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COMPARATIVE STUDY ON ANTHROPOMETRIC AND MOTOR DIFFERENCES IN U15 BASKETBALL PLAYERS

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Abstract. Basketball is a predominantly aerobic sport during which high-intensity anaerobic actions are performed. In recent years, this characteristic has evolved in terms of demands on the athlete and intensity of the competition, implying an increase in the number and duration of explosive actions. To meet the demands of this sport, good technical, tactical, physical and mental training is required.
The research purpose was to determine the anthropometric and motor differences between two male basketball teams from a private club, both playing in the U15 age category.
The study included 32 athletes who were divided into two groups. One group was made up of 16 players representing the club's elite team, and the other group also consisted of 16 players representing the club's secondary team for this age category. All players were tested in the same sports hall on two different days, during their training for the U15 National Basketball Championship of Romania. Anthropometric and physical characteristics were measured using a test battery with six variables: Height, Weight, Body mass index, 10 m Sprint, Standing long jump, Vertical jump, and Little Marathon. The methods used were: literature review, observation, mathematical statistics, tabular and graphical methods. Differences in anthropometric and physical values between the basketball players of the two teams were determined using the t-Test for independent small samples (Assuming Equal Variances). Our research hypothesis is confirmed, since there are significant anthropometric and motor differences between the players of the two representative club teams, justifying the presence of the elite team in the U15 National Basketball Championship.

Keywords: anthropometric characteristics, physical characteristics, young male basketball players.

Introduction

Team sports are constantly developing, and physical abilities account for a fairly important percentage in increasing performance during game play. The assessment of physical abilities is the most representative method to find out whether the athlete's physical fitness is appropriate. Basketball is an intermittent team sport that requires a wide range of physical qualities among which the ability to perform high-intensity sprints, jumps and runs (Delextrat et al., 2015). As in the other team sports, the improvement of player's performance should be properly addressed, including from a physical, technical, tactical and psychological point of view. Thus, the player's physical fitness will be influenced by the type of training to be performed and should be enhanced according to the specifics of the training programme.

Basketball is a predominantly aerobic sport (Korkmaz & Karahan, 2012) during which high-intensity anaerobic actions are performed (Meckel et al., 2009). In recent years, this characteristic has evolved in terms of demands on the athlete and intensity of the competition, implying an increase in the number and duration of explosive actions (Padulo et al., 2016). This evolution means that the athlete's physical fitness also develops and, to meet the demands of this sport, good technical, tactical, physical and mental training is required.

Aerobic capacity is essential for players to cope throughout the match, and their anaerobic performance is the most important descriptor of the final result (Ibáñez et al., 2008). Anaerobic capacity allows for energy production through a glycolysis and phosphagen combination, while anaerobic power reflects the ability to use the phosphagen system, which is understood as the relationship between strength and speed during a maximal intensity action performed over a short period of time (Alemdaroğlu, 2012).

In terms of age differences, the pubertal period and related physiological processes have been confirmed to be limiting factors in the development of physical abilities and implicitly the athletic performance of young basketball players (Ramos et al., 2019).

Basketball is characterised by rapid changes of direction that involve complex movements and require a large number of accelerations and decelerations during a game (Ransone, 2016). Consequently, strength, speed and agility are often highly correlated with the athletic performance of basketball players (Ostojic et al., 2006). We believe that an increased level of these motor skills is also a key factor in minimising the risk of injury.

Testing team sports players is an essential component in assessing training programmes and determining player progress during the season. According to the literature (Rodriguez-Alonso et al., 2003), the physiological demands imposed by the game of basketball in the last 20 years have indicated a major dependence on anaerobic metabolism. Indeed, a large number of jumps and sprints are performed during a game, which demonstrates the importance of anaerobic power, and the rather high average blood lactate values recorded in competitions show a significant involvement of the glycolytic energy system, also called anaerobic capacity. Therefore, coaches and scientists have developed various tests to assess both motor skills (strength, speed, endurance) and "the effectiveness of the physical conditioning undertaken by their players" (Delextrat & Cohen, 2008, p. 1066).

