PHYSICAL CHARACTERISTICS OF FEMALE BASKETBALL PLAYERS ACCORDING TO PLAYING POSITION

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Abstract. Physical characteristics play an important role in the selection of young basketball players and the progress in their playing performance. The aim of the study was to analyze differences in chosen physical characteristics of Slovak U17 female basketball players with respect to their playing positions. We assumed, that there will be statistically significant differences between playing positions in each performance tests results. Chosen characteristics were analyzed for 14 players (mean/SD, age 16.34 ± 0.82; body height 179.72 ± 8.04 cm; body weight 67.62 ± 7.10 kg; body fat 16.59 ± 2.04 %; VO_2max 46.20 ± 4.71 $ml.kg^{-1}.min^{-1}$) according to their playing positions (guard, forward, center). Five specific performance tests for each player were conducted as a 3/4 Basketball court sprint, 10 x 5m Shuttle test, Lane agility drill, No-step vertical jump and Maximum vertical jump. The differences in tests results by playing positions were evaluated by one-way ANOVA. There were no significant differences found in results of chosen performance tests between playing positions ($p>.05$). In spite of fact, that there were no significant differences, we found interesting results between playing positions in physical characteristics. Guards had better results in speed (3.73 ± 0.16 s), quickness (17.43 ± 0.56 s) and both lower-body power tests (47.16 ± 3.06 cm; 57.00 ± 3.40 cm) than forwards and centers. Forwards had the best results in agility test (12.54 ± 0.43 s). The results of this study produce useful information about physical characteristics of young basketball players according to their playing position and help to diagnose and improve their performance.

Key words: female, youth basketball, physical characteristics, playing position

Introduction

Basketball is a team sports game that can be represented as an ordered series of jobs that each player should do with respect to the position and role within a particular model of tactics (Trninić 2006). Motor abilities play an important role in the selection of young basketball players and the progress in their playing performance (Erčulj et al. 2003). Basketball players with better abilities as speed, strength, agility have a great advantage in full-court as well as half-court game situations (Foran and Pound 2007). A number of studies confirm that better physical abilities has profitable effect on better basketball skills (Hoffman et al. 1996; Taylor 2004; Erčulj et al. 2010). Each of the playing positions has its own characteristics and team role. Studies have shown significant differences among playing position for body size, speed, agility, vertical jump, maximum oxygen consumption (Hoffman et. al. 1996; Sallet 2005; Cormery et al. 2008; Bielik and Tománek 2009; Mačura et al. 2013). For example Abdelkrim et al. (2010) indicated that there may be a dependence of age and court position differences in fitness performance in men's basketball. Ostojic et al. (2006) showed that a strong relationship exists between body composition, aerobic fitness, anaerobic power, and position roles in elite basketball. Players may be in great shape to reach their full potential in the game. The physical characteristics of an athlete are important predictive factors of whether the athlete will reach the top level of their chosen sports discipline (Sallet et al. 2005). The aim of the study was to analyse differences in chosen physical characteristics of Slovak U17 female basketball players with respect to their playing positions. Because of differences in body weight and body height between players and different playing roles requirements in each playing positions we assumed, that there will be statistically significant differences between playing positions in each performance tests results.

Methods

Participants and Procedure

The participants were 14 members of Slovak U17 female basketball team. The participants were divided into three groups according to their playing position: center (n = 4), forward (n = 4) and guard (n = 6). The classification by playing position was made by the coaches. Table 1 shows a comparison of the three groups of players in terms of their age, body height, body weight, body fat and VO_2max. The subjects were examined during the first

two days of national team practice camp in final preparation phase of the team for the U17 Word Championship. It was therefore assumed that all subjects were in good basketball condition. The players were tested in the National Sports Center in Bratislava.

