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Biological maturation, training experience, body size and functional capacity of adolescent female basketball players: A Bayesian analysis

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Abstract

In the present study we examined the age- and maturity-associated variation on body size and functional capacities in 47 adolescent female basketball players. Also, we examined the relative contribution of growth and maturity status to functional capacity between player variation. Data included chronological age, age at menarche, years of training experience; body dimensions; countermovement jump, Line drill test and Yo-Yo intermittent recovery test – level 1. Bayesian multilevel modelling was used to estimate the independent effects of age, maturity status, years of training experience and body size on functional capacity indicators. Players were, on average, advanced in maturity status, with a mean age at menarche of 11.20 years (1.32 years). Age-associated variation in age at menarche, body size and functional performance was present. No substantial maturity-associated variation was observed for stature and functional capacities, but late maturing players appeared to be less experienced in the sport. Variance partition coefficients ranged between 38% and 45% for the three indicators of functional capacities. Body mass and adiposity were the predictors identified for all indicators of performance. Maturity status and years of experience were predictors of performance in the countermovement jump while age and years of experience were predictors of performance for the Line drill. Stature was only identified as a predictor of the Yo-Yo intermittent recovery – level 1. Coaches should interpret functional performance in adolescent female basketball players considering their different ages (chronological, biological and accumulated training) and their influence on body dimensions.

Keywords

Anthropometry, body mass, countermovement jump, line drill test, stature, Yo-Yo intermittent recovery test

Introduction

Basketball is a multifaceted team sport with movement patterns that involve short, intense and repeated episodes of activity requiring frequent rapid changes in direction.[1–3] Although basketball involves a large part of intermittent activities aerobic in nature, high intensity short-term activities (e.g. sprinting, jumping, cutting) are crucial for the success in the game.[2] Thus, interpretations about the young basketball player's performance by coaches or researchers should consider testing maximal short-term output (e.g. jumping, agility, sprint), as well basketball related intermittent endurance. Also, body dimensions characteristics are determinant for performance,[4] and are valued by coaches when attempting to select and/or predict future outcomes.[5] However, the between-subject variability

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in growth, as well as complex environmental factors, often hinders interpretations of performance in young athletes.[5,6]

There is an emphasis in youth sports, including youth basketball, on talent identification, development and selection.[7] Attainment of athletic excellence when being adults is limited for a very narrow group of basketball players, independent of gender.[8] In youth basketball, body size and functional performance are important determinants of performance that influence coaches decisions,[4,9] whether to develop and provide training and competition opportunities, or not to promote player's participation. Often differences in adolescent player's physique and performance are transient, and may be exacerbated by the complex interaction between pubertal growth rate, chronological age and accumulated sport-specific experience.[10,11] Thus, the appropriate interpretation of the young basketball player's performance is of utmost importance for the coach and the athlete.

The majority of data dealing with functional capacities in young athletes, particularly basketball players, are based on male players.[12–17] Despite the increasing number of female young athletes involved in intensive training programmes and high level competitions, available knowledge on the functional capacities of young female basketball players remains limited.[18] In particularly, sexual dimorphism may complicate interpretations of young female athletes' functional capacity.[18] There is a large between-girls variation in the timing and tempo of biological maturation, as well as sex differences.[19] Hence examining functional capacity in young female athletes engaged in sport-specific training merits further study.

Considering the preceding observations, performance interpretation among young female basketball players requires accounting for variation from different sources and levels of observation. Limitations of traditional analytic approaches have been raised in other scientific areas,[20,21] and noted in applied analysis with young athletes[22,23] considering different sources of variation. Multilevel modelling, within a Bayesian approach which treats parameters as random variables combining both sample data and prior distribution information to estimate posterior information,[21] is a flexible and robust framework to deal with small scale applied sport and exercise science studies.[24]

Generally youth sports competitions and training programmes are organized by age groups, and maturity-associated variation between and within age groups of young players should be considered. Thus, the present study examined the age-related and biological maturity-associated variation in training experience, body dimensions and basketball-specific functional performance among adolescent female players, considering a Bayesian multilevel framework. Also, we examined relationships between growth and maturation status and indicators of functional capacity in adolescent female basketball players.

