Progression of Spanish National Team Basketball Players by Age and Sex

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Abstract: The aim of this study was to analyze the relationship between basketball players that have participated in the Spanish national team at different age categories and their progression through these categories. This progress is differentiated according to sex. The data for this study contain information about 320 players (163 females and 157 males). Results show that only a small percentage of players recognized as talented young players reached athletic excellence when adults. The evolution of the level of participation for females and males was similar. There was a break in the continuity of participation when comparing under-16 and senior categories. This rupture is also observed in female players in the move from under-18 to senior categories.

Keywords: Basketball, sex, talent progression, expertise.

INTRODUCTION

In sport science, the study of the factors that influence an athlete's development from the initial stages to expertise is very important. These studies have contributed to the detection, identification, selection, and development of sports talent [1]. They also allow for the identification of factors that determine the progression and development of an athlete in several sport disciplines, which depends on many aspects, such as genetics, psychological factors, socio-economic situation, or the training process.

In team sports, studies of talented players focus on aspects such as: anthropometric factors and physiological capabilities of the athlete [2-4], motor control and biomechanics [5], perceptual and visual skills [6, 7], tactical intelligence [8], and psychological factors [9-11], among others. It is very common to use multiple criteria to detect young talent in basketball based on several factors, but the most common ones are physiological ones. However, Wolff *et al*. [12] have indicated that these tests are inadequate.

Additionally, in many studies, the importance of social factors in the development of talent has been pointed out. There are many external factors that influence the development of an athlete from a youth with talent to an expert player, such as the family's socio-economic resources [13-15], the familial dynamics with regard to the talented youth [16, 9, 17, 18], coaches and sport clubs [19], and the role of the parents [20].

Because there are many factors that influence the development of the athlete from youth to expert, it is necessary to integrate such factors in a multidisciplinary approach [21-23, 19], since in some situations these factors may favor the progression of the athlete but in others they may limit this progression.

The identification of a young talented athlete does not guarantee that the player will progress into an expert player, and likewise, not all experts were identified as talented athletes in their youth. The failure of a young player to have a long, successful sports career may be conditioned by the failure of some of the aforementioned factors, while the success of another athlete may be the consequence of a successful application of the same factors. The development of a talented athlete must be considered a long-term continuous process with clear objectives [24-26]. The success of an athlete obviously has genetic influences, but without an adequate formative program the evolution of this talent may be halted [27].

Therefore, it is clear there is a need to study the progression of the athlete from talented youth to expert on the basis of the factors that influence him or her over the span of their career and observe when there is a failure to become an expert and when there is success. In this way, it can be observed whether the applied programs are efficient, if the environment favors a positive evolution, or if the athletes have the capability to complete this evolution process. Many studies have been transverse, observing a specific age or stage and determining the factors that have influenced athletes along their journey until this point. However, at present, there are only a few studies that have had a longitudinal focus, observing the progression of the player from a youth athlete to an expert and analyzing the factors that favor this evolution [11]. Additionally, there are few studies that attempt to identify differentiations between the sexes in this process. These two approaches, longitudinal and sex differentiation, are the object of the present study in basketball. It is necessary to establish statistical criteria that permit us to observe whether or not there is a set evolution from a talented youth to an expert, whether expert basketball players

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are identified early as talented, or whether they are the product of an adequate combination of factors and programs.

Sampaio *et al*. [28] found differences in game-related statistics by category of competition and sex in basketball. These differences create additional questions related to the progression of the athlete on the basis of sex differentiation, such as whether both sexes have the same progression.

Hoare and Warr [29] indicated that it is possible to select female soccer players on the basis of anthropometry, some psychological factors, and skill attributes. In other hand, Miah and Rich [30] suggested that the out of the sport curriculum context generic test may miss-read the skill of the sportsmen, being needed to establish specific programs to every sport discipline.

Therefore, these factors are usually used in early talent detection and selection [31]. However, this carries many risks since young players without these characteristics at early ages may evolve to be expert players who overcome those players that initially were identified as talented on the basis of only anthropometrics and physiological characteristics [12, 32]. This success is based on an adequate combination of factors that requires further study.

The present study is centered on the analysis of the relationship between basketball players that play for the national team at different age categories and their progression from youth to senior categories. Furthermore, this evolution is differentiated according to sex, and the differences and similarities between males and females are analyzed. For that, the participation of the players in each category was compared to their possible continuation at higher categories and whether or not they participated in the senior national team.

METHOD

The present study utilized a pre-experimental design with a single sample and a qualitative, descriptive methodology, widely used in similar studies [33, 34]. The nature of the sample allowed for a longitudinal research design, analyzing the participants' progression through time. Data related to the sport lives of female and male Spanish basketball players from youth to senior or professional stages were gathered.

Objectives

The present study analyzed the participation of female and male basketball players on the Spanish national team at different age categories, players' progression through these different categories, and the relationships between the different levels of participation at each category. Three official categories from the FIBA rules (cadet/under-16 (U16), junior/under-18 (U18), and Senior) were selected.

