

MOTOR FITNESS, AEROBIC AND ANAEROBIC POWER AND PHYSIQUE IN ELITE BLACK AND WHITE ATHLETES

by

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Over the years, numerous studies of physique have compared blacks of West African origin with white Americans and consistently reached the same conclusions. Blacks have less body fat, narrower hips, thicker thighs, longer legs and lighter calves. From a biomechanical perspective such antropometric variables allow for more efficient running and jumping. Considering motor abilities basketball is a sport discipline in which speed and explosive strength are of greatest importance. Similarly to track and field, the best league in the world (the NBA) is dominated by black athletes. The main objective of this paper was to compare the level of general motor abilities and special sport skills, selected antropometric variables and indicators of aerobic and anaerobic power of elite white and black basketball players of the Polish Basketball League. The research was conducted on 23 basketball players of the Polish first division of which 11 were white European athletes and 12 American black athletes. All players were measured and tested during the competitive period. Several antropometric measurements were taken, explosive and maximal strength of the upper and lower limb, speed and agility were evaluated through field tests. Two basketball tests were applied to diagnose sport skills. Also the values of maximal anaerobic power and maximal oxygen uptake were registered.

Key words: motor fitness, aerobic and anaerobic power, competitive sport

Introduction

Racial variation in sports performance has been extensively studied in the last 20-30 years (Bar-Or et al. 1980, Ama et al. 1990, Burfoot 1992, Malina and Bouchard 1991). Research in this area is justified because of the dominance of certain races in particular sport disciplines. The dominance of the Negroid Race in track events, basketball, football and boxing is astonishing. It is no

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coincidence that black athletes of African origin have won from 60 to 90% of all medals in running events at the last few Olympic Games and track and field World Championships. Similarly to track and field, the world's best basketball league, the NBA is dominated by black athletes (over 80% of all NBA players are black). Several authors indicate that the superiority of black athletes in sports requiring sprinting and jumping falls into two domains: structural (anatomical) and functional (Carter 1984, Himes 1988, Samson and Yerles 1988, Skinner et al. 1986, Fields et al. 1995, Bar-Or et al. 1980). The first refers to body size and proportions, shape and muscle area (this also structural not functional), the second refers to enzymatic activity, energy delivery and metabolic functions. Many studies have compared blacks of West African origin with white American and consistently reached the same conclusions (Ama et al. 1986, Hunter 1988, Ama and Simoneau 1990). Blacks have less body fat, narrower hips, greater thigh circumference, longer legs and smaller calve circumference. From a biomechanical perspective such antropometric characteristics allow for more efficient running and jumping. A number of studies contrasted performance characteristics and demonstrated distinct black superiority in simple physical tasks such as running and jumping among children as well as college students and athletes (Malina 1988). Controversial data has been obtained in relation to physiological variables such as anaerobic and aerobic power (Hunter 1988). A few research projects have indicated significant racial differences in motor tasks requiring speed and explosive strength while minor insignificant differences in laboratory tests measuring anaerobic power (Samson and Yerles 1991).

The main objective of this paper was to compare antropometric dimensions and performance characteristics of elite white and black basketball players competing in the first division of the Polish Basketball League.

Methods

The sample of 23 basketball players competing in the Polish first division comprised 11 white players of European ancestry and 12 black players of American origin. All players were measured and tested during the competitive period with over 20 variables registered. Several antropometric measurements

were taken, explosive and maximal strength of the upper and lower limb, speed and agility were evaluated through field tests. Two basketball tests were applied to determine the level of specific skills. Also the values of maximal anaerobic power and maximal oxygen uptake were registered. All antropometric measurements were obtained by the same investigator using the antropometer for all length measurements and electronic scale for body weight and the electric impedance method for evaluation of body fat content (BIA-101/SC device).

All together eight antropometric variables were measured:

1. Body mass [kg]
2. Body height [cm]
3. Arm span [cm]
4. Leg length [cm]
5. Foot length [cm]
6. Hand length [cm]
7. Torso length [cm]
8. Body fat content [%].

