.4 ± 9.3	26.8 ± 8.5	.878	-	-
Low decision-making (%)	46.6 ± 15.9	49.3 ± 11.9	.128	-	-
High decision-making (%)	53.3 ± 15.9	50.6 ± 11.9	.128	-	-

*$p < .05$; **$p < .01$; ***$p < .001$.

development in elite soccer in Brazil and Spain and (c) to compare the practice structure between elite youth soccer in Brazil and Spain. Overall, we found many differences between Brazil and Spain for their milestones in soccer and their engagement in practice activities during childhood and early adolescence, especially related to futsal and the sum of practice in soccer and futsal, and the involvement in other sports. On the other hand, when analyzing the practice structure between countries, we found a very similar percentual structure (individual, pair, drills, group tactics and collective tactics activities), although Brazilian players accumulated a greater practice volume.

Considering the starting age of involvement in different soccer activities, we found that Spanish players started earlier playing soccer (~4 y/o), and their involvement in structured activities, such as practice (~5 y/o) and competition (~6 y/o), compared to Brazilian players. Our results confirm a previous study showing that Brazilian players usually start later their participation in structured activities, such as practice (~7–8 y/o) and competition (~8–9 y/o),[32] compared to other European countries (i.e., England, Finland, France, Germany, Portugal, Sweden and Switzerland).[14,15,32,35,36] Those European countries usually start practice (~4–6 y/o) and competition (~6–8 y/o) earlier in childhood.

Regarding the starting age of playing the official 11v11 format, Spanish players usually start later in childhood (~11–12 y/o) compared to Brazil (~10 y/o). This organization looks to be better structured in Spain once the 11v11 official format (i.e., with official field, goalpost and ball sizes) is considered too complex in terms of tactical, technical and physical demands for children.[37,38] We suggest that such a format must be used later in sports formation, especially in the Brazilian context, while it can be first used with adaptations in the field, goalpost and ball sizes (e.g., playing 11v11 in a small field compared to the official dimensions). This proposition decreases the physical demands (less grass to cover) and increases the technical demands (more crowded field, for the same number of players on a smaller pitch) while maintaining the tactical component.[39] It can be done to progress first the adaptations in the complexity level, related to the official number of players, and later, adaptations in terms of spatial constraints (official field size).[37,40,41]

Considering the comparisons between developmental activities during childhood (6–12 y/o) and early adolescence (13–15 y/o), we found that Brazilian players: (a) were more involved in structured activities, such as practice; (b) participated in a greater number of sports in both stages analyzed; and (c) were more involved with futsal (67.6%), compared to Spanish players participated (19.0%). Overall, these results reinforce previous research showing that futsal practice is integrated within the sport formation structure of elite soccer players in Brazil, mainly in childhood.[32] In turn, we found that in Spain, the involvement in futsal practice is apparently less integrated with the sport formation system in soccer. Only 19.0% participated in childhood and 9.5% in early adolescence, and the amount of futsal practice in Spain during childhood and early adolescence is much lower than in Brazil. To the best of our knowledge, it was the first study that assessed the involvement of elite soccer players in Spain with futsal during their sport formation.

The lower involvement of soccer players in Spain with futsal compared to Brazil was somehow surprising, since futsal is a popular sport in both countries and Spain is the second most successful nation in the sport.[33] These results could be due to several socio-cultural factors. Among them, two aspects are highlighted. The first is related to the sports facilities of both countries, as it may directly impact the participation in futsal.[42] On the one hand, Spain has many public soccer pitches (+7000) that allow children and adolescents to practice soccer during their entire sports formation,[43] which is more than public pitches available in Brazil.[44] On the other hand, in Brazil is much more often to find futsal courts in primary and secondary public schools (~78%) compared to soccer pitches (~14%).[45] Secondly, a study carried out with 20,000 children and adolescents in Spain[46] showed that around 66% of the population aged 6–11 practice only one sport. Moreover, children of this age practice soccer three times more often (around 33%) than futsal (around 11%). This sport participation profile in Spain suggests that children usually choose one sport between soccer and futsal to practice since childhood. However, more research is certainly needed to learn more about this issue.

The findings of our study could offer valuable insights towards enhancing the soccer developmental pathway, while acknowledging the cultural variations across countries, rather than proposing a standardized approach for players' progress. Considering the Spanish context, we found that the sport formation of U-18 elite soccer players was characterized by the early engagement pathway.[14] During childhood, players participated in high amounts of play and practice activities in soccer, with lower diversification in other sports or contexts in the primary sport. Moreover, Spanish players accumulated less than 10% of their structured practice during their childhood (6–12 years) in futsal.

