http://doi.org/10.22282/ojrs.2017.24

THE COMPARISON OF PHYSIOLOGICAL AND MOTORIC CHARACTERISTICS OF U16-U18 BASKETBALL PLAYERS ACCORDING TO THEIR PLAYING POSITIONS

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ABSTRACT

The purpose of this study was to compare of physiological and motoric characteristics of U16-U18 basketball players according to their playing positions. 48 healthy male basketball players who participated in basketball competitions some sports clubs in Denizli participated in this study. Players divided into 3 groups according to the playing positions. Vertical jump, 10-20m speed, agility, flexibility, standing long jump, Yo-Yo intermittent recovery test level-1 (Yo-YoIR1) and pulmonary function test were applied. The difference between the physiological and motoric characteristics of the basketball players according to their position was tested by one-way ANOVA and the difference between the groups was tested by Bonferroni post-hoc analysis. Statistically significant difference was found between Yo-YoIR1 and force vital capacity (FVC) according to playing positions ($p<0.05$). According to the Bonferroni Post-Hoc analysis to understand what the difference is between the groups; there was a significant difference in the Yo-YoIR1 values between the center players and both guard players and forward ($p<0.05$). Statistically significant difference was found between center players and guard players in FVC values($p<0.05$). 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: Basketball, Motoric characteristics, Playing position, Physical characteristics

Introduction

Basketball is an aerobic-based anaerobic sport which requires high intensity activities such as jumping, turns, dribbles, sprints, screens and low intensity activities such as walking, stopping and jogging (Delextrat and Cohen, 2009; Meckell et al., 2009; Metaxas et al., 2009). During a basketball game, professional players cover about 3500-5000m. Each player performs about 1000, mainly short, activities lasting around 2 seconds; time motion analysis has shown that these short activities are performed with a different frequency according to the player's position (Abdelkrim et al., 2007). Motor abilities play an important role in the selection of young basketball players and the progress in their playing performance (Erčulj et al. 2010). 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). Studies have shown significant differences among playing position for body size, speed, agility, vertical jump, maximum oxygen consumption (Sallet 2005; Mačura et al. 2013). A number of studies confirm that better physical abilities has profitable effect on better basketball skills. Each of the playing positions has its own characteristics and team role. The aim of this study was to compare of physiological and motoric characteristics of U16-U18 basketball players according to their playing positions.

Material and Method

A total of 48 healthy male basketball players between the ages of 15-17 who participated in basketball competitions in some sports clubs in Denizli participated in this study. Players divided into 3 groups [guard (1-2),forward (3-4), center (5)] according to the playing positions. The body height of the basketball players was measured using a stadiometer accurate to within 1 cm (SECA,Germany), while electronic scales (Tanita BC 418,Japan) accurate to within 0.1 kg were used to measure body mass. Vertical jump performance was measured using IPhone My Jump application. Players performed countermovement (CMJ) and squat jumps (SJ). Players were asked to jump as high as possible; the best score was recorded in centimeters. The subjects performed 2 maximal 20 m sprints on the basketball court. There was a recovery period of 3 minutes between the 20 m sprints. Times were measured using an electronic timing system (Prosport TMR ESC 2100). Flexibility measurements of the subjects were performed by sit-and-reach test on the flexibility stand. When the subjects rested their naked soles of feet on the test stand while sitting on the ground, they pushed forward ruler on the table extending forward without bending the knees and the stretching distance was recorded by standing 2 sec at the farthest point to extend. A line was drawn on the field where the standing long jump test was done and from standing position, the players were placed in a way that their toe ends touch the line and were asked to jump forward. The players stopped at the place where their feet first touched the ground and the distance between the line and the players' heels was measured and recorded in centimeters. The measurement was done twice and the best score was recorded. Agility measurements of the subjects were performed by T-test. At the tester's signal, subjects sprinted forward 9.14 m and touched the tip of the cone with their right hand. Then they performed a lateral shuffle to the left 4.57 m and touched the tip of the cone with the left hand. Subjects then changed direction and shuffled 9.14 m to the right to touch the tip of the cone with their right hand. They then shuffled 4.57 m to the left to touch point with their left hand. Finally, the subjects back-peddled 9.14 m, passing through the finish point. The Yo-Yo intermittent recovery test consists of repeated 2x20m runs back and forth between the starting, turning, and finishing line at a progressively increased speed controlled by audio beeps from a tape recorder. Between each running bout, the subjects had a 10 s active rest period, consisting of 2x5m of jogging. When the subjects twice had failed to reach the finishing line in time, the distance covered was recorded as the test result. Pulmonary function tests were carried by Cosmed BTL-08 spirometry. Forced vital capacity (FVC), maximal voluntary ventilation (MVV), forced expiratory volume in 1st second (FEV1), FEV1/FVC ratio were measured. At least three acceptable maneuvers were required for each subject, and the best of the three values was recorded. The data are reported as means and standard deviations. The difference between the physiological and motoric characteristics of the basketball players according to their position was tested by one-way ANOVA and the difference between the groups was tested by Bonferroni post-hoc analysis. The statistical significance was set at $p<0.05$.