Also eight field tests were applied to evaluate basic motor abilities. These tests included:

1. Vertical jump - explosive strength of lower limbs using "vertec" [cm]
2. Bench press - maximal strength of upper limbs using olympic barbell [kg]
3. Clean and jerk - maximal strength of whole body using olympic barbell [kg]
4. Overhead throw - explosive strength of upper body using 2 kg medicine ball [m]
5. Chest throw - explosive strength of upper limbs using 2 kg medicine ball [m]
6. 5 m sprint - starting speed using phototiming [s]
7. 20 m sprint - absolute speed using phototiming [s]
8. 4x10 m shuttle run - agility using phototiming [s].

Two tests were used to evaluate the level of specific basketball skills. The first, a shooting test included 5 spots placed 3 m away from the basket and 5 spots placed 6.25 m away from the basket. Each player attempted to make as many shots as possible during a 2-min time period alternatively from the position. The midrange shots were scored 2 points while the long range shots 3 points according to basketball rules. The result is presented in a total amount of

points. The other test was a dribbling and lay-up drill in which the player attempted 10 full court lay-ups at maximum speed. The result is presented in seconds.

The anaerobic power was evaluated through the 30-s Wingate test using the MONARK 829 ergocycle with the resistance set at 75 g per kg of body weight. Relative peak power was registered [W/kg]. Aerobic capacity of the athletes was measured with the use of the direct gasometric method (BECKMAN metabolic cart). VO_{2max} was measured on the stationary ergocycle with the starting load set at 50W and increased by that amount every 3 min. until exhaustion. VO_{2max} was expressed in ml/min./kg.

Basic descriptive statistic was applied with the t-Student test to determine the significance between the considered variables in both groups of basketball players.

Results

Somatic and performance characteristics (means and standard deviations) of both groups are presented in Table 1. With the exception of arm span, which is greater in blacks than in whites, the groups do not differ in anthropometric dimensions. Blacks outperform whites in vertical jump, medicine ball throw overhead, shuttle run, 20 m sprint, relative anaerobic power and dribble lay-up test. Whites have better results for relative aerobic power.

Discussion

This research has confirmed that significant variation exists in physique, motor abilities and physiological characteristics of black and white males. These differences seem to be more pronounced in case of elite athletes. In relation to physique, the results of this study are consistent with those of Carter (1984), Himes (1988), Malina (1988) and Samson and Yerles (1988). Shorter torsos, longer legs and feet may create favourable biomechanical conditions for more efficient running and jumping, the dominant motor abilities of basketball. Greater arm span and hand length of black athletes includes other anthropometric variables of the upper limbs which may be beneficial in the game

Table 1. The differences between black and white athletes in relation to diagnosed variables