Our data could indicate a potential for the Spanish soccer development system to explore more the use of futsal as part of their sport formation system to provide more diversification, especially in childhood.[16,20,47] On the one hand, the use of futsal allows variability in the training context (i.e., different ball, court size, number of players or speed of the game), which is positively associated with motor, cognitive and tactical skill acquisition on childhood.[41] On the other hand, as futsal is usually played on indoor courts, it can be explored during specific seasons in the year as an alternative to keep players practicing in rough

environmental conditions (i.e., heavy rains, negative temperatures or snowfall). These suggestions could be translated not just for the Spanish sports development system but also for other European countries that suffer from significant environmental changes during wintertime.

Considering the Brazilian developmental pathway in soccer, we found that U-18 elite players usually accumulated around one-third of their structured practice during childhood (6–12 years) in futsal. This variability of participation in different contexts of the 'main sport' (i.e., play in soccer and practice in soccer and futsal) characterizes the developmental pathway in Brazil as the specialized sampling model.[15] These findings provide important empirical data showing that futsal is part of the talent development system in Brazil for the development of soccer players. Stakeholders involved in long-term athlete development in the Brazilian system, such as soccer clubs' staff and regional and national soccer federations, might benefit from this information. Furthermore, recent research showed that futsal is a 'donor sport' for soccer development, especially in childhood.[19,20] Therefore, those involved in soccer could systematically provide better coach education to improve the quality of practice in futsal.[48] Moreover, it could be integrated into soccer curriculums, which need a systematic organization of how its practice could optimize the teaching process of elements related to soccer skills and the transition between the futsal court to the soccer pitch.[18,49] We highlight that such a strategy would need an integrative approach between both modalities (soccer and futsal) to plan an effective strategy to progress and adapt the structure of futsal (i.e., 4v4 + GKs) from a smaller court (40×20 m) to larger structures (e.g., 7v7 + GKs) and bigger pitches.[41,50]

In terms of the practice structure of both countries, we found a very similar structure (percentual) between Spain and Brazil, although Brazilian players accumulated a greater practice volume. This result indicates similarities in how elite youth soccer coaches structure their practice in both countries, focusing mainly on tactical and decision-making aspects, as shown by previous research.[21,24] In this line, Roca and Ford[21] found that southern European countries such as Spain and Portugal spend a greater amount of their practice in activities that contain active decision-making for the players (e.g., small-sided games) than other European countries, such as Germany and England. This greater similarity in the practice structure between the Brazilian context and southern european countries, such as Spain and Portugal, might be related to closer cultural similarities (e.g., style of play and language). Such results might be helpful for different stakeholders, such as coaches and club staff, to understand similarities/dissimilarities in the soccer system among countries.[51] For example, the data from our study and previous research might indicate that the cultural adaptation of international transferences of Brazilian soccer players to Europe might be easier to adapt in southern European countries than in central or northern European countries due to the organization of the soccer system. Conversely, soccer players can be equipped with the necessary skills to confront and acclimate more rapidly to soccer systems that exhibit substantial deviations from those they are habituated to training for.

To the best of our knowledge, our study was the first to compare the practice structure in soccer between the European and South American contexts and analyze the developmental activities of elite youth soccer players in Spain. However, some limitations of our study must be acknowledged. First, a limitation in our study was the assessment of the structure of practice activities, conducted only within the previous two years. Second, although the Portuguese version of the retrospective questionnaire has been used previously in Brazilian and Portuguese samples,[24,26–28] the information about the validity and reliability is available only for the original version in English[25] and its Norwegian version.[31] Third, the sample consists of U18 players, and therefore, associations between these practices and future senior success should not be directed established. For future research, we suggest including the analysis of the training structure with actual training recording, in addition to the use of retrospective questionnaires. Moreover, the practice structure of different age groups, competitive levels and competitive periods could be assessed. In terms of the analysis of developmental pathways in soccer, in the future, similar studies could be done with female players, and other nations in Europe and South America could be assessed additionally to other continents, as we found differences between and within continents.[32]

Conclusions

It is concluded that Spanish and Brazilian U-18 elite youth male soccer players were differentiated by their milestones in soccer and their engagement in practice activities during childhood and early adolescence. In general, in Spain, players started their involvement in soccer earlier, but Brazilian players spent more time practicing soccer and futsal and were involved more in other sports. Moreover, during childhood, the talent development pathway of male soccer players in Spain was characterized by the early engagement pathway[14]. On the other hand, the Brazilian system was characterized by the specialized sampling model[15] due to most players' participation in futsal. Finally, in terms of the practice structure of both countries, we found a very similar structure (percentual) between Spain and Brazil, although Brazilian players accumulated more percentual time in group tactics activities and a greater practice volume.

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