Updates to basketball rules following their modification includes shortening the attack time from 30 to 24 seconds, shortening the time allowed to cross the median line from 10 to 8 seconds and subdividing the duration of play into four quarters of 10 minutes each instead of two 20-minute halves, which supports the idea that the new rules change the tactical and physical demands of basketball, leading to an increase in game intensity (Abdelkrim et al., 2007).

Motor skills play an important role in the selection of young basketball players and the performance progress during the game. This is especially true for those skills that are mainly innate and difficult to develop up to a higher level only through training so as to meet the requirements of modern basketball. Explosive strength/power, speed and agility are motor skills that directly contribute to efficient movement with or without the ball, thus playing a major role in basketball technique and tactics (Erčulj et al., 2003). Consequently, the level of these motor skills is most often identified through various tests performed with or without the ball. According to the literature (Dežman et al., 2005), physical tests are considered the most accessible and applicable to the game of basketball, because they are used in the same conditions as those encountered in training and competition.

In the current basketball game, the level of competition is supposed to be higher, which implicitly requires a higher level of motor skills, more rigorous criteria for player selection and a better quality of training. In this regard, we can say that the number of workouts and the importance of integrating physical training have considerably increased in recent years. In addition to motor skills, basketball performance is influenced by many other factors. Among them, height plays an essential role, having a negative impact on the level of certain motor skills, which are less developed than in shorter players (Karpowicz, 2006).

To achieve high performance in the game of basketball, players should be able to cover various distances using continuous accelerations and decelerations, sudden stops and changes of direction while performing game-specific actions (such as dribbling, jumping, throwing) as correctly as possible (Hoffman & Maresh, 2000). In addition, players should be able to repeat these actions during the match, and the rest time between game actions should be used as efficiently as possible.

The ability to perform repeated bouts of short and high-intensity actions during a match has become more and more important in recent years, because the level of amateur and professional basketball players has developed, thus increasing the demands of competitive basketball. Moreover, it has been demonstrated that the number and duration of “action bouts” increase and decrease with the technical and physical level of players; thus, U19 basketball players perform 55 ± 11 “action bouts” during a match, with an average duration of 2.1 seconds (Abdelkrim et al., 2007), while for professional players, the average number of “action bouts” is 105 ± 52, with an average duration of 1.7 seconds (McInnes et al., 1995).

Numerous scientific studies have investigated the anthropometric characteristics and body composition of athletes, with many researchers reaching the conclusion that specific morpho-functional adaptations occur in the human body following a long process of systematic training based on different types of exercise (Masanovic, 2018). Top-level athletes are expected to show more favourable characteristics in the game of basketball than those who play at a lower level (Hulka & Weisser, 2017). All competitive sports played at a professional level require the body to function at its maximum physiological potential (Leonardi et al., 2018). An accurate assessment of body composition is important in sport, because errors can lead to mistakes in planning workouts and developing dietary programmes, which will affect sports performance (Popovic et al., 2013).

Position-specific tasks and body size characteristics are well established in basketball, indicating that centres are the tallest and heaviest in a team, while playmakers are the shortest and most agile team players (Boone & Bourgois, 2013). Physical differences between playing positions have been analysed for professional basketball by Vaquera et al. (2015). The above studies support the idea that forwards possess advanced qualities of speed and well-developed aerobic capacity. However, the results of studies comparing agility performance between playing positions are unclear. In some cases, better agility and speed performance was reported in forwards than point guards and shooting guards (Köklü et al., 2011). On the other hand, Scanlan et al. (2014) reported opposite results, with frontcourt players (forwards and centres) showing higher agility performance than backcourt players (guards).

This brief review of the literature reveals the existence of a limited number of research studies that present differences between playing positions in basketball due to athletes’ body dimension, physical fitness and skills, so their results are inconsistent.