Methods

Study design and participants

This study was based on a cross-sectional design[25] to examine the relative contributions (i.e. correlational research) of between player variation in chronological age, biological maturity status, training experience and body dimensions on basketball-specific functional performance among adolescent female players. The study was based on a total sample of 47 adolescent female basketball players aged 11.5 to 15.6 years. The players were engaged in formal training and competition within under 13 ($n = 30$) and under 15 ($n = 17$) teams from two clubs from the Campinas metropolitan region at Brazil, and competed at regional level competition supervised by the *Associação Regional de Basquetebol* (ARB). At the time of study, all players trained regularly (~300–360 min/wk) over a 10-month season (March to November). No player was suffering from injury at the time of testing or during six months before testing.

The Research Ethics Committee of the University of Campinas approved the study. Participants were informed about the nature of the study, that participation was voluntary and that they could withdraw from the study at any time. Players and their parents or legal guardians provided written informed consent.

Measures

Chronological age was calculated to the nearest 0.1 year by subtracting birth date from date of testing. Years of training were obtained by interview. Age at menarche was obtained with individual interview by the coaches of the players (female coaches in all cases). Seven players had attained menarche at the date of observation. Data were organized into three groups of menarcheal status: early ($n = 27$), average ($n = 8$) and late ($n = 12$). Reference age at menarche (mean = 12.49, SD = 0.41) for the state of São Paulo, Brazil population was estimated based on data from five studies, considering 2495 observations, using Bayesian multilevel modelling to perform meta-analysis.[26] Players classified as having early or late maturation were those whose age at menarche was minus or plus one standard deviation from the mean of age at menarche in the state of São Paulo, Brazil (i.e. the state of the study sample).

A single experienced observer took all anthropometric measurements. Stature was measured with a portable stadiometer (Seca model 206, Hanover, MD) to the nearest 0.1 cm. Body mass was measured with a calibrated portable balance (Seca model 770, Hanover, MD) to the nearest 0.1 kg. Body mass index was calculated as body mass (kg) by stature (m) squared. The triceps, subscapular, suprailiac and medial calf skinfolds were measured and summed as a measure of relative body fat distribution. Skinfold sites were measured with a Lange skinfold caliper (Cambridge Scientific Industries, Inc, Cambridge, MD). Reliability estimates for the observer are published elsewhere.[15,16]

Three protocols were used as measures of functional capacity for basketball: vertical jump with countermovement,[27] a short-term maximal running protocol, the Line drill (LD) test[16,28] and an intermittent endurance test, the Yo-Yo Intermittent Recovery level 1 test (Yo-Yo IR1).[29] Tests were performed in two sessions separated by at least 48 h, where the first session included the vertical jump and LD test, and the second session the Yo-Yo IR1. Before testing a standardized warm-up was taken by all athletes before testing.

The countermovement jump test was performed on a jump mat (Multisprint System, Hidrofit, Brazil). Participants started from an upright standing position. Players were instructed to begin the jump with a downward movement, which was immediately followed by a concentric upward movement, resulting in a maximal vertical jump. During jumping, hands were held on the hips during all phases of the jumping. Three trials were allowed and the best retained for analysis. The coefficient of variation based on replicate measures separated by one week in 18 players was 6.9% (95% credible interval (CI) 5.1 to 10.5).

In the LD protocol,[16,28] players ran 140 m as fast as possible in the form of four consecutive shuttle sprints of 5.8, 14.0, 22.2 and 28.0 m within a regulation basketball court. Players began the test 1 m behind the baseline of the basketball court, where a pair of photoelectric cells (Multisprint System, Hidrofit, Brazil) was aligned with the baseline. Verbal encouragement for an all-out effort was given throughout the test. Time was recorded in seconds. Reliability estimates are presented elsewhere.[16]