Table 1

Basic descriptive parameters of body composition and VO$_2$max of players

Position	Age [years] $\overline{x}\pm SD$ (min–max)	Body height [cm] $\overline{x}\pm SD$ (min–max)	Body weight [kg] $\overline{x}\pm SD$ (min–max)	BFP° [%] $\overline{x}\pm SD$ (min–max)	VO$_2$max [mml/L] $\overline{x}\pm SD$ (min–max)
Center (n =4)	15.64±1.98 (14.74-16.74)	186.73±3.20 (185.40-188.80)	73.05±9.25 (68.40-79.40)	17.85±3.84 (16.70-19.90)	44.68±8.90 (38.40-48.70)
Forward (n = 4)	16.92±0.30 (16.79-17.11)	183.50±3.43 (182.10-186.20)	70.82±8.87 (66.80-77.70)	16.27±2.44 (15.10-17.60)	45.42±6.77 (40.00-47.60)
Guard (n = 6)	16.42±0.69 (15.20-17.05)	172.55±7.25 (164.60-182.90)	61.86±5.77 (55.00-69.20)	15.96±2.41 (11.60-18.50)	47.73±5.71 (40.40-55.30)
All players (n= 14)	16.34±0.82 (14.63-17.11)	179.72±8.04 (164.60-188.80)	67.62±7.10 (55.00-79.40)	16.59±2.04 (11.60-19.90)	46.20±4.71 (38.40-55.30)

°BFP = Body Fat Percentage

Statistical analyses

All data were analyzed with SPSS for Windows, version 17.0 (SPSS Inc., Chicago, IL). Shapiro-Wilk test was used to test if data were normally distributed. The data were presented using standard descriptive statistic methods as mean, standard deviation, minimum and maximum. One-way univariate analysis of variance (ANOVA) was used to assess differences between basketball players in all the groups of players. The statistical significance was maintained at 5% level.

Tests

The study consisted of 5 specific performance tests (Foran and Pound 2007) - Table 2. Testing was preceded by a thorough warm-up including some jumps, acceleration and deceleration moves and starts.

- 3/4 Basketball court sprint (22.2 meters). The players were instructed to run fast as possible from starting line (baseline) through finish line (free throw line). Start from a stationary position behind the court baseline, with one foot up to the line (a two-point stance). The time needed to get from a starting point to finish line was measured with photocells. Two trials were allowed and the best time was recorded.

- 10 x 5m Shuttle test. The players were instructed to run fast as possible the marked distance between two lines (run to the opposite marked line, turn and return to the starting line). Start from a stationary position behind the starting line, with one foot up to the line (a two-point stance). Players both feet had to fully cross the lines. The time needed to run the whole distance was measured with hand held stopwatches. Two trials were allowed and the best time was recorded.

- Lane agility drill. The players were instructed to run the pattern marked with cones. The starting and finishing line was extended to the left corner free throw line. Players start from a stationary position behind the starting line, with one foot up to the line (a two-point stance) facing the baseline. The pattern consists of: sprint to the baseline past the cone, defensive-shuffle to the right corner of the lane and past the cone, backpedal to the free throw line past the cone, defensive-shuffle to the left and touch the change-of-direction line with left foot. Than change direction back to right, defensive-shuffle and run with the same motions back through the finish line. One foul was allowed without penalty and the player had the chance to start over. A foul includes knocking down or moving a cone, crossing the feet during defensive-shuffle, not touching the change-of-direction line, sprinting instead of defensive-shuffle or falling down. The time needed to run the whole pattern was measured with photocells. Two trials were allowed and the best time was recorded.

- No-step vertical jump. The standing reach and vertical jump of players were measured in shoes and with Vertec device. The players were instructed to jump (two legs) straight up as high as possible with a straight arm without taking a step and tap the Vertec device. Two attempts were allowed. If the second attempt was higher a third attempt was allowed. The no-step vertical jump result was the difference between the standing reach and the jump reach distance.

- Maximum vertical jump. The standing reach and vertical jump of players were measured in shoes and with Vertec device. The players were instructed to jump (two legs or one leg) straight up as high as possible, taking as many steps toward the Vertec as necessary to acquire a maximum vertical jump. Two attempts were allowed. If the second attempt was higher a third attempt was allowed. The maximum vertical jump result was the difference between the standing reach and the jump reach distance.

Table 2

Description of the performance tests

Test	Main Ability	Unit
3/4 Basketball court sprint	Speed	Time [s]
10 x 5m shuttle test	Quickness	Time [s]
Lane agility drill	Agility and quickness	Time [s]
No-step vertical jump	Lower-body power	Jump height [cm]
Maximum vertical jump	Lower-body power	Jump height [cm]

Results and Discussion

Shapiro-Wilk test showed that data was normally distributed. Players' characteristics and test performance results are reported in Table 1 and Table 3. The tallest (186.73±3.20 cm) and the heaviest (73.05±9.25 kg) players on average, as expected, were the centers. The guards had the lowest body fat percentage (15.96±2.41 %) and the best results in maximal oxygen uptake (47.73±5.71 ml.kg^{-1}.min^{-1}).