The five playing positions in a basketball team can be classified in various ways. Thus, the most detailed system described in the literature classifies athletes according to their anthropometric and motor profiles as well as their playing positions. Other specialised studies about team sports indicate that a particular type of body profile is needed for each playing position (Ramos-Campo et al. 2014). Basketball players are assigned the following five positions on the court (each one with specific tasks during the game): point guard, shooting guard, small forward, power forward, and centre.

The point guard (also called playmaker) (position 1) has the role of coordinating the team through different schemes. In motor terms, players are characterised by agility, and from an anthropometric point of view, they are not very tall but have a good technical strategy.

The shooting guard (position 2) has a good throwing technique, being the player who scores most points during a match.

The small forward (position 3) and power forward (position 4) are characterised by versatility and the ability to do almost everything on the court, for example, regaining possession and shooting. From an anthropometric and physical point of view, players are tall, fast and show good endurance ability during the game.

The centre (position 5) plays a crucial role in a basketball team, having the major responsibility to regain possession of the ball and prevent the opponents from scoring. Players are the tallest and strongest in the team.

The *purpose* of this research is to determine the anthropometric and motor differences between two male basketball teams from the same club, Laguna Sharks Bucharest, both playing in the U15 age category.

The research *hypothesis* is that team A will outperform Team B in physical testing and anthropometric measurements, and these differences will justify Team A's presence in the U15 National Championship and Team B's presence in the U15 Municipal Championship.

Methodology

Participants

The research sample included 32 male basketball players aged 15 years (U15 category) from the Laguna Sharks Basketball Club of Bucharest, who were divided into two groups. One group was made up of 16 players representing the club's elite team (A) registered in the U15 National Basketball Championship of Romania, and the other group also consisted of 16 players representing the club's secondary or semi-elite team (B) registered in the U15 Municipal Basketball Championship, where players compete against the other clubs from the Bucharest Municipality. Players in the first team (A) had 6-7 years of experience, while those in the second team (B) had 3-5 years of experience. It should be noted that the semi-elite team (B) started playing basketball 1 year before or even during the COVID-19 pandemic, which considerably influenced their training, in the sense their lessons were conducted online for a long time before returning to the basketball court, while the elite team (A) already had a more solid theoretical and practical background acquired prior to the pandemic, so when returning to the sports hall, they had consistent knowledge about the game of basketball.

Testing procedures

Anthropometric measurements and physical tests took place in the same sports hall on two different days. Similar testing equipment and methods were used, and the testing procedures were conducted during the competitive season, when players had reached their peak form.

Anthropometric measurements

The players' somatic and motor profiles were determined by anthropometric measurements (height, weight, arm span), and then their body mass index (BMI) was calculated.

Physical tests

Vertical jump – was used to test the explosive power of the lower limbs. The player was measured in the standing position with the arm outstretched. Then, the athlete performed a vertical leap with the legs outstretched, and the reach height was recorded. The difference between the two measurements represented the player's score. The best time of two attempts was taken into account.

Speed – was measured with the help of Microgate, a portable wireless timing system used to record the values in sprint tests (10 m). Players took a standing start and were timed individually. The time needed to complete the test was measured in seconds and hundredths of a second using a photoelectric cell device. The best time of two attempts was recorded.

Little Marathon – involved running at maximum speed over the distance of 98 m with a standing start. Test description: Players were placed at the end line of the basketball court and, at the signal, started running between the transverse lines of the court. The timer started when the athlete's rear leg was lifted off the ground and stopped when their chest crossed the finishing line. The time was recorded in seconds and tenths of a second.

The test battery also consisted of coordination and explosive power measurements, for example, the Standing long jump test, which was performed with feet apart and tiptoes placed behind the starting line. The instruction for players was to jump as far as possible. The measurement was made with an accuracy of 0.1 cm, using a measuring tape stretched from the starting line to the heel of the rear foot. Two attempts were given, and the jumps where players lost their balance on landing and did not maintain a stationary position were not taken into account, so they had to be repeated.

