Patterns of Sport Participation in Portuguese Volleyball Players According to Expertise Level and Gender

Patrícia Coutinho[1], Isabel Mesquita[1], António M. Fonseca[1] and Luciana De Martin-Silva[2]

[1]Centre of Research, Education, Innovation and Intervention in Sport (CIFI2D), Faculty of Sport, University of Porto, Rua Dr. Plácido Costa, 91, 4200.450 Porto, Portugal.

[2]University of the West of England, UWE Hartpury, Hartpury College, Hartpury House, Gloucester, UK, GL19 3BE.

Email: pcoutinho@fade.up.pt; imesquita@fade.up.pt

ABSTRACT

This study aimed to examine the sport participation of 229 Portuguese volleyball players through a previously validated questionnaire within different stages of their development and considering their expertise level and gender. The skilled players differed from the less skilled in having accrued more hours of training throughout all stages. Female players reported less early sport involvement (fewer number of sports practiced and less involvement in team sports and competitions) than males. The early involvement in individual sports by skilled female players seems to be important in their route to expertise, while the later involvement in individual sports by less-skilled male players possibly indicates the need for other motivational sport experiences. These particular findings provide valuable information to guide the designs of Portuguese volleyball players' development considering gender and expertise at the same time. However, additional work is needed to understand to what extent these findings may be system, culture or sport dependent.

Key words: Deliberate Practice, Early Specialization, Expert Development, Team Sport, Volleyball

INTRODUCTION

A significant body of literature has emerged over the past decades attempting to understand the factors that contribute to expertise development in sport [1-3]. Researchers have been divided over the importance of environmental and genetic contributions to sport expertise leading to dichotomous positions and reductionist conclusions [4]. However, recent research has suggested that expertise is the result of interactions between biological and environmental constraints and acknowledged therefore as an integrative process [5, 6]. Of the environmental constraints, researchers have mainly characterized the role of practice as

Reviewer: Karl Erickson (Queen's University, Canada)

one of the primary influences on sport expertise [2, 7, 8], but have also acknowledged the influence of secondary factors such as family, coach and peer support [1, 9]. Considerable research attention has been given to the role of practice, particularly the influence of quantity and quality of practice in expertise achievement [2, 10-12].

Deliberate practice [13] is typically defined as an activity undertaken with the specific purpose of increasing performance, requiring cognitive and/or physical effort, and relevant to promoting positive skill development. It is often suggested that those who reach expert levels of performance in competitive domains have typically undertaken something in the order of 10 years or 10,000 hours of practice. Studies examining the application of the theory of deliberate practice in sport have suggested that expert athletes seem to accumulate a superior amount of practice throughout their development [14, 15].

Nevertheless, some of the original tenets of the deliberate practice framework did not fit the context of sport [16]. A considerable body of evidence has demonstrated that athletes who had a diversified early sports experience and engaged in deliberate play during childhood still achieved an elite level [2, 7, 17]. Deliberate play activities are characterized as "a form of sporting activity that involves early developmental physical activities that are intrinsically motivating, provide immediate gratification, and are specifically designed to maximize enjoyment" [18, p. 270].

Based on evidence about different pathways to reach expertise, Côté and colleagues [1, 18, 19] have developed and refined the Developmental Model of Sport Participation (DMSP) over the last 10 years. This conceptual framework is based on understanding that sport programs should not only promote performance, but also sustainable participation and personal development by focusing on the experiences in sport as well as the environment in which these processes take place [18]. From the extensive research on DMSP, three sport participation trajectories have been identified: 1) recreational participation through early sampling and deliberate play; 2) elite performance through early sampling and deliberate play; and 3) elite performance through early specialization and deliberate practice [18, 19]. Although expertise can be reached from both early diversification and early specialization, Côté and colleagues [18, 20] indicated some postulates echoing the benefits of early diversification for continued participation, elite performance and personal development. The postulates highlight the efficiency of sport programs based on early sports diversification and deliberate play during sampling years; the specialization in the favourite sport around 13 years-old or maintaining sport participation at a recreation level; and the development of skills (motor, cognitive, emotional and personal) to invest their effort in highly specialized training in late adolescence. Within DMSP research, sporting experience has been characterized mainly from the quantity and type of practice, affording worthwhile information about the athlete's development pathways [7, 15, 21].

The quantity of practice has been studied mostly by the examination of the number of training hours, which generally increases from early to later sport involvement [7, 21]. Here researchers notice that experts accumulated not only more hours of training, but also a greater amount of sport-specific practice throughout their development [7, 14, 22]. Although competition is a sporting activity that provides all the components to improve skill and expertise acquisition [7, 23], little attention has been given to this variable within current research agendas. The few studies that examine the amount of competition, namely in team sports, reiterate its value in promoting game-based perceptual and decision-making skills [21] which ultimately have an influence in the development of expertise [7, 23]. Therefore, more research is needed considering competition as a valuable source to characterize the patterns of sport participation particularly in team sports.

Regarding the type of practice, research has mainly characterized the specificity of practice (sport-specific and non-sport specific) [3, 24, 25] and the formality of practice (structured and non-structured) [2, 7, 8]. Some recent studies applied to team sports have analysed the specific contribution of sampling sports related to the primary sport (sports that share a number of characteristics in common) to expertise achievement, suggesting a possible transfer of skills from one sport to another [7, 26]. For instance, Berry at al. [7] examined the participation of football players in sport-specific activities, and emphasized the role of invasion-type activities experienced during the sampling years in the development of perceptual and decision-making expertise. Similarly, Leite et al. [22] analysed the sport-specific and non-specific practice of Portuguese team sports athletes, suggesting that exposure to sports related to the primary sport was important for their expertise achievement. However, considering the case of the volleyball sample in particular, this study only included 14 players, not allowing a valid generalization of these findings.