The Yo-Yo IR1 was performed by all players.[29] The protocol is based on repeated 2×20-m runs back and forth between the starting, turning and finishing line at a progressively increased speed controlled by audio bleeps from a tape recorder.[29] The athletes have a 10-s active rest period between each bout, jogging in a distance of 2×5-m. Players ran until they were no longer able to maintain the required speed; the test was completed when athletes failed twice to reach the finishing line in time. Covered distance was measured in meters. Based on replicate measures on a subsample of 11 players measured twice within one week, the coefficient of variation was 6.0% (95% CI 4.5 to 9.5%), which is within the range of reproducibility reported for the Yo-Yo IR1.[30]

Statistical analysis

Descriptive statistics for chronological age, age at menarche, years of basketball training experience, body size and functional performance were calculated. Initially we explored visually the data to explore the distribution trends by plotting the body dimensions and indicators of functional capacity by age groups, maturity status and years of experience. Then we examined the difference between players in chronological age, age at menarche, years of training experience, body size and indicators of functional capacity among female basketball players grouped by age groups and by menarcheal status groups by fitting Bayesian multilevel models. To derive posterior means and respective 95% CIs (population-level effects) we removed the intercept term from the model. Also, we allowed for random variation within each maturity group at level 2 (group-level effects).

We used Bayesian multilevel modelling to estimate the relative contributions of chronological age, menarcheal status, training experience, stature, body mass and adiposity to the three indicators of functional capacity. We used z-score transformation on both dependent variables (functional capacity indicators) and independent variables, i.e. the candidate predictors (chronological age, menarcheal status, training experience, stature, body mass and adiposity). Initially we fitted a full model including all the candidate predictor variables as population-level effects and allowed the intercept to vary randomly at group-level (i.e. between-players random variation). The use of standardized coefficients is convenient both for interpretation and model convergence when variables have different scales,[21] and is similar to multiple linear regressions used previously in adolescent male basketball players.[15] Considering uncertainty of population level estimates (95% CIs) we removed the variables where zero was likely within the uncertainty estimates. Variance partition coefficient was estimated to measure the proportion of total variance which fells between-players.[31]

We used weakly informative prior distributions for population-level, normal priors (0,10), and for group-level effects, half-cauchy priors (0,2), allowing model convergence, as well as ensuring that results reflect the knowledge available on the current data. We then run the chain for 10,000 iterations with a warm-up length of 2000 iterations with a thinning rate of 10. The models were implemented with Bayesian methods via Markov Chain Monte Carlo (MCMC) simulation and using Hamiltonian Monte Carlo and its extension, the No-U-Turn Sampler using Stan,[32] obtained using 'brms' package,[26] available as a package in the R statistical language.[33]

Results

The posterior means and 95% CIs of young Brazilian female basketball players are summarized in Table 1. Seven players had not attained menarche at time of observation. From those seven players, five were from the under 13 group and two were from the under 15 group. The statures, body masses and body mass indexes of the total sample of female basketball players by stage of menarche are plotted relative to the US growth charts (Figure 1).

Means and 95% CIs for young female players by age groups are summarized in Table 2. The Bayesian

Table 1. Descriptive statistics for the all samples ($n = 47$).

	Posterior mean (95% credible interval)	Range
Chronological age (yrs)	13.5 (13.2 to 13.8)	11.5–15.6
Age at menarche (yrs)[a]	11.2 (10.8 to 11.6)	8.8–13.4
Years of training (yrs)	3.4 (2.8 to 4.0)	0.5–8.0
Age at beginning of formal training (yrs)	10.1 (9.6 to 10.6)	6.6–16.4
Stature (cm)	163.5 (161.4 to 165.6)	138.5–178.6
Body mass (kg)	57.8 (54.6 to 60.9)	28.5–84.1
Body mass index (kg/m^2)	21.4 (20.6 to 22.3)	14.9–30.7
Sum 4 skinfolds (mm)	62.7 (57.8 to 67.6)	31.0–107.0
Countermovement jump (cm)	25.2 (24.1 to 26.4)	16.2–32.3
Line drill (s)	35.51 (34.82 to 36.21)	29.67–41.24
Yo-Yo IR1 (m)	451.5 (408.9 to 494.2)	240.0–880.0

[a]Seven players did not attain menarche at the date of observation, thus excluded from analysis in this model.