Three specific objectives for this study were established:

i) to identify the level of participation of male and female basketball players at the different categories of the Spanish national teams,

ii) to study the relationships between players' level of participation in the different categories of the national teams throughout time. The participation of the players in each of the three national team categories was categorized into four levels, and players' progression over time was analyzed according to their age, and

iii) to establish whether or not there are differences between males and females in the two previous objectives.

Participants

The data for this study were gathered from the Spanish Basketball Federation (FEB) and contained information about female and male basketball players born between 1964 and 1981 who participated in any way in the three selected Spanish national team categories. The last birth year to be analyzed was 1981 in order to guarantee that all players from the sample could progress from U16 to the senior category. If younger players had been used, it is possible that they could have participated in some of the younger age categories but have not progressed enough to be called for the senior team. The FEB does not have a complete database for players born before 1964. The sample was composed of 320 players, of which 163 (50.94%) were females and 157 (49.06%) were males.

DATABASE

The database utilized was composed of all calls that each player received to participate in the different categories of the Spanish national basketball teams. To be included in the database, the player must have been called at least once to participate at any category of the national basketball teams. Four levels of participation were established to classify the nature or the type of participation of each player. Each level was weighted: 0, the player was not called at this level; 1, the player was called to train with the national team and may have played scrimmages; 2, the player participated in at least one official game in classificatory or important tournaments (i.e. pre-European or pre-Olympic classificatory games); and 3, the player participated in at least one official final competition such as the World, European, or Olympic Games competitions. Using this categorical system, every player was assigned a qualitative value according to their level of participation at each of the categories of the national team, from U16 to Senior.

Data Analysis

Descriptive, non-parametric analyses (frequencies and percentages) for the levels of participation for female and male basketball players were used to study the evolution of these levels of participation over time. The Chi square (χ^2) was used to test differences in the participation of the players according to their birth year. Next, in order to determine the relationship between the variables, an inferential non-parametric analysis was done, establishing a covariance hypothesis. To obtain the relationship between the levels of the players' participation, cross-tabulations between each category were performed. Chi square (χ^2) and contingency coefficients (C) were calculated to obtain the magnitude of the relationships between the levels of participation among the different age categories. The dependent relationships between the categorical variables were clarified by using a correspondence analysis. The correspondence analysis is a statistical technique that is used to analyze, from a graphical point of view, the relationships of dependence and independ-

ence in a set of categorical variables from the data found in a contingency table.

RESULTS

Descriptive Statistics

The descriptive results obtained in the analysis of the level of participation of the Spanish basketball players in three different categories of the national team used in the present study are demonstrated in Table **1**.

Of the total sample, 77.8% was never called for the national senior team. For males, this percentage was 88.5%, while for females it was 67.5%. Of the 22.3% of the sample that was called for the national senior team, only 14.1% participated at the highest level, official final competitions. Again, males had a lower participation than females (7% vs. 20.9%, respectively).

The U18 category had the highest number of players participate in official competitions (37.8% of the sample). For males, though 41.4% were called to the U18 national team official final competitions, paradoxically, only 7% were called for official final competitions in the senior category. For females, this reduction is less drastic (34.4% for U18 vs. 20.6% for senior).

Over half of the sample (56.3%) was never called for the U16 category, with similar results among males (58.6%) and females (54.0%). Of all participants in the U16 category, only 29.5% participated in an official final competition of the national team (27.4% of males and 30.7% of females).

The number of players that participated in official final competitions of the national teams tended to decrease in the evolution from youth to senior categories. This tendency was stronger for males than females.

The total sample demonstrated a non-homogeneous level of participation according to players' dates of birth, independent of sex. This observation was evidenced by Chi square (χ^2) results: there were statistically significant differences between age groups for both the total sample ($\chi^2_{(16)}$ = 233.456, p<.001) and the sample differentiated by sex (males: $\chi^2_{(7)}$ = 19.153, p<.01; females: $\chi^2_{(16)}$ =113.485, p<.001). A more homogeneous age distribution due to the long time period analyzed should have been expected.

Inferential Non-parametric Statistics

The longitudinal relationships among the three different national team categories and the four levels of participation utilized were analyzed. The U16 category was compared to U18 and senior categories, and later the U18 category was compared to the senior category with regard to the total sample and sex.

Relationships Between U16 and U18 Categories

The dependent and independent statistical associations between the different levels of participation for the U16 and U18 basketball players were studied. The relationships between the different levels of participation for these two categories are demonstrated in Table **2**, and significant relationships are indicated.

There was a statistically significant dependent association between the U16 and U18 categories ($\chi^2_{(9)}$= 46.53, p<.001). This association was evaluated by a contingency coefficient (C = .356, p<.001) and reflected a medium association; 35.6% of the values from both categories shared the same level of participation. When the adjusted standardized residual (*ASR* value) of the cross-tabulation table was analyzed, the number of players who were not called at the U16 category and later maintained this same level of participation in U18 was lower than may have been expected (*ASR*=-5.2). On the other hand, the ratio of players not called in U16 that were later called in U18 for important tournaments/ classificatory competitions or official final competitions (levels 2 and 3, respectively) was higher than expected; there were *ASR* values of 3.0 for level 2 and 3.3 for level 3. Finally, the increase in the expected ratio for those players that in U16 were either called for training or for classificatory competitions/important tournaments and than in U18 were not called (*ASR* values of 2.9 and 4.4, respectively) should be pointed out.