Another topic that has received sparse attention is athletes' gender and the consequent factors that could undermine their expertise achievement. According to Leite and Sampaio [12], female basketball players showed a lesser amount of training per week and per season, which could mean a lesser commitment to the sport. Taking into account gender specificities, researchers recommend considering players of similar levels of participation when comparing both groups [27]. Notwithstanding, a similar level of participation in the same sport-context could mean different expertise levels for males and females. For instance, in Portugal the competitive level of male volleyball players is superior to that of female players, even competing in the same levels of participation (i.e., first and second league) [28]. Therefore, expertise is not an absolute indicator [5, 6], which means that gender could affect the athlete's pathway and consequently their expertise achievement. This evidence highlights the need to examine the players' sport participation according to expertise level and gender at the same time, in order to consider their possible interaction, thereby providing fruitful insights for developing adjustable sport programs.

The purpose of this study is twofold. First, it aims to characterize sports participation, specifically the starting age (sports in general and primary sport), the quantity of practice (hours of training and number of competitions), and the type of sporting activities (number of sports, team or individual sports) of Portuguese Volleyball players throughout different developmental stages. Second, it aims to ascertain if sport participation varies according to athletes' expertise level and gender as well as to examine the possible effects of the interaction. In line with the theoretical background previously mentioned, it was hypothesized that Portuguese Volleyball players from different expertise levels and different genders differed in their sporting development. Additionally, we expected the interaction between expertise level and gender to determine different sport participation pathways.

METHOD

PARTICIPANTS

The sample consisted of 229 volleyball players (86 females and 143 males), all aged 19 years old or over. 140 of the participants played at the highest level of the Portuguese League (premier league), while 89 played in the second league. Of the participants in the premier league, 105 were male (75%) and 35 were female (25%). Of those playing in the second league, 38 were male (43%) and 51 were female (57%). The competitive level was the criterion used to define the expertise levels [7, 29]. Hence, while players from the premier league are referred to as *skilled* players, those from the second league are referred to as *less-skilled* players.

PROCEDURES

The *Developmental Model of Sport Participation* [1, 18, 19] was used as the theoretical background to define the players' developmental stages. Additionally, the Portuguese Volleyball Federation competitive system was used to define their age group cut-off values. Thus, four stages were defined (6-12 years; 13-14 years, 15-16 years and 17-18 years). The first stage (6-12 years) was similar to the first stage in the DMSP. This age group in volleyball is characterized by informal practice, reduced games (2x2 and 4x4), where fun and sport initiation/participation are the main objectives. The second (13-14 years) and third (15-16 years) stages match to second stage of the DMSP (13-15 years). While the 13-14 years age group focus on the introduction to the formal game (6x6), with more systematic practice and regular competitions, the 15-16 years age group is usually related to functional and tactical specialization, with an increase of quantity of practice and competitions. Finally, the fourth stage (17-18 years) matches the last stage in the DMSP (+16 years). This age group precedes the adult stage and preparation for high-level practice and competition is the main target.

A retrospective questionnaire was designed and applied to gather detailed data of the players' practice activities performed throughout the developmental stages. Players were asked to report the type of sports practice they undertook and to estimate the quantity of time engaged in that practice. Three strategies were used to develop the questionnaire, while fulfilling the requirements for validity and reliability. First, the underlying theoretical framework and a review of the literature with an examination of already existing questions in other instruments contributed to the process of item generation and design for the first version of the questionnaire [7, 8, 25, 30]. Second, a panel of four experts in this research field evaluated whether the initial pool of questionnaire items represented the totality of the problems related to the aims of this study. Specifically, in order to estimate content validity of the questionnaire (i.e., a method for gauging agreement among the experts regarding the range of possible items that should be covered in the questionnaire) [31], the panel of experts was asked to rate each question as "essential", "useful, but not essential" or "not necessary" to measure the sport activities under analysis. The experts' input relating to the assessment of each question was then used to measure the content validity ratio (CVR), which is an indicator of overall test content validity [31]. The CVR was calculated based on the following formula: $CVR=[(NE – (N/2)/(N/2)]$, where NE=number of experts indicating "essential", N=total number of experts. This formula yields values that range from -1.00 to 1.00, in which the value of 1.00 indicated that all experts rated the questionnaire's items as essential. Thus, the requirements of the content validity were guaranteed since a value of 1.00 was reached [31]. Finally, the revised version of the questionnaire was subjected to a pilot study with a sub-sample of 20 players, in order to test the clarity and accuracy of the items, and the feasibility of the questionnaire.

The final version of the questionnaire was composed of a section addressing players' demographic characteristics (gender, nationality and current playing division) and eighteen questions related to sports activities. The type of practice (type of sports activities practiced such as team or individual sports) and the quantity of practice and competition (number of training hours per week and number of competitions per week) performed throughout the four developmental stages were answered through twelve open questions. Questions about initial sports participation, volleyball starting age, and the number of sports practiced (throughout the developmental stages) were answered using six closed multiple-choice questions.