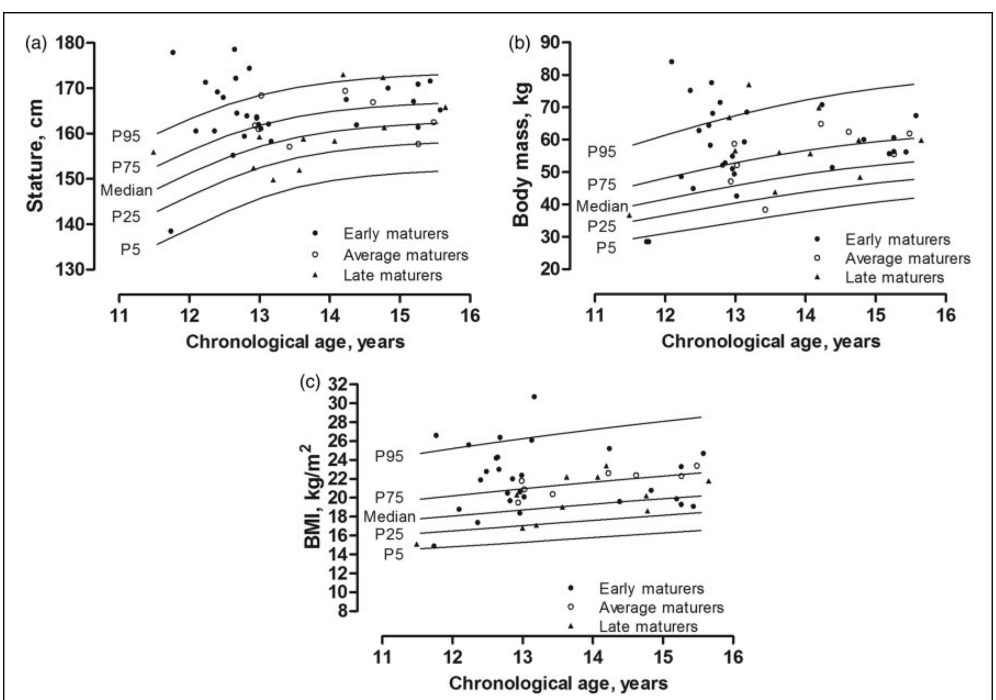

Figure 1. Statures (a), body masses (b) and body mass index (c) of young female basketball players by chronological age and by menarcheal status.

Table 2. Posterior means and 95% credible intervals of young female basketball players by age groups.

	Under 13 ($n = 30$)	Under 15 ($n = 17$)
Chronological age (yrs)	12.75 (12.56 to 12.9)	14.91 (14.62 to 15.21)
Age at menarche (yrs)[a]	10.87 (10.30 to 11.42)	11.78 (11.11 to 12.51)
Years of training (yrs)	2.6 (1.9 to 3.1)	5.0 (3.9 to 6.1)
Age at beginning of formal training (yrs)	10.2 (9.5 to 10.8)	9.9 (9.0 to 10.7)
Stature (cm)	162.0 (159.1 to 164.9)	166.2 (163.0 to 169.4)
Body mass (kg)	56.7 (51.9 to 61.5)	59.7 (56.0 to 63.6)
Body mass index (kg/m^2)	21.3 (19.8 to 22.4)	21.7 (20.5 to 22.8)
Sum 4 skinfolds (mm)	61.3 (55.1 to 67.9)	66.1 (58.0 to 74.1)
Countermovement jump (cm)	24.1 (22.7 to 25.4)	27.4 (25.6 to 29.2)
Line drill (s)	36.34 (35.70 to 37.06)	33.99 (33.23 to 34.76)
Yo-Yo IR1 (m)	420.1 (369.6 to 471.4)	507.7 (436.2.4 to 576.1)

[a]Seven players did not attain menarche at the date of observation, thus excluded from analysis in this model.

Table 3. Posterior means and 95% credible intervals of young female basketball players by menarcheal status groups.