Findings

Table 1. Physical characteristics according the their playing position of Basketball players'

Position	Age (year)	Height (cm)	Body Weight (kg)
Guard	15.81±0.75	175.63±7.60	64.34±11.94
Forward	16.25±0.68	180.38±7.32	74.79±13.41
Center	15.88±0.88	187.31±5.41	82.59±11.41

Table 2. Differences between performance tests (ANOVA) results by playing positions

	Position	x̄±SD	F	p	Difference
Yo-YoIR1	**Guard**	1155.00±382.24	5.30	0.01*	Center-Guard Center-Forward
	Forward	1200.00±445.42			
	Center	797.50±309.31			
Standing Long Jump	**Guard**	173.31±24.86	0.41	0.67	
	Forward	176.63±49.84			
	Center	162.94±54.09			
CMJ	**Guard**	40.56±6.34	2.46	0.10	
	Forward	45.54±8.57			
	Center	40.53±6.97			
SJ	**Guard**	41.02±8.17	0.20	0.82	
	Forward	41.50±5.90			
	Center	39.84±8.31			
Flexibility	**Guard**	23.84±6.92	0.75	0.48	
	Forward	24.31±4.76			
	Center	21.81±6.52			
10m	**Guard**	1.90±0.14	0.39	0.68	
	Forward	1.94±0.13			
	Center	1.90±0.10			
20m	**Guard**	3.36±0.26	0.91	0.41	
	Forward	3.43±0.30			
	Center	3.32±0.14			
Agility	**Guard**	10.96±0.84	0.10	0.91	
	Forward	11.04±0.65			
	Center	11.06±0.60			
FVC	**Guard**	4.43±1.26	3.67	0.03*	Center-Guard
	Forward	5.23±1.22			
	Center	5.58±1.21			
FEV1	**Guard**	3.96±1.01	3.13	0.05	
	Forward	4.31±1.24			
	Center	4.97±1.23			
FEV/FVC	**Guard**	90.17±13.53	1.53	0.23	
	Forward	82.77±15.05			
	Center	88.43±7.75			
MVV	**Guard**	126.14±31.01	0.02	0.98	
	Forward	128.31±44.46			
	Center	126.60±28.69			

*p<0,05

According to the result of Anova analysis, only statistically significant difference was found between Yo-YoIR1 and force vital capacity (FVC) according to playing positions

($p<0.05$). According to the Bonferroni Post-Hoc analysis to understand what the difference is between the groups; there was a significant difference in the Yo-YoIR1 values between the center players and both guard players and forward ($p<0.05$). Statistically significant difference was found between center players and guard players in FVC values ($p<0.05$).

Discussion and Result

Players physiological characteristics differ according to their position on court, and need specific training to developed the skill needed by each playing position. Specifically in basketball, results showed that center were taller, heavier and presented a higher percentage of body fat than forwards and point guard (Abdelkrim et al., 2007). In our study, the tallest (187.31±5.41 cm) and the heaviest (82.59±11.41kg) players on average, as expected, were the center. Forward and guard body weights are less than centers, which initiates and sustains fast attack. It can be said that they will give them the advantage of balanced and quick movement in different parts of the game. In their study of Sallet et al. (2005), according to the positions played by professional basketball players, centers are longer than other players and body weights are higher, and forwards are longer than guards. This study supports our work.

Forward players are statistically more flexible when compared to guard and center players. Bavlı (2008) in his study, according to the results of the counter movement jump test of the guard 33.4 ± 5.1, forward 31.8 ± 5.2 and center 31.3 ± 5.4 were reported, respectively. Greene et al. (1998) found that the average vertical jump of female basketball players with age mean 16.02 year, was 46.36 cm. In our study, forwards counter movement jump values (45.54 ± 8.57) were found to be higher than other positions. In a study conducted by Kızılet et al. (2010), in squat jump performance were reported as 22.83 ± 3.56. In our study, the values of the forwards (41.50 ± 5.90) were higher than the others. Studies in the literature on whether basketball players playing in different positions have different biomotor features focus on elite basketball players. These studies indicate that forward and guard players have better vertical jump performance than center players. According to the basketball players, there was no difference between 10 m speed performance and 20 m speed performance. This may be due to the fact that the players are in the age of development; they have different motoric characteristics, and the training contents they have done.