The questionnaire was complete by each participant after a training session in the

presence of the researcher. After assuring participants of confidentiality and anonymity, players who volunteered to participate in the study were conducted to a quiet room where the questionnaire was explained and informed consent obtained. The time to complete the questionnaire was not limited but averaged about 30 minutes to one hour.

RELIABILITY OF RETROSPECTIVE INFORMATION

Most parts of the questionnaire relied on retrospective recall of the athletes, which required the validation of information. While providing valid information for more recent events is relatively reliable, the information of activities undertaken much earlier in the players' development may not provide similarly accurate recall [32]. Reliability of the retrospective information provided by athletes was done by temporal stability of the measures, where 10% of the sample was asked to complete the questionnaire again one month after the first data collection. The correspondence between the information reported by athletes at the two different time points was examined through the percentage agreement [33], in which the values ranged from 89% to 100%. Accordingly, Reiss [34] argues that scores greater than 75% indicate strong agreement.

STATISTICAL ANALYSIS

Descriptive statistics were used to calculate frequencies, percentages, means and standard deviation. The requirements of normality and homogeneity of variance were examined through the Kolmogorov-Smirnov test and Levene's test in order to explore players' perceptions according to their expertise level and gender. To test for statistical differences between long-term developmental variables, Two-way ANOVA was performed using Tukey's post hoc multiple comparisons. Effect size was evaluated with η^2_P (eta partial squared). The power of the statistical tests was also calculated. The statistical significance level was set at $p \leq 0.05$.

RESULTS

SPORTS STARTING AGE AND VOLLEYBALL STARTING AGE

The sports starting age and volleyball starting age variables are presented in Table 1. Results show no significant differences in these variables for expertise level, gender and interaction. The majority of players began participating in sports (82.1%) and practising volleyball (55.9%) between 6 and 12 years of age; however, there is a considerable number of players who began practising volleyball after that age (44.1%). Considering the expertise level, 52.1% of skilled players started practising volleyball between 6 and 12 years of age and 47.9% after 12 years of age. When compared with skilled players, more less-skilled players began practising between 6-12 years of age (61.8%). Considering gender, 53.8% of male and 59.3% of female players started practising volleyball between 6 and 12 years, while 40.7% females and 46.2% males started practising volleyball after that age.

FIRST DEVELOPMENTAL STAGE (6-12 YEAR OLDS)

Considering the quantity of practice, skilled players practiced more hours of training per week than less-skilled players ($F_{(1,196)}$=4.370; p=0.038; η^2_p=0.02; π=0.55), but no significant differences were found for gender ($F_{(1,196)}$=2.885; p=0.091). The figures for interaction between expertise level and gender showed no significant differences ($F_{(1,196)}$=0.438; p=0.509). Regarding the average number of competitions per week, no significant differences were observed for expertise level ($F_{(1,138)}$=1.303; p=0.256), gender ($F_{(1,138)}$=2.402; p=0.123) or interaction ($F_{(1,138)}$=1.505; p=0.222). When the number of sports practiced was considered,

Table 1. Descriptive Statistics (%) for Sport Starting Age and Volleyball Starting Age

	Stages	Total	Skilled	Less-Skilled	Skilled Males	Less-Skilled Males	Skilled Females	Less-Skilled Females	Males	Females
Sport Starting Age	6-12y	82.1	79.3	86.5	76.2	86.8	88.6	86.3	79.0	87.2
	13-14y	15.3	17.1	12.4	21.0	10.5	5.7	13.7	18.2	10.5
	15-16y	2.6	3.6	1.1	2.9	2.6	5.7	-	2.8	2.3
	17-18y	-	-	-	-	-	-	-	-	-
Volleyball Starting Age	6-12y	55.9	52.1	61.8	52.4	57.9	51.4	64.7	53.8	59.3
	13-14y	26.3	29.3	21.3	27.6	13.2	29.3	27.5	23.8	30.2
	15-16y	14.8	15.7	13.5	16.2	23.7	15.7	5.9	18.2	9.3
	17-18y	3.0	2.9	3.3	3.8	5.2	2.9	2.0	4.2	1.2

no significant differences were observed for expertise level ($F_{(1,225)}$=2.802; p=0.096), gender ($F_{(1,225)}$=3.205; p=0.075) or interaction ($F_{(1,225)}$=1.641; p=0.202).

Considering the type of sports practiced, males practiced more team sports than females ($F_{(1,225)}$=36.502; p<0.001; η^2_p=0.14; π=1.00). The figures for interaction ($F_{(1,225)}$=0.191; p=0.663) showed no significant differences for team sports. The individual sports practice showed no significant differences for expertise level ($F_{(1,225)}$=0.191; p=0.663) or gender ($F_{(1,225)}$=2.603; p=0.108). However, skilled females practiced more individual sports than skilled males and than both less-skilled males and females ($F_{(1,225)}$=4.549; p=0.034; η^2_p =0.02; π=0.57).

SECOND DEVELOPMENTAL STAGE (13-14 YEARS OLD)

Skilled players practiced more hours of training per week than less-skilled players ($F_{(1,196)}$=10.662; p=0.001; η^2_p=0.05; π=0.90). No significant differences were identified for gender ($F_{(1,196)}$=1.193; p=0.276) and interaction ($F_{(1,196)}$=0.021; p=0.885). Considering the number of competitions per week, males participated in more competitions per week than females ($F_{(1,138)}$=4.330; p=0.039; η^2_p=0.030; π=0.54). No significant differences were observed in the average number of competitions per week for expertise level ($F_{(1,138)}$=0.207; p=0.650) and interaction ($F_{(1,138)}$=0.071; p=0.790). Considering the number of sports practiced, males practiced more sports than females ($F_{(1,225)}$=4.964; p=0.027; η^2_p=0.022; π=0.60). No significant differences were observed for expertise level ($F_{(1,225)}$=0.105; p=0.747) and interaction ($F_{(1,225)}$=0.149; p=0.700).