	Early maturers ($n = 27$)	Average maturers ($n = 8$)	Late maturers ($n = 12$)
Chronological age (yrs)	13.35 (12.86 to 13.81)	13.99 (13.02 to 14.95)	13.59 (12.80 to 14.35)
Age at menarche (yrs)[a]	10.46 (10.14 to 10.78)	12.41 (12.17 to 12.62)	13.30 (13.01 to 13.65)
Years of training (yrs)	3.6 (2.8 to 4.5)	3.8 (1.9 to 5.7)	2.9 (1.6 to 4.2)
Age at beginning of formal training (yrs)	9.8 (9.2 to 10.5)	10.2 (8.7 to 11.6)	10.7 (9.7 to 11.8)
Stature (cm)	166.0 (163.6 to 168.3)	163.0 (158.3 to 167.3)	158.1 (152.3 to 163.4)
Body mass (kg)	61.8 (57.9 to 65.3)	57.8 (49.8 to 64.9)	48.9 (42.5 to 55.2)
Body mass index (kg/m^2)	22.2 (21.1 to 23.4)	21.7 (19.9 to 23.4)	19.1 (17.5 to 21.0)
Sum 4 skinfolds (mm)	68.2 (62.0 to 74.0)	60.0 (47.8 to 72.0)	53.3 (43.7 to 62.8)
Countermovement jump (cm)	24.7 (23.0 to 26.4)	24.6 (21.8 to 27.5)	26.7 (23.9 to 29.3)
Line drill (s)	35.39 (34.64 to 36.18)	35.56 (34.41 to 36.84)	35.69 (34.53 to 36.82)
Yo-Yo IR1 (m)	433.5 (375.1 to 495.7)	506.6 (394.4 to 611.3)	462.3 (369.4 to 546.3)

[a]Seven players did not attain menarche at the date of observation, thus excluded from analysis in this model.

analysis provides direct probabilistic comparisons of the posterior and estimates CIs. Under 15 players had substantially higher training experience and were, on average, taller and heavier than the players in the under 13 group. No substantial differences were found for body mass index between age groups. The trend of variation between players (group level effects at level-2) for stature (standard deviation = 5.0, 95% CI 0.3 to 8.8) and body mass (standard deviation = 10.7, 95% CI 1.1 to 16.4) within the under 13 group was confirmed in the multilevel models. Performance was substantially better for the players in the under 15 group.

Characteristics of players by menarcheal status are summarized in Table 3. Note that sample sizes per group are small for the average and late maturers' groups. No substantial differences in chronological age and years of training experience in basketball between maturity stages were observed. Late maturing players were, on average substantially smaller, lighter and leaner that early maturing players. No substantial differences were found for body mass index between groups. No variation between maturity stages for the functional capacity indicators was observed.

Estimates of the relative contribution and uncertainty of chronological age, maturity stage, years of formal training, stature, body mass and adiposity to the three indicators of functional capacity are given in Table 4. The variance partition coefficients imply that independent variables explained 38% of between-players variation in the countermovement jump. Early and average maturity status and adiposity were negative predictors while late maturity status, years of experience and body mass had a positive contribution to countermovement jump performance. The independent variables explained 40% of the between-player

Table 4. Predictors of functional capacities in adolescent female basketball players.

	Partition variation coefficient	Predictors	Population-level standardized β coefficient
(95% credible intervals)			
Countermovement jump	0.38	Maturity (early)	−0.34 (−0.67 to 0.00)
		Maturity (average)	−0.51 (−1.09 to 0.04)
		Maturity (late)	0.40 (−0.14 to 0.94)
		Years of experience	0.51 (0.26 to 0.76)
		Body mass	0.49 (0.05 to 0.92)
		Adiposity	−0.54 (−0.95 to −0.15)
Line drill[a]	0.40	Age	0.28 (0.04 to 0.56)
		Years of experience	0.44 (0.18 to 0.66)
		Body mass	0.50 (0.17 to 0.83)
		Adiposity	−0.65 (−0.99 to −0.33)
Yo-Yo IR1	0.45	Age	0.48 (0.24 to 0.73)
		Stature	−0.34 (−0.78 to 0.07)
		Body mass	0.86 (0.26 to 1.56)
		Adiposity	−0.97 (−1.40 to −0.56)

[a]Signs are reversed since a lower time on the running tests indicates a better performance.

variation in the LD. Chronological age, training experience and body mass had a positive contribution to performance in the LD while adiposity had a negative contribution. As for the Yo-Yo IR1, the independent variables explained 45% of the between-player variation. Chronological age and body mass had a positive contribution to performance in the intermittent endurance performance while stature and adiposity had a negative contribution.