The correspondence analysis shows the distribution of the relationship between U16 and U18 categories in as few dimensions as possible. There were two dimensions that account for 98% of the total inertia. Inertia is generalized variance or a measurement of the dispersion of the scores taking into account its marginal frequencies. The first dimension accounted for 83.3% (0.121/0.145) (the inertia of each dimension divided by the total inertia yields the proportion of that inertia or variance), whereas the second dimension accounted for only 14.9% (0.022/0.145) of the total. The contributions of points are important in interpreting a correspondence analysis solution. For the first dimension in the U16 category, the following elements or levels: “classificatory competitions” (.428), “not called” (.314), and “called for training” (.213) were dominant points, contributing 95.5% to the inertia. Among the points in the U18 category, “not called” (.554) and “official final competitions” (.280) only contributed 83.4% to the inertia of the first dimension. For the second dimension, the most important contribution was

Table 1. The Distribution of the Whole Sample for All Spanish National Basketball Teams

	Not Called						Called for Training						Classificatory Competitions						Final Competitions					
Category	M	%	F	%	T	%	M	%	F	%	T	%	M	%	F	%	T	%	M	%	F	%	T	%
Senior	139	88.5	110	67.5	249	77.8	1	0.6	5	3.1	6	1.9	6	3.8	14	8.6	20	6.3	11	7	34	20.9	45	14.1
U18	69	43.9	73	44.8	142	44.4	7	4.5	15	9.2	22	6.9	16	10.2	19	11.7	35	10.9	65	41.4	56	34.4	121	37.8
U16	92	58.6	88	54.0	180	56.3	11	7	7	4.3	18	5.6	11	7	18	11.0	29	9.1	43	27.4	50	30.7	93	29.1
Total	300		271		571		19		27		46		33		51		84		119		140		259	

Table 2. Cross Tabulation Between U16 and U18 Categories

		U18 Category				
U16 Category		**Not Called**	**Called for Training**	**Classificatory Competitions**	**Final Competitions**	**Total**
Not called	*n*	57	13	28	82	180
	% U16	31.7%	7.2%	15.6%	45.6%	100.0%
	% U18	40.1%	59.1%	80.0%	67.8%	56.3%
	% Total	17.8%	4.1%	8.8%	25.6%	56.3%
	A.S.R.	-5.2	.3	3.0	3.2	
Called for training	*n*	14	0	0	4	18
	% U16	77.8%	.0%	.0%	22.2%	100.0%
	% U18	9.9%	.0%	.0%	3.3%	5.6%
	% Total	4.4%	.0%	.0%	1.3%	5.6%
	A.S.R.	2.9	-1.2	-1.5	-1.4	
Classificatory competitions	*n*	24	0	3	2	29
	% U16	82.8%	.0%	10.3%	6.9%	100.0%
	% U18	16.9%	.0%	8.6%	1.7%	9.1%
	% Total	7.5%	.0%	.9%	.6%	9.1%
	A.S.R.	4.4	-1.5	-.1	-3.6	
Final competitions	*n*	47	9	4	33	93
	% U16	50.5%	9.7%	4.3%	35.5%	100.0%
	% U18	33.1%	40.9%	11.4%	27.3%	29.1%
	% Total	14.7%	2.8%	1.3%	10.3%	29.1%
	A.S.R.	1.4	1.3	-2.4	-.5	
Total	*n*	142	22	35	121	320
	% U16	44.4%	6.9%	10.9%	37.8%	100.0%
	% U18	100.0%	100.0%	100.0%	100.0%	100.0%
	% Total	44.4%	6.9%	10.9%	37.8%	100.0%

made by "official final competitions" (.566) and "classificatory competitions" (.636) for the U16 and U18 categories, respectively.

The underlying relationship between categories and participation levels is graphically illustrated in Fig. (**1**). The interpretation of the plot is fairly straightforward; the points that are closer together are more alike than points that are farther apart. The proximity of the row points, "not called", from the U16 category, and the column points, "classificatory competitions" and "final competitions", from the U18 category, together with the proximity of the column points, "not called", from the U18 category and the row points, "called for training" and "classificatory competitions", from the U16 category, demonstrate the previously opposing relationships. The dependent relationships that existed between categories are demonstrated again in this graph, which corroborated the results of the adjusted standardized residual.

Subsequently, the association between level of participation in the U16 and U18 categories according to sex was analyzed. Results showed a significant ($\chi^2_{(9)}$= 19.01, p<.05), medium association (C = .329, p<.05) for males. The ratio of males who were not called in the U16 and U18 categories was lower than expected (*ASR* = -2.4). The number of players that participated in classificatory tournaments in U16 and then did not participate in official, final competitions in U18 was also lower than expected (*ASR* = -2.3). On the other hand, the number of players that were called for training in the U16 category and later were not called in the U18 category was higher than expected (*ASR*=2.6).