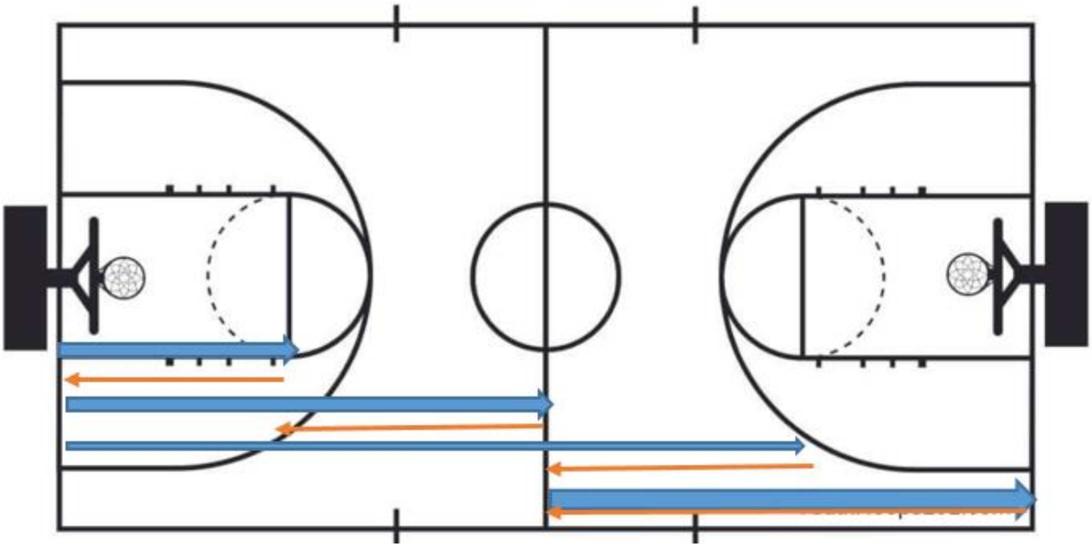

Figura 1. Scheme of the small marathon running event

Results and discussions

The data obtained from our study are of great importance, because they indicate that the research hypothesis is confirmed, which is demonstrated by the fact that the results of basketball players in the club's elite team (A) are significantly better than those obtained by the club's secondary team (B). We considered it necessary to determine whether there were differences in the degree of homogeneity of each group, as the age of 14-15 years is critical for young players, who are in full development. This age is characterised by a rapid increase in muscle mass, a disproportionate bone development and a temporary lack of harmony in movement coordination, all of which are particularly important in the game of basketball.

Monitoring the levels of physical development, motor preparedness and technical/tactical skills of the young basketball players allows for the successful management of the training process and the faster achievement of the sports mastery level (Borukova 2019).

Descriptive statistics

Table 1. Physical test results and somatic characteristics – A comparison between team A and team B Laguna Sharks

Variables	Average A	Std dev A	P-value A	Average B	Std dev B	P-value B
10 m	1.83	0.07	0.93	2.04	0.08	0.14
Height	1.75	0.07	0.90	1.74	0.06	0.37
Weight	61.24	6.31	0.56	63.34	6.33	0.59
Vertical jump	53.56	4.22	0.35	42.38	8.13	0.86
BMI	19.83	1.48	0.90	20.64	1.84	0.47
Small marathon	24.85	1.15	0.12	25.33	1.63	0.34
Standing long jump	2.18	0.20	0.42	2.05	0.23	0.80
Arm span	1.82	0.06	0.88	1.76	0.02	0.68

The Shapiro-Wilk test highlights the following aspects:

- in the 10 m Sprint test, the average score of team B athletes is 2.04, which is higher than the average score obtained by team A athletes, 1.83;

- the difference in height between team A and team B athletes is very small, with team A having an average of 1.75 and team B, 1.74;
- the average weight for team A athletes is 61.24 kg, while for team B athletes, it is 63.34 kg, which indicates that the club's semi-elite team weighs more;
- the average BMI is 19.83 for team A athletes and 20.64 for team B athletes, meaning that those in team B are slightly heavier, so their adipose tissue/muscle mass ratio is positive;
- in the Vertical jump test, the average score of team A athletes is 53.56, therefore it is much higher than that of team B athletes, 42.38;
- in the Little Marathon test, the average score of team A athletes is 24.85, which is much better than the average score achieved by team B athletes, 25.33;
- in the Standing long jump test, the average score of team A athletes is 2.18, therefore it is much higher than that of team B athletes, 2.05;
- the average arm span is 1.82 for team A athletes and 1.76 for team B athletes, and this difference is significantly larger than their difference in height, which is almost similar for the two teams.