According to the type of sport practiced, males practiced more team sports than females, ($F_{(1,225)}$=17.767; p=0.000; η^2_p =0.073; π=0.99). The expertise level ($F_{(1,225)}$=0.471; p=0.493) and the interaction ($F_{(1,225)}$=0.667; p=0.415) showed no significant differences. There was no difference in the number of individual sports practiced for expertise level ($F_{(1,225)}$=0.008; p=0.927) or gender ($F_{(1,225)}$=0.007; p=0.934). However, the interaction reveals that skilled females practiced more individual sports than skilled males and than both less-skilled males and females ($F_{(1,225)}$=5.229; p=0.023; η^2_p =0.023; π=0.62).

THIRD DEVELOPMENTAL STAGE (15-16 YEARS OLD)

Skilled players practiced more hours of training per week than less-skilled players ($F_{(1,196)}$=16.759; p=0.000; η^2_p=0.08; π=0.98). No significant differences were identified for gender ($F_{(1,196)}$=3.139; p=0.078) and interaction ($F_{(1,196)}$=0.082; p=0.774). Considering the average number of competitions per week, males participated in more competitions than females ($F_{(1,138)}$=6.420; p=0.012; η^2_p=0.04; π=0.71). No significant differences were observed for expertise level ($F_{(1,138)}$=1.475; p=0.227) and interaction ($F_{(1,138)}$=1.940; p=0.166). Considering the number of sports practiced, males practiced more sports than females ($F_{(1,225)}$=12.610; p=0.000; η^2_p=0.053; π=0.94). No significant differences were observed for expertise level ($F_{(1,225)}$=2.372; p=0.125). However, less-skilled males practiced more sports than all players (skilled males, skilled females and less-skilled females) ($F_{(1,225)}$=5.770; p=0.017; η^2_p=0.025; π=0.67).

According to the type of sport practiced, males practiced more team sports than females ($F_{(1,225)}$=10.427; p=0.001; η^2_p =0.044; π=0.90). The expertise level ($F_{(1,225)}$=1.639; p=0.202) and the interaction ($F_{(1,225)}$=0.892; p=0.346) showed no significant differences in the number of team sports practiced. The number of individual sports practiced showed no significant differences for expertise level ($F_{(1,225)}$=0.327; p=0.568) or gender ($F_{(1,225)}$=2.695; p=0.102). However, less-skilled males practiced more individual sports than all other players ($F_{(1,225)}$=6.238; p=0.013; η^2_p =0.027; π=0.70).

Table 2 – Descriptive Statistics (mean and std. deviation) of Average Hours of Training and Number of Competitions per Week, Number of Sports and Type of Sports Practiced Throughout Developmental Stages