No statistically significant differences ($p > .05$) were found for running speed, quickness, agility and both lower-body power between any playing positions (Table 4). Guards had better results in speed (3.73±0.16 s), quickness (17.43±0.56 s) and both lower-body power tests (47.16±3.06 cm; 57.00±3.40 cm) than forwards and centers, on average. Comparison of our findings from our 3/4 Basketball court sprint test (mean 3.78 s) with findings (mean 3.40 s) from Drinkwater et al. (2008) showed close results. The best results in Lane agility drill test (12.54±0.43 s) had the forwards. The lowest average measured values of No-step vertical jump and Maximum vertical jump were surprisingly, found in centers (43.00±4.69 cm and 53.00±3.86 cm) and the highest by guards (47.16±3.06 cm and 57.00±3.40 cm). The highest maximal vertical jump performance was achieved by playing positions guard and forward, with values of 62.00 cm. Greene et al. (1998) found that the average vertical jump (using the same Vertec device as we) of female basketball players with age mean 16.02 year, was 46.36 cm. This result is compared to our Maximum vertical jump results (55.78 cm) lower (Table 3). Comparing the 3/4 Basketball court sprint and no-step vertical jump results with Erčulj et al. (2010) which tested sixty-five female basketball players from different European countries aged between 13 and 15 during international FIBA camps for the best European U15 basketball players, we can state that their results in 3/4 Basketball court sprint (3.6±0.21 s) and no-step vertical jump (26.34±5.15 cm) compared with our

findings (3.78±0.14 s) and (45.57±4.43 cm) were better in 3/4 Basketball court sprint performance test. We consider that the difference (19 cm) in no-step vertical jump is effecting due to age of tested players.

Table 3

Descriptive statistics of performance test results by playing positions

Test	3/4 S°	10x5 T°	Lane Drill°	NVJ°	MVJ°
Position	X̄±SD (min–max)	X̄±SD (min–max)	X̄±SD (min–max)	X̄±SD (min–max)	X̄±SD (min–max)
Centers (n =4)	3.89±0.04 (3.85-3.95)	17.95±0.37 (17.40-18.20)	13.65±0.36 (12.92-13.65)	43.00±4.69 (37.00-48.00)	53.00±3.86 (48.00-57.00)
Forwards (n = 4)	3.75±0.12 (3.88-3.75)	17.70±0.20 (17.30-17.70)	**12.54±0.43** (12.19-13.18)	45.75±5.79 (38.00-52.00)	56.50±7.14 (47.00-62.00)
Guards (n = 6)	**3.73±0.16** **(3.58-4.01)**	**17.43±0.56** **(16.70-18.20)**	12.73±0.40 (12.25-13.21)	**47.16±3.06** **(45.00-52.00)**	**57.00±3.40** **(53.00-62.00)**
All players (n= 14)	3.78±0.14 (3.58-4.01)	17.60±0.46 (16.70-18.20)	12.83±0.47 (12.19-13.65)	45.57±4.43 (37.00-52.00)	55.78±4.74 (47.00-62.00)

°3/4 S = 3/4 Basketball Court Sprint, 10x5 T = 10 x 5m Shuttle Test, Lane Drill = Lane agility drill, NVJ = No-step Vertical Jump, MVJ = Maximum Vertical Jump

Table 4

Differences between performance tests (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
3/4 Basketball court sprint	0.06	2	0.03	1.93	0.19
10 x 5m Shuttle Test	0.68	2	0.33	1.73	0.22
Lane agility drill	1.21	2	0.60	3.81	0.06
No-step vertical jump	41.85	2	20.92	1.82	0.48
Maximum vertical jump	36.61	2	18.30	0.85	0.22

Conclusions

Performance testing provides feedback about players actual shape, feedback for evaluating a training program and information for recovery assessment. Players physiological characteristics differ according to their position on court, and need specific training to developed the skill needed by each playing position. However, in our study were no significant differences found in results of chosen performance tests between playing positions. Findings of the study indicated that the results of physical performance tests of Slovak female U17 basketball players do not significantly differ between playing positions guard, forward and center. This fact could be used by coaches stuff to determine tactics to opponents. Small differences in physical characteristics between players gives more options using players in

several playing positions. On the other hand, with this kind of playing positions homogeneity, should be treated with caution in the future selection of players for basketball in general and also for national teams.

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