Discussion

The present study examined the relative contribution of age, maturity status, training experience and body size to adolescent female basketball player's variation. Available data about functional performance among young female athletes, particularly basketball players is limited, which is glaring in light of the increase of young female athletes involved in intensive training programmes and high level competitions.[18] Particularly, the effect of sexual dimorphism on changes in body size and functional performance during adolescence advise an awareness of individual differences of young girls engaged in basketball training programmes.

Variation in body size of the present sample of Brazilian adolescent female basketball players was considerable (Table 1, Figure 1), consistent with variability in size accounted to the different player roles within a basketball team.[34] Mean statures compared favourably with age-specific 75th percentiles, particularly higher than age-specific 95th percentiles for the under 13 age group, and mean body masses were comparable with age-specific 50th to 75th percentiles of US reference data.[35] The distribution of body mass index across the present sample is rather scattered between the age specific 5th percentile and above the 95th percentile of US reference data.[35] Similar to adolescent male basketball players, the trend of variation in stature and body mass was consistent with the importance of body size in basketball selection.[4,34]

The sample of female basketball players was, on average, advanced in maturity status expressed by mean age at menarche. The mean age at menarche was 11.20 years (Table 1), earlier than worldwide observations,[36] as well as on observations based on Brazilian data.[37] Seven of the 47 players observed had not attained menarche at the observation date. Caution is warranted interpreting this data as menarche may be influenced by environmental sources such as nutritional status, ethnicity, family size, socio-economic background among others,[38–40] as well as the secular trend of age at menarche declining.[41,42]

Selective criterion in sport has been noted to favour the selection of late maturing girls, particularly in individual sports where data are abundant, such as gymnastics, tennis, swimming, figure skating or athletics.[43–49] As for young female basketball players, available data remain limited, particularly in sample size and player's level of competition. The present data are inconsistent with a trend for later occurrence of menarche in athletes,[47] probably reflecting the relative stature advantage of the early maturing girls in the younger age group. The distribution of maturity status in the under 15 group becomes almost even between early maturers

($n = 8$) and average and late maturers ($n = 9$), with no substantial differences in years of training experience as well as in the age when they started formal practice. This likely suggests a transient overrepresentation of tall early maturing girls in younger age groups of youth female basketball. As relative fat mass increases with pubertal growth[18] and as late maturing girls catch up in stature they may be more likely to remain engaged in the training programmes.

Considering the full LD protocol performance, results of the present sample are comparable with longitudinal observations in young female Australian basketball players.[17] As for the jumping performance, and allowing for variation in procedures, the present results are comparable with the limited data available with young female basketball players.[50] Although the Yo-Yo IR1 appears to be recognised as a valid tool to assess specific intermittent endurance fitness in basketball,[51] data for young female players, particularly basketball players, is limited. The results in the present study were comparable with young athletes from other team sports[52,53] and higher than young adult females, although similar after accounting for training exposure.[54] Also, the results of the players with higher performances in the present study compare fairly well with available data with adult female athletes.[55]

Functional performance in young female athletes may be in part influenced by individual differences in timing of adolescent growth spurt.[18,56] We observed a substantial age-associated variation in body dimensions and functional performance. However, no substantial variation in functional capacities was observed when players were grouped by menarcheal status, even considering that there were no substantial differences in age across maturity status groups. This trend remained also after controlling for possible influences of body mass on performance with allometric scaling (data not presented). These results may be due to menarche being a late maturational event during puberty, thus major pubertal changes in growth and performance may have already been attained in the present sample. Overall, the older female basketball players in the present sample were taller, heavier, and had better functional performance. This trend is consistent with observations of performance development in young female tennis and swimmers.[57,58] Also, it has been noted that girls are expected to have age-related increases in maximal short-term outputs during pubertal years.[59,60]