		Stages	Total	Skilled	Less-Skilled	Skilled Males	Less-Skilled Males	Skilled Females	Less-Skilled Females	Males	Females
Hours of training per week		6-12 y	7.3 (3.8)	7.9 (4.2)	6.4 (2.9)	8.0 (4.3)	7.2 (3.3)	7.4 (4.1)	5.8 (2.2)	7.8 (4.0)	6.5 (3.2)
		13-14 y	8.1 (3.6)	8.9 (3.8)	7.0 (2.4)	9.0 (4.0)	7.4 (2.9)	8.5 (3.4)	6.7 (1.9)	8.6 (3.8)	7.5 (2.8)
		15-16 y	9.1 (3.5)	9.8 (3.2)	7.7 (2.6)	9.9 (3.3)	8.2 (3.2)	9.3 (2.9)	7.2 (2.0)	9.5 (3.3)	8.1 (2.6)
		17-18 y	10.8 (4.8)	12.3 (4.6)	8.5 (3.5)	12.5 (4.6)	9.6 (4.6)	11.6 (4.6)	7.5 (1.8)	11.7 (4.7)	9.3 (3.9)
Number of competitions per week		6-12 y	1.2 (0.4)	1.2 (0.4)	1.1 (0.4)	1.2 (0.4)	1.2 (0.4)	1.2 (0.4)	1.0 (0.2)	1.2 (0.4)	1.1 (0.3)
		13-14 y	1.1 (0.5)	1.2 (0.4)	1.1 (0.3)	1.2 (0.4)	1.2 (0.4)	1.1 (0.3)	1.0 (0.2)	1.2 (0.4)	1.1 (0.2)
		15-16 y	1.1 (0.3)	1.1 (0.4)	1.2 (0.4)	1.2 (0.4)	1.3 (0.5)	1.1 (0.3)	1.1 (0.3)	1.2 (0.4)	1.1 (0.3)
		17-18 y	1.2 (0.4)	1.3 (0.5)	1.2 (0.4)	1.3 (0.5)	1.4 (0.5)	1.3 (0.4)	1.1 (0.3)	1.3 (0.5)	1.2 (0.4)
Number of Sports		6-12 y	2.2 (1.2)	2.2 (1.2)	1.8 (1.2)	2.2 (1.2)	2.1 (1.3)	2.1 (1.1)	2.1 (1.3)	2.2 (1.2)	1.8 (1.1)
		13-14 y	1.3 (0.7)	1.3 (0.8)	1.2 (0.7)	1.4 (0.8)	1.4 (0.8)	1.2 (0.7)	1.4 (0.8)	1.4 (0.8)	1.1 (0.6)
		15-16 y	1.1 (0.5)	1.1 (0.4)	1.2 (0.6)	1.1 (0.5)	1.4 (0.8)	1.1 (0.2)	1.4 (0.8)	1.2 (0.6)	1.0 (0.2)
		17-18 y	1.1 (0.4)	1.1 (0.4)	1.1 (0.4)	1.1 (0.5)	1.2 (0.6)	1.1 (0.2)	1.2 (0.6)	1.1 (0.5)	1.0 (0.2)
Type of Sport	Team Sports	6-12 y	0.7 (0.8)	0.8 (0.9)	0.5 (0.7)	1.0 (0.9)	0.8 (0.7)	0.3 (0.6)	0.8 (0.7)	0.9 (0.8)	0.2 (0.5)
		13-14 y	0.3 (0.6)	0.3 (0.7)	0.2 (0.5)	0.4 (0.7)	0.3 (0.6)	0.03 (0.2)	0.3 (0.6)	0.4 (0.7)	0.04 (0.2)
		15-16 y	0.1 (0.4)	0.1 (0.4)	0.1 (0.4)	0.1 (0.5)	0.3 (0.6)	0.0 (0.0)	0.3 (0.6)	0.2 (0.5)	0.01 (0.1)
		17-18 y	0.04 (0.3)	0.04 (0.3)	0.02 (0.1)	0.06 (0.4)	0.5 (0.2)	0.0 (0.0)	0.5 (0.2)	0.06 (0.3)	0.0 (0.0)
	Ind. Sports	6-12 y	0.8 (1.0)	0.8 (1.0)	0.9 (1.1)	0.7 (0.9)	0.9 (1.1)	1.2 (1.1)	0.9 (1.1)	0.7 (1.0)	1.0 (1.1)
		13-14 y	0.2 (0.6)	0.2 (0.6)	0.2 (0.5)	0.2 (0.4)	0.3 (0.7)	0.3 (1.0)	0.3 (0.7)	0.2 (0.5)	0.2 (0.7)
		15-16 y	0.07 (0.3)	0.1 (0.3)	0.1 (0.4)	0.1 (0.3)	0.2 (0.6)	0.1 (0.3)	0.2 (0.6)	0.1 (0.4)	0.04 (0.2)
		17-18 y	0.05 (0.3)	0.04 (0.2)	0.1 (0.4)	0.04 (0.2)	0.2 (0.5)	0.1 (0.2)	0.2 (0.5)	0.1 (0.3)	0.02 (0.2)

All statistical significant differences are described in the results section

FOURTH DEVELOPMENTAL STAGE (17-18 YEARS OLD)

Considering the quantity of practice, skilled players practiced more hours of training per week than less-skilled players ($F_{(1,196)}$=28.450; p=0.000; η^2_p=0.13; π=1.00) and males practiced more hours of training per week than females ($F_{(1,196)}$=5.463; p=0.020; η^2_p=0.27; π=0.64). The figures for interaction showed no significant differences ($F_{(1,196)}$=0.857; p=0.356). Regarding the average number of competitions per week, males participated in more competitions per week than females ($F_{(1,138)}$=5.728; p=0.018; η^2_p=0.40; π=0.66). No significant differences were observed for expertise level ($F_{(1,138)}$=0.025; p=0.874). However, skilled females participated in more competitions per week than less-skilled females ($F_{(1,138)}$=4.310; p=0.040; η^2_p=0.30; π=0.54). The number of sports practiced showed no significant differences for expertise level ($F_{(1,225)}$=0.128; p=0.721), gender ($F_{(1,225)}$=3.384; p=0.067) or interaction ($F_{(1,225)}$=1.811; p=0.180).

Considering the type of sports practiced, there were no significant differences in the number of team sports practiced for expertise level ($F_{(1,225)}$=0.004; p=0.953), gender ($F_{(1,225)}$=2.075; p=0.151) and interaction ($F_{(1,225)}$=0.004; p=0.953). However, less-skilled males practiced more individual sports than all players (skilled male, skilled female and less-skilled female) ($F_{(1,225)}$=4.463; p=0.036; $?^2_p$=0.19; π=0.56). No significant differences for the expertise level ($F_{(1,225)}$=0.560; p=0.455) or gender ($F_{(1,225)}$=2.748; p=0.099) were observed.

DISCUSSION

The aim of this study was to characterize the sports involvement of Portuguese volleyball players (sport and volleyball starting ages, the quantity of practice and type of sporting activities) during the early stages of sport development, considering their expertise level and gender.