For females, a significant association between the U16 and U18 categories ($\chi^2_{(9)}$= 41.40, p<.001) was observed, and the association was moderate (C = .450, p<.001). Through this association, it was observed that the number of female players that were not called in U16 and U18 was lower than expected (*ASR*=-4.9). Likewise, there were fewer U16 players that took part in classificatory competitions while later taking part in official final competitions in the U18 category than could have been expected (*ASR*=-2.7). This result was similar to those taking part in official final competitions in U16 and later classificatory competitions in U18 (*ASR*=-2.0). On the other hand, some positive, progressive relationships were observed. For example, for female players who were

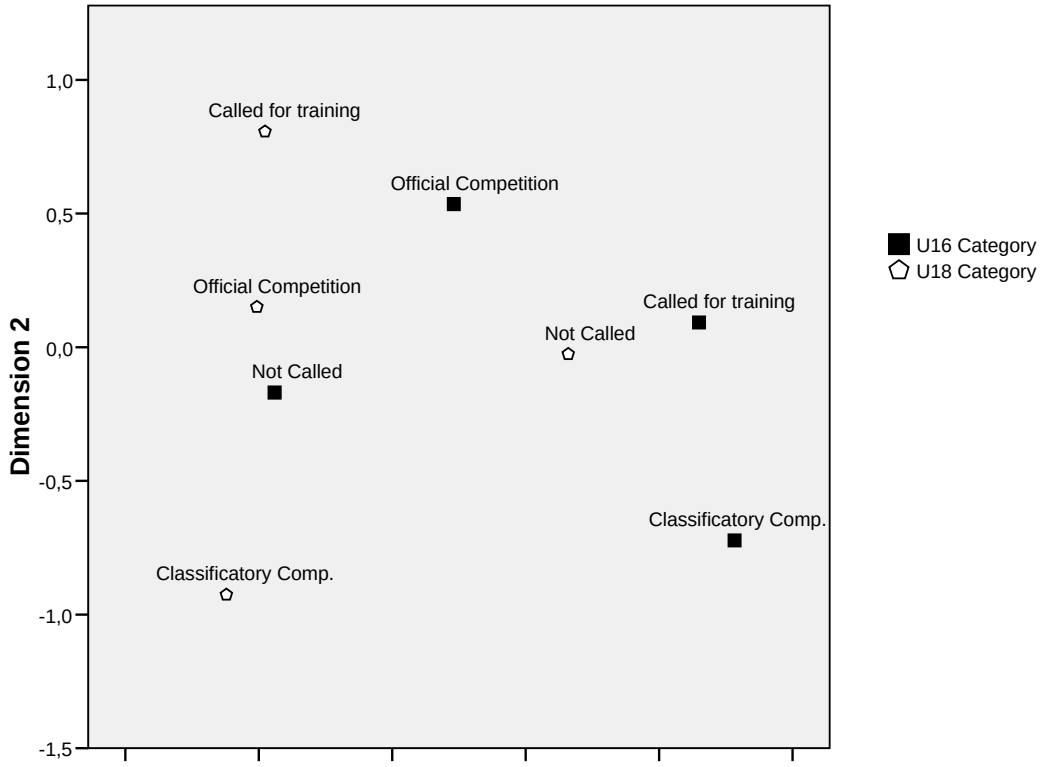

Fig. (1). Relationship between levels of participation using correspondence analysis for U16 and U18 categories.

not called in U16 and later participated in classificatory competitions in the U18 category, an *ASR* value of 3.3 was observed, while a value of 3.2 was found for these same U16 players who later took part in U18 official final competitions. This was similar to the evolution of female players who took part in classificatory competitions in the U16 category and later were not called for the U18 category (*ASR*= 4.5). In Table **3** these relationships can be observed.

One result that should be highlighted is the low number of male players that maintained their level of participation in official final competitions when they progressed from U16 to U18, suggesting a lack of continuity in the participation of the players in the two categories. On the other hand, female players that had a high level of participation in the U16 category showed a low level in U18. For both males and females, a generational discontinuity that cut off participation in the U18 category was observed.

Relationships Between U16 and Senior Categories

The next step was the analysis of the relationship between the U16 and senior categories, where a dependent association ($\chi^2_{(9)}$= 18.87, p<.05), though low (C = .236, p<.05), was found. The adjusted standardized residual showed that the ratio of players who were not called in these two categories was lower than expected (-3.8), while the ratio of players who were not called in the U16 category but later were called for training or called for official final competitions in the senior category was higher than expected (*ASR* values of 2.2 and 3.1, respectively). Additionally, it was observed that the ratio of the players that participated in high-level competition in the U16 category and later were not called in the senior category was higher than expected (*ASR* = 2.1 for classificatory competition and *ASR* = 2.6 for official competition). A more detailed description of the values found in this analysis is presented in Table **4**.