The relative contributions of age, maturity status, training experience and body size to between players variation was based on multiple regression models, including variables after z-score transformation, within a Bayesian multilevel framework. The results emphasize the importance of body mass, a surrogate of muscle mass and adiposity on functional capacities. These results are consistent with observations based on longitudinal data with non-athlete girls noting the importance of body mass and adiposity to interpretation of variability in functional capacities during pubertal years.[60,61] The influence of stature was identified for intermittent endurance, implying that taller girls may not be sufficiently fit to maintain basketball-specific aerobic demands in competitive conditions.

On the other hand, the Bayesian multilevel models allow interpreting functional performance variation partitioning the influence of body size (Table 4). Thus after partitioning body size influence, the models highlight the importance of years of accumulated training experience in basketball to maximal short-term performance. Also, late maturity status had a substantial positive influence on jumping performance, in contrast to the negative trend of influence in the other maturity status categories. Given the importance of vertical jump performance in basketball, the contrasting exponents by maturity status (Table 4) add to the earlier interpretations to explain the trend of an increased number of late maturing girls in the under 15 group. As for intermittent endurance, the results indicate that performance increases with age, partitioning the influence of training experience and body size. Thus, it appears that adolescent female players will improve as age increases, and being exposed to basketball specific training. Overall, the results suggest that the interaction between age and accumulated years of training in basketball may have a decisive role to explain functional performance of young female basketball players, particularly maximal short-term performance. From a practical standpoint, it should be expected that female adolescent players with more training exposure may have better functional performances, independent of age and maturity status. However, coaches should consider whether accumulation of training loads are appropriated for both chronological and biological ages to interpret player's functional performance appropriately, and limit possible negative effects of basketball-specific training stimulus.

Caution is warranted when generalizing the interpretations of the present study, given the specificities of the context of female Brazilian basketball. Historically Brazilian female basketball has had world-class results and is ranked in the top 10 nations by the International Basketball Federation.[62] Unlike their male peers, female basketball players are scarcely studied and the present data show that girls do not follow exactly the same path as boys during the specialization years. Given the lack of data in young female athletes, particularly in basketball, this cross-sectional study needs to be replicated and adolescent basketball female basketball players should be followed longitudinally.

Youth basketball coaches' intervention and expertise include planning, organising and evaluating practice sessions, prescribe the training load and the recovery periods, prevent injuries or managing competitions. However, coaches should also be knowledgeable about following the athletes' evolution in response to training, growth and maturation, identifying and developing talent, preparing for higher competitive demands. Overall the present results add to the latter. Overlooking the interactions between age, growth and maturation with functional performance may have powerful pedagogical consequences, possibly preventing young players to fully achieve their potential in basketball.[11]

This study provides an exploratory (cross-sectional) analysis of the complex interpretation of performance in young female basketball players. It shows the need to account for chronological, biological and training experience, i.e. age in sport, and partition their influence on body size. Together with context of practice and coaching, these variables influence and mediate the physiological performance and its development. This poses analytical challenges that are not answered with traditional statistical approaches used in sports science. Bayesian multilevel modelling is a flexible and powerful approach to interpret young athlete's performance.

In summary, a substantial variation by age groups for maturity status, body size and functional capacities indicators was observed. Noteworthy, the young female players in the present sample were advanced in biological maturity status expressed by average age at menarche, contrasting with existing available observations among adolescent athletes, mainly based in individual sports. This trend of overrepresentation of early maturing players may contribute for the small maturity-associated variation in body size and functional capacity indicators, particularly since the early maturing players were mostly tall individuals, which per se likely confers an advantage in basketball. Partitioning the influence of body dimensions on functional performance highlights the contributions of basketball specific training exposure and age to the development of functional performance in female adolescent players. Thus, the interactions of growth-related variation with accumulated basketball training experience are relevant to understand female basketball player's performance.

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