The age at which players started practicing sports did not differ for the various groups considered. Indeed, the majority of players had an early involvement in sports corroborating a trend already identified in team sports [7, 12, 21]. For instance, Baker et al. [25] examined the developmental experiences of team sports athletes and noted that, rather than specializing early, they specialized relatively late after first experiencing a very broad base of sports. Concerning the volleyball starting age, a variety of paths was found in this study. Although there were players who began practicing volleyball between 6 and 12 years of age, there were others beginning only after that age, unrelated to their expertise level and gender. These findings suggest that early or late specialization in volleyball seems to be a factor that does not narrow or hinder high-level achievement. This variety of paths reinforced the findings of Leite et al. [22] applied to Portuguese team sports, adding fruitful information to the Portuguese volleyball context at this level, since the number of volleyball players in our study was significantly higher (229 players) than the number considered in Leite et al.'s study (14 players). Notwithstanding, negative consequences have been associated with the early specialization, such as negative physical outcomes, a decreasing of sports enjoyment and burnout [35, 36]. On the other hand, early diversification seems to be beneficial rather than disadvantageous [18, 36] because of the intrinsic motivation that stems from the fun, enjoyment and competence children experience through their sporting involvement [36]. Additionally, a diversified early sport involvement may also stimulate physiological and cognitive adaptations that may be transferable to athletes' later sport specialization and contribute to expertise achievement [11, 36]. Sport developmental programs should take into account this evidence in order to ensure that children follow an appropriate sports pathway and stay involved in sports (elite or recreational level) throughout their development [18].

From this study, different pathways emerged taking into account players' gender and expertise level when analysed separately and simultaneously. The quantity of practice is often a key distinguishing factor of expertise in both individual [8, 15] and team sports [2, 7, 14]. Our results corroborate this trend, since skilled players accumulated more hours of training per week throughout all developmental stages than less-skilled players. On the other hand, the number and type of sports practiced were similar for both skilled and less-skilled players, suggesting that the practice of other sports beyond the primary sport did not affect their expertise achievement [2, 7]. Although early specialization (mainly characterized by deliberate practice) and early diversification (usually characterized by deliberate play) are traditionally considered as two different and opposing talent development approaches [10], empirical evidence has recently shown that different relevant learning activities can coexist within the long-term athlete development pathway. Ford et al. [2] examined the sports participation of 6-12 year-old elite youth soccer players and found that accumulated experiences were reflected by minimal diversity in other sports (i.e., early specialization) and high levels of play (i.e., deliberate play) in the primary domain. This highlights the need for a reframing of traditional conceptual frameworks by considering the inclusion of other learning activities on a continuum between deliberate practice and deliberate play, and can therefore provide a more holistic and realistic characterization of the learning involvement in sport [10]. Further studies should examine the microstructure of practice in greater detail in order to better understand the impact of different learning activities and pathways on the development and acquisition of expert performance in sport.

In this study, greater sports involvement was accomplished by male players since they practiced more sports during the second and third stages, more team sports between 6 and 16 years of age, and participated in more competitions per week throughout all the developmental stages. The practice of other different team sports by male players during childhood may have been important, since it provides relevant adaptations that could be transferred to volleyball. Some researchers have already acknowledged the possible transfer of skills across sports activities during early stages of development [26]. Specifically in team sports, Baker et al. [25] noted that participation in other related activities (sports that share a number of characteristics in common, like team sports) might be a functional element in the development of expert decision-making skills. On the other hand, the findings of this study suggest less commitment and expectations for female players and reinforce the need to provide them with more opportunities to practice and compete on a regular basis throughout development. It reveals a critical weakness in the current Portuguese sport development system and would be worth of future study in other countries and sport systems. Hence, further research should examine the factors contributing to gender dissonance regarding male and female players' involvement in sport while considering the cultural context in question. Moreover, in order to guide the design of appropriate sport programs, it is essential that the practicalities concerning the implementation of such programs are taken into consideration.

The real novelty of this study emerged when a simultaneous analysis of gender and expertise level was undertaken. All groups (i.e., skilled male, skilled female, less-skilled male and less-skilled female) demonstrated similar sport starting age and volleyball starting age, as well as identical pathways regarding the number of hours of training per week and the number of team sports practiced. However, skilled female and less-skilled male players showed different pathways in the number of competitions per week, number of sports and number of individual sports practiced. Here, skilled female players practiced more individual sports than all the other players during stages 1 and 2 and participated in more competitions than less-skilled female players during stage 4. The less-skilled male players practiced more

sports during stage 3, and more individual sports during stages 3 and 4 than all the other players. The practice of more individual sports by skilled female players between 6 and 14 years of age arises as a possible key factor to reach expertise. Considering the relatively low level of female volleyball in Portugal (lower than the average international ranking level) [28], superior physical skills could be an advantage in the route of expertise. Therefore, the sports programs should consider not only the transfer of learning from sport-specific activities to the primary sport [7, 26], but also the potential role of non-sport specific activities in shaping possible deficits during the players' early sporting experiences. Otherwise, the practice of more individual sports between the ages of 15 and 18 years by less-skilled male players could be a sign of less commitment and disengagement with the primary sport, probably due to the perception of failure in achieving expertise in volleyball. Conflicts of interest and negative experiences such as lack of fun, coach conflicts, and lack of playing time have been highlighted as the most common reasons for withdrawal from sport [37]. Beyond that, the continued participation in other individual sports by less-skilled players may have been a restrictive factor in their expertise development in volleyball. According to the predictions of the DMSP, the participation in a variety of sports may be beneficial before age 12, but some degree of *specialization* and *investment* in the primary domain is necessary after that age for optimal expertise development. An in-depth examination of such findings is necessary in order to explain the variety of sport paths encountered within the different levels of expertise and gender. Finally, our study showed that skilled female players participated in a greater number of competitions between 17 and 18 years of age compared with less-skilled females. Although no empirical evidence exists to support these findings, the relatively low level of Portuguese female volleyball probably means that young female players are taken up by adult teams for training and competitions earlier than normal. Future research should study these issues more deeply in order to provide accurate explanations.