The correspondence analysis demonstrated that there were relationships between the U16 and senior categories, and there were two dimensions that explained 99.2% of the inertia, or generalized variance. The first dimension had a very high weight, 92.4% (0.054/0.059) of the total inertia, whereas the second dimension presented only 6.8% (0.004/0.059). For the first dimension of U16 points, "not called" (.427), "official final competitions" (.296), and "classificatory competitions" (.228) were the dominant points, contributing 95.1% of the inertia. Among the points for the senior category, "official final competitions" (.504), "called for training" (.261), and "not called" (.193) contributed 95.8% of the inertia for the first dimension. For the second dimension, the most important points that contributed to it were "called for training" (.894) and "classificatory competitions" (.892) for U16 and U18 categories, respectively. These two relationships are demonstrated in Fig. (**2**).

The proximity of the row point "not called" for the U16 category, and the column points "called for training" and "official final competitions" for the senior category, together with the proximity of the column point "not called" for the senior category and the row points "classificatory competitions" and "official final competitions" for the U16 category, indicated the dependent relationship between the two categories, which corroborated the results of the adjusted standardized residual.

The analysis of the relationship between U16 and senior categories with regard to sex was completed next. For males, an dependent association ($\chi^2_{(9)}$= 8.26, p>.05) was not found,

Table 3. Cross Tabulation Between U16 and U18 Categories, by Sex

U16 Category		U18 Category: Not Called		Called for Training		Classificatory Competitions		Final Competitions		Total	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Not called	*n*	33	24	6	7	11	17	42	40	92	88
	% U16	35.9%	27.3%	6.5%	8.0%	12.0%	19.3%	45.7%	45.5%	100.0%	100.0%
	% U18	47.8%	32.9%	85.7%	46.7%	68.8%	89.5%	64.6%	71.4%	58.6%	54.0%
	% Total	21.0%	14.7%	3.8%	4.3%	7.0%	10.4%	26.8%	24.5%	58.6%	54.0%
	A.S.R.	-2.4	-4.9	1.5	-.6	.9	3.3	1.3	3.2		
Called for training	*n*	9	5	0	0	0	0	2	2	11	7
	% U16	81.8%	71.4%	.0%	.0%	.0%	.0%	18.2%	28.6%	100.0%	100.0%
	% U18	13.0%	6.8%	.0%	.0%	.0%	.0%	3.1%	3.6%	7.0%	4.3%
	% Total	5.7%	3.1%	.0%	.0%	.0%	.0%	1.3%	1.2%	7.0%	4.3%
	A.S.R.	2.6	1.4	-.7	-.9	-1.2	-1.0	-1.6	-.3		
Classificatory competitions	*n*	7	17	0	0	3	0	1	1	11	18
	% U16	63.6%	94.4%	.0%	.0%	27.3%	.0%	9.1%	5.6%	100.0%	100.0%
	% U18	10.1%	23.3%	.0%	.0%	18.8%	.0%	1.5%	1.8%	7.0%	11.0%
	% Total	4.5%	10.4%	.0%	.0%	1.9%	.0%	.6%	.6%	7.0%	11.0%
	A.S.R.	1.4	4.5	-.7	-1.4	1.9	-1.6	-2.3	-2.7		
Final competitions	*n*	20	27	1	8	2	2	20	13	43	50
	% U16	46.5%	54.0%	2.3%	16.0%	4.7%	4.0%	46.5%	26.0%	100.0%	100.0%
	% U18	29.0%	37.0%	14.3%	53.3%	12.5%	10.5%	30.8%	23.2%	27.4%	30.7%
	% Total	12.7%	16.6%	.6%	4.9%	1.3%	1.2%	12.7%	8.0%	27.4%	30.7%
	A.S.R.	.4	1.6	-.8	2.0	-1.4	-2.0	.8	-1.5		
Total	*n*	69	73	7	15	16	19	65	56	157	163
	% U16	43.9%	44.8%	4.5%	9.2%	10.2%	11.7%	41.4%	34.4%	100.0%	100.0%
	% U18	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% Total	43.9%	44.8%	4.5%	9.2%	10.2%	11.7%	41.4%	34.4%	100.0%	100.0%

while for females there was a dependent association ($\chi^2_{(9)}$= 16.75, p<.05). For females, the contingency coefficient (C = .305, p<.05) suggested a medium association. The adjusted standardized residuals demonstrated that the ratio of female players who were not called in both U16 and senior categories was lower than expected (-3.5). However, the number of female players who were not called in U16 and later were called for training or participated in official final competitions was higher than expected (*ASR* = 2.1 and 3.0, respectively). This was also observed in female players that played in U16 classificatory competitions but later were not called in the senior category (*ASR* = 2.1), as demonstrated in Table **5**.

Relationships Between U18 and Senior Categories

In studying the relationship between the U18 and senior categories, an insignificant association between the two categories ($\chi^2_{(9)}$= 14.89, p>.05) was observed. This lack of association is independent of sex since similar results for both males ($\chi^2_{(9)}$= 6.88, p>.05) and females ($\chi^2_{(9)}$= 13.52, p>.05) were observed. A quick observation of these results suggests that neither female nor male players in the U18 category are guaranteed continuity in official competitions at the senior category.