Variables	Black		White		Difference		t	p
	Mean	SD	Mean	SD	Absolute	%		
1. Age [years]	27,010	3,682	25,182	4,094	1,818	6,733	1,066	0,300
2. Game experience [years]	11,600	3,502	10,364	4,273	1,236	10,655	0,721	0,480
3. Body weight [kg]	97,800	9,693	95,182	10,400	2,618	2,677	0,595	0,559
4. Body height [cm]	196,800	7,052	194,545	6,699	2,255	1,146	0,751	0,462
5. Leg length [cm]	102,911	8,121	101,231	9,223	1,680	1,632	0,444	0,851
6. Foot length	31,218	5,965	30,265	4,121	0,953	3,053	0,422	0,812
7. Hand length [cm]	22,901	3,987	21,535	3,676	1,366	5,965	0,814	0,432
8. Torso length [cm]	55,291	7,536	56,398	8,761	-1,107	-2,002	-0,311	0,599
9. Arm span [cm]	205,700	11,126	195,455	8,190	10,245	4,981	2,419	0,026
10. Body fat content [%]	14,700	2,688	15,418	2,649	-0,718	-4,884	-0,616	0,545
11. Vertical jump [cm]	90,800	8,715	76,364	9,469	14,436	15,899	3,623	0,002
12. Bench press [kg]	104,750	11,084	101,136	14,377	3,614	3,450	0,640	0,530
13. Clean and jerk [kg]	99,500	10,124	97,500	14,098	2,000	2,010	0,370	0,716
14. Medicine ball overhead throw [m]	23,280	4,274	18,845	2,331	4,435	19,051	2,991	0,008
15. Medicine ball chest throw [m]	17,240	1,749	15,845	1,407	1,395	8,092	2,022	0,058
16. Shuttle run 4x10m [s]	8,791	0,136	8,948	0,167	-0,157	-1,786	-2,348	0,030
17. Dribble and lay-up 10x28 m test [s]	57,660	1,345	59,627	1,622	-1,967	-3,411	-3,007	0,007
18. 5 m sprint [s]	0,926	0,074	0,980	0,075	-0,054	-5,832	-1,667	0,112
19. 20 m sprint [s]	2,903	0,078	2,986	0,082	-0,083	-2,859	-2,376	0,028
20. Shooting test [pts]	59,300	8,895	61,818	5,056	-2,518	-4,246	-0,808	0,429
21. Relative anaerobic power [W/kg]	11,790	0,569	11,073	0,615	0,717	6,081	2,766	0,012
22. Maximal oxygen uptake [ml/min./kg]	50,840	3,661	57,118	8,918	-6,278	-12,349	-2,069	0,051

Bold text underlines statistically significant differences

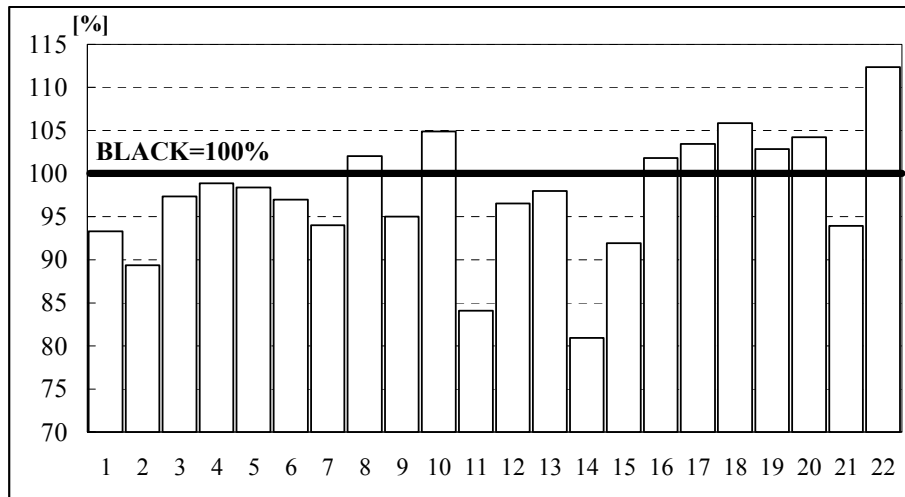


Fig. 1. The differences between black (100%) and white athletes (white columns) in measured variables (numbers of variables refers to table 1)

of basketball. Greatest differences between black and white players in motor performance occur in tasks requiring speed and explosive strength. Most authors agree that the differences in running speed and vertical jumping are highly related to antropometric and skeletal muscle characteristic (Skinner et al. 1986, Carter 1984,). Ama et al. (1986) has reported a significantly greater proportions of fast twitch muscle fibres in sedentary blacks and black athletes of West African origin performing in speed-strength sport disciplines in comparison to white athletes.

White basketball players compensate the lack of explosive strength and speed by developing aerobic capacity to higher extent as well as specific skills, such as shooting.

It may be concluded that black athletes have favourable antropometric and physiological predispositions which allows them to dominate in sport disciplines such as basketball.

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