Although retrospective interviews have been considered an incomplete tool to collect accurate data, it is also recognized as a necessary method within this research field [38]. Despite this apparent limitation, our study afforded important insights into this research field and coaching practice highlighting the influence of the interaction of expertise and gender to define the athletes' paths throughout their development. These findings may provide a valuable source of information to guide the design of sport programs, particularly in Portugal, although further work is obviously required to determine to what extent they may be culture, system or sport dependent. In order to obtain a more representative portrait of the athletes' pathways, further research should examine the microstructure of practice in greater detail in order to understand what best facilitates the acquisition of expert performance [39]. Here, the use of weekly practice diaries emerges as a worthwhile tool for obtaining contextualised and deeper information about a player's sport participation [32].

CONCLUSION

While the quantity of practice emerged as a requisite to expertise achievement in this study, both early specialization and early diversification seem to be a factor that did not narrow or hinder the high-level achievement of our participants. Nevertheless, coaches and sport organizations should be aware of the negative consequences of early specialization for continued sport participation when planning and designing youth developmental sports programs. Furthermore, the distinct sports pathway found according to gender highlight the need for sports programs and coaches to consider gender specific interventions in order to promote appropriate sport environments for players. In the same way, coaches' interventions

should bear in mind these issues in order to design adjustable sporting experiences according to gender differences. Finally, the assumption that only the practice of sport-specific activities can have an impact on expertise achievement should be accepted only with caution. In this study, the practice of non-sport specific activities (such as individual sports) during early sport participation appeared to have considerable importance for female volleyball players in reaching a higher competitive level. Sport developmental programs and coaches should consider this evidence in order to create appropriate sporting experiences according to players' needs and characteristics during their early development.

ACKNOWLEDGMENTS

This research was supported by a grant from Foundation for Science and Technology (FCT) (SFRH/BD/64680/2009)/POPH/QREN/European Social Fund awarded to the first author.

REFERENCES

1. Côté, J., The Influence of the Family in the Development of Talent in Sport, *The Sport Psychologist*, 1999, 13, 395-417.
2. Ford, P.R., Ward, P., Hodges, N.J. and Williams, A.M., The Role of Deliberate Practice and Play in Career Progression in Sport: the Early Engagement Hypothesis, *High Ability Studies*, 2009, 20(1), 65-75.
3. Gulbin, J., Oldenziel, K., Weissensteiner, J. and Gagné, F., A Look Through the Rear View Mirror: Developmental Experiences and Insights of High Performance Athletes, *Talent Development & Excellence*, 2010, 2(2), 149-64.
4. Davids, K. and Baker, J., Genes, Environment and Sport-Performance: Why the Nature-Nurture Dualism is No Longer Relevant, *Sports Medicine*, 2007, 37(11), 1-20.
5. Burgess, D.J. and Naughton, G.A., Talent Development in Adolescent Team Sports: A Review, *International Journal of Sports Physiology and Performance*, 2010, 5(1), 103-16.
6. Phillips, E., Davids, K., Renshaw, I. and Portus, M., Expert Performance in Sport and the Dynamics of Talent Development, *Sports Medicine*, 2010, 40(4), 271-83.
7. Berry, J., Abernethy, B. and Côté, J., The Contribution of Structured Activity and Deliberate Play to the Development of Expert Perceptual and Decision-Making Skill, *Journal of Sport & Exercise Psychology*, 2008, 30, 685-708.
8. Baker, J., Côté, J. and Deakin, J., Expertise in Ultra-Endurance Triathletes Early Sport Involvement, Training Structure, and the Theory of Deliberate Practice, *Journal of Applied Sport Psychology*, 2005b, 17, 64-78.
9. Chan, D.K., Lonsdale, C. and Fung, H., Influences of Coaches, Parents, and Peers on the Motivational Patterns of Child and Adolescent Athletes, *Scandinavian Journal of Medicine & Science in Sports*, 2012, 22(4), 558-68.
10. Côté, J., Erickson, K. and Abernethy, B., Play and Practice During Childhood, in: Côté, J. and Lidor, R., eds., *Conditions of Children's Talent Development in Sport*, FIT, Morgantown, WV, 2013, 9-20.
11. Baker, J. and Côté, J., Shifting Training Requirements During Athlete Development: Deliberate Practice, Deliberate Play and Other Sport Involvement in the Acquisition of Sport Expertise., in: Tenenbaum, D.H.G., ed., *Essential Processes for Attaining Peak Performance*, Meyer & Meyer Sport, Oxford, 2006, 92-109.
12. Leite, N. and Sampaio, J., Long-Term Athletic Development Across Different Age Groups and Gender from Portuguese Basketball Players, *International Journal of Sports Science and Coaching*, 2012, 7(2), 285-300.
13. Ericsson, K., Krampe, R. and Tesch-Romër, C., The Role of Deliberate Practice in the Acquisition of Expert Performance, *Psychological Review*, 1993, 100(3), 363-406.
14. Ward, P., Hodges, N., Starkes, J. and Williams, A.M., The Road to Excellence: Deliberate Practice and the Development of Expertise, *High Ability Studies*, 2007, 18(2), 119-53.
15. Law, M., Côté, J. and Ericsson, K.A., Characteristics of Expert Development in Rhythmic Gymnastics: A Retrospective Study, *International Journal of Sport and Exercise Psychology*, 2007, 5, 82-103.

16. Abernethy, B., Farrow, D. and Berry, J., Constraints and Issues in the Development of a General Theory of Expert Perceptual-Motor Performance, in: Starkes, J.L. and Ericsson, K.A., eds., *Expert Performance in Sports: Advances in Research on Sport Expertise,* Human Kinetics, Champaign, IL, 2003.