DISCUSSION

In the present study the presence and evolution of male and female basketball players in the Spanish national teams from youth to senior categories was analyzed. Specifically the participation of the players in a particular category was compared to the player's participation in higher categories. The intention was to observe whether a player that took part in the national team at an initial stage stayed with the team until reaching the senior team, to examine the ratio of players that were present in all categories, and whether or not there were differences related to the sex of the players.

From the obtained results, it can be confirmed that there is no homogeneity in the formative process of Spanish basketball players; there are generations of players that provide

Table 4. Cross Tabulation Between U16 and Senior Categories

U16 Category		Senior Category				
		Not Called	**Called for Training**	**Classificatory Competitions**	**Final Competitions**	**Total**
Not called	*n*	126	6	13	35	180
	% U16	70.0%	3.3%	7.2%	19.4%	100.0%
	% Senior	50.6%	100.0%	65.0%	77.8%	56.3%
	% Total	39.4%	1.9%	4.1%	10.9%	56.3%
	A.S.R.	-3.8	2.2	.8	3.1	
Called for training	*n*	15	0	2	1	18
	% U16	83.3%	.0%	11.1%	5.6%	100.0%
	% Senior	6.0%	.0%	10.0%	2.2%	5.6%
	% Total	4.7%	.0%	.6%	.3%	5.6%
	A.S.R.	.6	-.6	.9	-1.1	
Classificatory competitions	*n*	27	0	1	1	29
	% U16	93.1%	.0%	3.4%	3.4%	100.0%
	% Senior	10.8%	.0%	5.0%	2.2%	9.1%
	% Total	8.4%	.0%	.3%	.3%	9.1%
	A.S.R.	2.1	-.8	-.7	-1.7	
Final competitions	*n*	81	0	4	8	93
	% U16	87.1%	.0%	4.3%	8.6%	100.0%
	% Senior	32.5%	.0%	20.0%	17.8%	29.1%
	% Total	25.3%	.0%	1.3%	2.5%	29.1%
	A.S.R.	2.6	-1.6	-.9	-1.8	
Total	*n*	249	6	20	45	320
	% U16	77.8%	1.9%	6.3%	14.1%	100.0%
	% Senior	100.0%	100.0%	100.0%	100.0%	100.0%
	% Total	77.8%	1.9%	6.3%	14.1%	100.0%

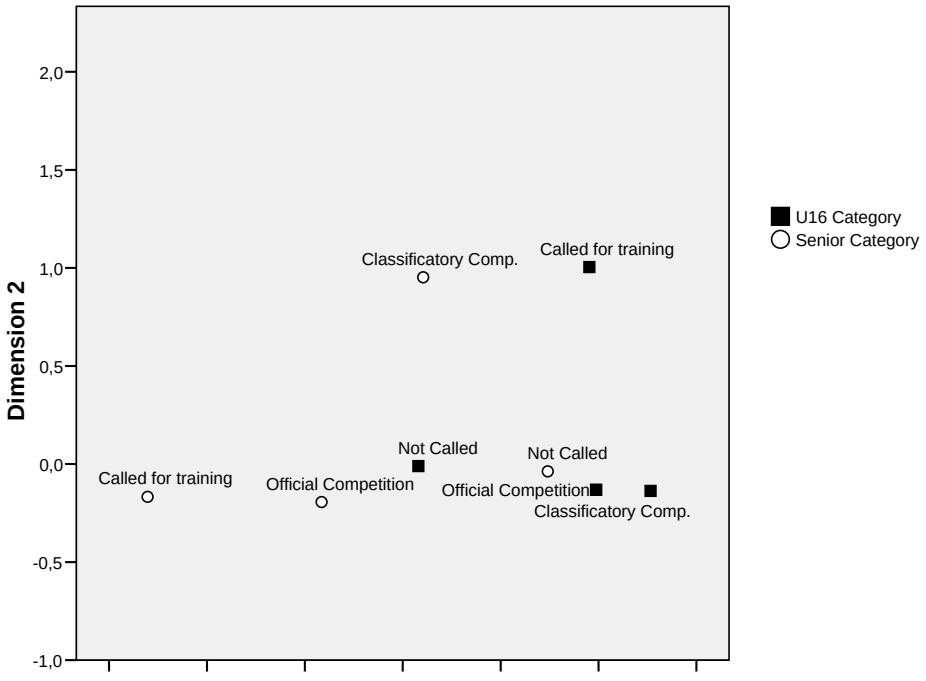

Fig. (2). Relationship between different levels of participation using correspondence analysis for U16 and senior categories.