The guards showed the greatest results in pulmonary function tests. In modern basketball, they apply more running and aerobic activities that need to be on high aerobic levels. Players in guard positions must have high aerobic characteristics due to their higher and constant mobility, agility and speed both in the defense and in attack phase (McKeag, 2003). Atan et al. (2013), it is stated that swimmers have the best FVC values (4.11 ± 0.53) compared to other branches in their studies comparing respiratory functions of athletes dealing with different branches in the category of youth. Erdil et al. (1984) reported that FVC (forced vital capacity) respiratory parameters of elite table tennis players (4,17±1,42) were different in sedentary individuals. In our study, forced vital capacity values were found in guards (4.43 ± 1.26), forward players (5.23 ± 1.22) and center players (5.58 ± 1.21). A statistically significant difference was found between Yo-YoIR1 and force vital capacity (FVC) according to playing positions. The difference between the Yo-Yo intermittent recovery test (Yo-YoIR1) and the force vital capacity parameter in our study of basketball players is due to the anthropometric characteristics of the center players, such as oversized and the the body weight is too high. The reason for having similar values may be due to the fact that the age values of the subject group are younger for comparing positions.

Performance testing provides feedback about players actual shape, feedback for evaluating a training program and information for recovery assessment. Small differences in physical characteristics between players gives more options using players in several playing positions. The results of this study; basketball players will be directed to the positions according to their motoric performances and coaches will be able to use the training to complete the missing aspects of the players playing in these positions.

References

Abdelkrim, N., Fazaa, S., Ati, J. (2007). Time motion analysis and physiological data of elite under-19-year-old basketball players during competition. *British Journal of Sports Medicine*, 41: 69-75.

Atan, T., Akyol, P., Çebi, M. (2013). Comparison of respiratory functions of athletes engaged in different individual sports branches. Dicle Medical Journal, 40(2):192-8.

Bavlı, Ö.(2008). Adölesan Dönem Basketbolcularda Mevkilere Göre Yapısal ve Motorik Özelliklerin Karşılaştırılması. Niğde Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi, 2(3);174-181.

Delextrat, A., Cohen, D. (2009). Strength, power, speed, and agility of women basketball players according to playing position. *Journal of Strength and Conditioning Research,* 23(7): 1974-1981.

Erculj, F., Blas, M. and Bracic, M. (2010). Physical demands on young elite European female basketball players with special reference to speed, agility, explosive strength, and take-off power. *J Strength Cond Res*,24(11): 2970-2978.

Erdil, G., Durusoy, F., İşleğen, Ç., Yolaz, G. (1984). Elit masa tenisçilerinin fiyolojik kapasite ölçümleri. Spor Hekimliği Dergisi, 19: 15-22.

Greene, JJ. et al., (1998). Anthropometric and performance measures for high school basketball players. Journal of Athletic Training, 33(3), 229-232.

Kızılet, A., Atılan, O., Erdemir, İ. (2010). 12-14 Yaş grubu basketbol oyuncularının çabukluk ve sıçrama yetilerine farklı kuvvet antrenmanlarının etkisi. ATABESBD, 12(2), 44-57.

Macura, P. et al., (2013). Zápasové vnútorné zaťaženie basketbalistov podľa hráčskych funkcií. [Game inside load of different player´s posts in male basketball]. In: Zborník vedeckých prác Katedry športových hier FTVŠ UK č. 21. Bratislava: 4-17. ISBN 978-80-89257-62-1.

McKeag, D. (2003). Basketball - Olympic handbook of sports medicine. Oxford: Blackwell Publishing.

Meckell, Y., Casorla, T., Eliakim, A. (2009). The influence of basketball dribbling on repeated sprints. *International Journal of Coaching Science,* 3(2): 43-56.

Metaxas, T., Koutlianos, N., Sendelides, T., Mandroukas, A. (2009). Preseason physiological profile of soccer and basketball players in different divisions. *Journal of Strength and Conditioning Research,* 23(6): 1704-1713.

Sallet, P. et al., (2005). Physiological differences in professional basketball players as a function of playing position and level of play. The Journal of Sports Medicine and Physical Fitness, 45(3): 291-294.