17. Hayman, R., Polman, R., Taylor, J., Hemmings, B. and Borkoles, E., Development of Elite Adolescent Golfers, *Talent Development & Excellence*, 2011, 3(2), 249-61.

18. Côté, J., Murphy-Mills, J. and Abernethy, B., The Development of Skill in Sport, in: Hodges, N. and Williams, A.M., eds., *Skill Acquisition in Sport - Research, Theory and Practice*, Routledge, New York, 2012, 269-86.

19. Côté, J., Baker, J. and Abernethy, B., Practice and Play in the Development of Sport Expertise, in: Eklund, R. and Tenenbaum, G., eds., *Handbook of Sport Psychology*, Wiley, Hoboken, NJ, 2007, 184-202.

20. Côté, J., Lidor, R. and Hackfort, D., ISSP Position Stand: To Sample or To Specialize? Seven Postulates About Youth Sport Activities that Lead to Continued Participation and Elite Performance, *International Journal of Sport and Exercise Psychology*, 2009, 9, 7-17.

21. Baker, J., Côté, J. and Abernethy, B., Learning From the Experts: Practice Activities of Expert Decision Makers in Sport, *Research Quarterly for Exercise and Sport*, 2003a, 74(3), 342-7.

22. Leite, N., Baker, J. and Sampaio, J., Paths to Expertise in Portuguese National Team Athletes, *Journal of Sports Science and Medicine*, 2009, 8(4), 560-6.

23. Starkes, J., Deakin, J., Allard, F., Hodge, K. and Hayes, A., Deliberate Practice in Sports: What is it Anyway?, in: Ericsson, K.A., ed., *The Road to Excellence: the Acquisition of Expert Performance in the Arts and Sciences, Sports and Games*, Lawrence Erlbaum, Mahwah, NJ, 1996, 81-106.

24. Johnson, M., Tenenbaum, G., Edmonds, W. and Castillo, Y., A Comparison of the Developmental Experiences of Elite and Sub-Elite Swimmers: Similar Developmental Histories Can Lead to Differences in Performance Level, *Sport, Education and Society*, 2008, 13(4), 453-75.

25. Baker, J., Côté, J. and Abernethy, B., Sport-Specific Practice and the Development of Expert Decision-Making in Team Ball Sports, *Journal of Applied Sport Psychology*, 2003b, 15, 12-25.

26. Abernethy, B., Baker, J. and Côté, J., Transfer of Pattern Recall Skills May Contribute to the Development of Sport Expertise, *Applied Cognitive Psychology,* 2005, 19(6), 705-18.

27. Ziv, G. and Lidor, R., Physical Attributes, Physiological Characteristics, On-Court Performances and Nutritional Strategies of Female and Male Basketball Players, *Sports Medicine*, 2009, 39(7), 547-68.

28. FIVB, Women's volleyball senior world ranking. Retrieved May 15, 2013, from *http://www.fivb.org/en/volleyball/VB_Ranking_W_2013-01.asp*

29. Helsen, W.F., Starkes, J. and Hodges, N., Team Sports and the Theory of Deliberate Practice, *Journal of Sport & Exercise Psychology,* 1998, 20, 12-34.

30. Côté, J., Baker, J. and Abernethy, B., From Play to Practice: A Developmental Framework for the Acquisition of Expertise in Team Sport, in: Starkes, J. and Ericsson, K.A., eds., *Expert Performance in Sports: Advances in Research on Sport Expertise*, Human Kinetics, Champaign, IL, 2003, 89-113.

31. Lawshe, C.H., A Quantitative Approach to Content Validity, *Personnel Psychology*, 1975, 28, 563-75.

32. Côté, J., Ericson, K.A. and Law, M., Tracing the Development of Athletes Using Retrospective Interview Methods: A Proposed Interview and Validation Procedure for Reported Information, *Journal of Applied Sport Psychology*, 2005, 17, 1-19.

33. Bahrick, H.P., Hall, L.K. and Berger, S.A., Accuracy and Distortion in Memory for High School Grades, *Psychological Science*, 1996, 7, 265-71.

34. Reiss, D., *Family's Constrution of Reality*, Harvard University Press, Cambridge, MA, 1981.

35. Wiersma, L.D., Risks and Benefits of Youth Sport Specialization: Perspectives and Recommendations, *Pediatric Exercise Science*, 2000, 12, 13-22.

36. Baker, J., Cobley, S. and Fraser-Thomas, J., What Do We Know About Early Sport Specialization? Not Much!, *High Ability Studies*, 2009, 20(1), 77-89.

37. Weiss, M.R. and Williams, L., The Why of Youth Sport Involvement: A Developmental Perspective on Motivational Processes, in: Weiss, M.R., ed., *Developmental Sport and Exercise Psychology: A Lifespan Perspective*, FIT, Morgantown, WV, 2004, 223-68.

38. Sosniak, L.A., Retrospective Interviews in the Study of Expertise and Expert Performance, in: Ericsson, K.A., Charness, N., Feltovich, P.J. and Hoffman, R., eds., *The Cambridge Handbook of Expertise and Expert Performance*, Cambridge University Press, New York, 2006, 287-301.

39. Williams, A.M. and Ford, P., Expertise and Expert Performance in Sport, *International Review of Sport and Exercise Psychology*, 2008, 1(1), 4-18.