Table 5. Cross Tabulation Between U16 and Senior Categories for Females

		Senior Category				
U16 Category		**Not Called**	**Called for Training**	**Classificatory Competitions**	**Official Competitions**	**Total**
Not called	*n*	49	5	8	26	88
	% U16	55.7%	5.7%	9.1%	29.5%	100.0%
	% Senior	44.5%	100.0%	57.1%	76.5%	54.0%
	% Total	30.1%	3.1%	4.9%	16.0%	54.0%
	A.S.R.	-3.5	2.1	.2	3.0	
Called for training	*n*	6	0	1	0	7
	% U16	85.7%	.0%	14.3%	.0%	100.0%
	% Senior	5.5%	.0%	7.1%	.0%	4.3%
	% Total	3.7%	.0%	.6%	.0%	4.3%
	A.S.R.	1.1	-.5	.5	-1.4	
Classificatory competitions	*n*	16	0	1	1	18
	% U16	88.9%	.0%	5.6%	5.6%	100.0%
	% Senior	14.5%	.0%	7.1%	2.9%	11.0%
	% Total	9.8%	.0%	.6%	.6%	11.0%
	A.S.R.	2.1	-.8	-.5	-1.7	
Official competitions	*n*	39	0	4	7	50
	% U16	78.0%	.0%	8.0%	14.0%	100.0%
	% Senior	35.5%	.0%	28.6%	20.6%	30.7%
	% Total	23.9%	.0%	2.5%	4.3%	30.7%
	A.S.R.	1.9	-1.5	-.2	-1.4	
Total	*n*	110	5	14	34	163
	% U16	67.5%	3.1%	8.6%	20.9%	100.0%
	% Senior	100.0%	100.0%	100.0%	100.0%	100.0%
	% Total	67.5%	3.1%	8.6%	20.9%	100.0%

more players to the national teams than others. There are several possible explanations for this observation: when a generation provides a high number of high-quality players, these players remain on the senior national team for a long time, and they reduce the presence of new younger players on the team; or it could be assumed that there are generations of players that are not good enough to play in high-level competition. There are no differences between males and females in this observation, but there is no uniformity in the generations providing players that fail to reach high-level competition. For this reason the authors are more confident about the first option than the second one.

The following discussion will look separately at each objective of the present study.

Level of Participation

As the main result, it can be affirmed that there is a decrease in the number of participants on the national teams as players get older. Only 14% of the sample played on the senior national team in an official final competition. This result is apparent since the number of players in lower categories is higher than in the senior category due to the fact that players must be renewed every two years in the U16 and U18 categories, but in the senior category, they can play for several years. However, it is noteworthy that the number of players that were never called to the U16 and U18 categories and then changed their level of participation at the senior level to participate in official final competitions was higher than might be expected. This result could indicate that there are some expert players that were never identified as talented in the initial stages or that many talented players failed along the formative process.

The highest number of players that participated in any category was in the U18 category. This result implies that the number of players that are identified as talented progresses with age, and it is more complex to find talented players at younger ages. Furthermore, in the U18 category, there is a convergence of players that finish their highest-level participation and will not continue in the senior category with players that have been identified as talented and later will be members of the senior national teams. The U18 category is a dual period; it is the beginning and the end of high-level competition.

It should be pointed out that the increase in the number of foreign players in the professional leagues limits the chances of young talented players to participate at this level and therefore reach athletic excellence. Since they do not have the opportunity to continue in high-level competition, it is difficult to make progress and later access professional leagues, to become an expert player, and to be in the highest (senior) national team.

Relationships Between Levels

The main result that should be pointed out is the existence of a negative relationship in the general evolution of the participation of the players in the different national teams. This negative relationship is stronger when comparing the U16 category with the other two categories. In this section, no differentiation according to the sex of the sample will be made, as that is the objective of the next section.

Comparing categories separately, the most negative relationship appears in the level of participation of U16 players compared to U18 and senior players. Players that in the U16 category had high-quality participation lost this level of participation in the U18 category, and on the contrary, those that had a low level of participation progressed to having a high level in the upper categories. In the case of the evolution of the level of participation between U18 and senior categories, there is no significant relationship.

For the level of participation of U16 players compared to U18 and senior players, the negative relationships for the youngest players can be interpreted various ways: a) The general philosophy of any national team, independent of the category and sport, is to compete at the highest level and to obtain the best result. This objective is not always compatible with a formation process. As national teams select the best players at the moment, they may leave out those that could progress in the future. Therefore, it is important to select young talented athletes on the basis of multiple factors, always taking into account their growth cycles and maturation [29]. b) Usually the most efficient players are those with an adequate biological and physiological development, among other qualities. In basketball, the anthropometric and physiological components are very specific (height, arm span, weight, strength, speed, etc.) and in many cases they are obtained once players have matured. For this reason, in the lower categories, mainly U16, many players that were not called for competition progressed as they got older and were later selected in higher categories. An early detection and specialization of talented athletes limits their progression and chances of participating in senior categories [5, 35]. Wolff *et al.* [12] have indicated that tests used to detect young talented basketball players based only on physiological factors are inadequate. In the future, the detection of young talented athletes should be centered on predictive models on the basis of multidisciplinary tests [36]. c) In the literature there are references to the so-called "age effect" [34]. At younger ages, there are clearly observed differences in general development as a function of the birth month; those players born in the first few months of the year are more developed that those born in the last few months. These differences disappear gradually with age. d) Finally, there is burnout, where some players quit practicing their sport upon arriving to the upper categories due to the loss of motivation, because of emotional and physical exhaustion, a reduced feeling of accomplishment, a devaluation or cynicism, a very demanding and inadequate formation process during youth, etc. [37].

As mentioned, the evolution from the U18 category to the senior category is not significantly related. At the age of 18, players are generally developed, and it is difficult to apply the hypothesis that talented youth players do not reach senior categories when this lack of continuity cannot statistically be confirmed or denied. Additionally, the U18 category is the final step for many players, since the next step is professional competition; therefore, they quit high-level competition at this age, because they do not perceive a possibility to continue professionally. On the other hand, other players continue progressing and can achieve professional-level development.

Sex Similarities and Differences

The first difference observed is related to the first objective. The decrease in participants as they get older is more evident for males than for females; there are more males that do not continue with the national team from youth categories to the senior category. This result is in confront of the general observation that indicates a decrease in the number of young and adult females that perform sport [38]. This may be explained on the basis of less competition between females to participate in this sport, as the number of female senior players is lower than males. Additionally, there is a unique situation for the male's Spanish senior national team. Presently, there is a generation of high-quality male players that do not permit a renewal of this category. However, in the case of the women's Spanish national team, there is a continuous renewal of players despite the fewer professional players.

In the case of the relationship between levels of participation there are no differences in the evolution between the U16 category and U18 category, that is, both males and females show a significant negative relationship. This negative relationship is more accentuated for females when comparing the U16 and senior categories, while males do not show any statistically significant relationship for this comparison. There is no guarantee that a U16 player that participated at a high level in the national team will do so in the U18 team for either sex, but for females this lack of continuity is also evidenced in the evolution from the U18 category to the senior category. This result implies that the trajectory of talented young female players is cut off as they get older. Lee *et al.* [39] indicated that females are more sedentary because they do not like competition since they look for long time objectives. Since this objectives are more complex to maintain this limited their permanence in the sport practice. However male love competition and therefore they receive a sudden reinforce in their behaviour in front to the sport practice.

The body stereotype, the intrinsic objectives in perform of the sport practice, and the presence of a competition, control the way in which male and female approach the physic and sport activities. Some sports and other physics activities are differentiated in the gender intrinsically [40].

There are differences between males and females in the abandonment of sport practice; usually females quit practic-

ing sport during the formative stages. It is important to take into account additional motivations related to gender in pubertal ages that force the abandonment of sport practice in talented young players. In general, females prefer to develop their social lives instead of their sport careers [33, 41]. In the present study it is demonstrated that there is no continuity in the progression of the female Spanish players, while this rupture in the continuity for the Spanish male players is only observed between the U16 and U18 categories. It has been observed that the pre- and post-pubertal athletic experiences appear during a critical period in the female youth basketball player because there is juxtaposition between participation in athletics and the perceived lack of femininity of it [42]. Other factors that differentiate between males and females in athletics is the relative importance of political, economical, and social factors according to sex [43], that limit the social recognition of females. Usually media discriminate females in sport; on average, the time dedicated to informing about or transmitting women's sport is much lower than that of men's sport. This aspect has a big influence in the continuity of females in athletics [44, 45]. Women's basketball is less popular than men's, which is a handicap for the motivation of young female players.

CONCLUSIONS

An early detection of young talented basketball players and their participation in the national team is not always a guarantee that this talent will be developed. Many factors may condition the success or failure of this evolution. An adequate formative process may favor the existence of new talented players that were not initially recognized as talented at very young ages [32]. The selection of talent based only on anthropometric or physiological criteria in basketball should not be done, since the influence of multiple factors can condition a player's progression.

Research on the detection and development of young talented basketball players should indicate multidisciplinary protocols that allow for improved efficiency in this process. Results must be evaluated jointly to avoid talent detection based solely on biological and anthropometric conditions. Furthermore, to evaluate the situation of any athlete it is necessary to take into account their growth and state of maturity [29].

The number of players that can participate in the national teams is very limited, since only 12 players can be selected at each category. It may be convenient for the development of young talented players to establish additional intermediate categories, according to the calendar year and to increase the formation categories, at least until 22 years of age (e.g., U16, U17, U18, U19, U20, U21, U22, and Senior). This option could favor the formation of the players and could provide new motivation.

The evolution of the level of participation of female and male players in the different national teams is similar. There is a break in the continuity of the participation when comparing U16 and senior categories. This rupture is also observed for female players in the evolution between U18 and senior categories, but for males no significantly statistical observations were made.

In general, the main objective of high-level competition is to obtain the best results and to win as much as possible. In many cases, this objective does not allow personal development of the young athletes. An inadequate selection of young athletes, based mainly on an early biological and physiological development, also works against the personal development of the young players. In the case of female players, there is an additional handicap since there is a lack of social recognition for women's basketball when compared to men's basketball. These previous points may be one of the most important reasons why the development of young talented female athletes is often interrupted at this point.

The present study is the first attempt to study the evolution of Spanish basketball players from youth to senior categories. It has been demonstrated that those athletes recognized as young talented players likely will not reach sport excellence in the future. It is necessary to undertake new studies that allow for the identification of the causes of failure and success using qualitative approaches based on the opinion and experience of coaches, players, federations, clubs, and families.

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