A very small standard deviation is observed for most variables in both team A and team B athletes, which reflects the homogeneity of the groups. However, the standard deviation is high for Standing long jump, Little Marathon, Vertical jump, BMI and Body weight, which indicates large differences between team A and team B athletes for these variables.

Table 2. Descriptive statistics for 10m

Team A		*Team B*	
Mean	1.84	Mean	2.03
Standard Error	0.02	Standard Error	0.02
Median	1.83	Median	2.02
Mode	1.86	Mode	1.96
Standard Deviation	0.07	Standard Deviation	0.09
Sample Variance	0.01	Sample Variance	0.01
Kurtosis	-0.05	Kurtosis	–0.84
Skewness	0.26	Skewness	0.53
Range	0.28	Range	0.31
Minimum	1.70	Minimum	1.92
Maximum	1.98	Maximum	2.23
Sum	29.42	Sum	32.55
Count	16.00	Count	16.00

Table 3. t-Test: Two-Sample Assuming Equal Variances

	Team A	*Team B*
Mean	1.84	2.03
Variance	0.01	0.01
Observations	16.00	16.00
Pooled Variance	0.01	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	–6.52	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.00	
t Critical two-tail	2.04	

Figura 2. Difference between Team A and Team B Laguna Sharks for the 10m sprint

In the 10 m Speed test (Table 2), the level of team A (M = 1.83, SD = 0.07, n = 16) was better than the level of team B (M = 2.04, SD = 0.08, n = 16), which is revealed by the mean difference between them. Statistical significance was set at an alpha level of 0.05. This difference was significant, as the results obtained in the speed test were better for team A, $t(30)$ = 2.04 (two-tail), p = 0.00 (one-tail). We mention that only two players in team B had better results than those in team A, and we believe that this was influenced by the pandemic period, because team B athletes were more affected than players in the club's elite team (A).

Table 4. Descriptive statistics for Standing Variances

	Variable 1	*Variable 2*
Mean	2.18	2.05
Variance	0.04	0.05
Observations	16.00	16.00
Pooled Variance	0.05	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	1.79	
P(T<=t) one-tail	0.04	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.08	
t Critical two-tail	2.04	

Table 5. t-Test: Two-Sample Assuming Equal long jump

Team A		*Team B*	
Mean	2.18	Mean	2.05
Standard Error	0.05	Standard Error	0.06
Median	2.16	Median	2.08
Mode	#N/A	Mode	2.08
Standard Deviation	0.20	Standard Deviation	0.23
Sample Variance	0.04	Sample Variance	0.05
Kurtosis	−0.46	Kurtosis	0.09
Skewness	0.62	Skewness	−0.59
Range	0.66	Range	0.88
Minimum	1.91	Minimum	1.54
Maximum	2.57	Maximum	2.42
Sum	34.93	Sum	32.73
Count	16.00	Count	16.00

Figure 3. Difference between team A and team B Laguna Sharks for standing long jump

Table 4 shows the difference between the two teams in the Standing long jump test, where the level of team A (M = 2.18, SD = 0.20, n = 16) was better than the level of team B (M = 2.05, SD = 0.23, n = 16). Statistical significance was set at an alpha level of 0.05. It can be seen that the best result of team A was 2.18, and the best result of team B was 2.05. Following the analysis of this test, we can demonstrate the existence of a significant difference, $t(30) = 2.04$ (two-tail), $p = 0.04$ (one-tail)

Table 6. *Descriptive statistics for vertical jump*

Team A		*Team B*	
Mean	53.56	Mean	42.38
Standard Error	1.06	Standard Error	2.03
Median	53.00	Median	43.00
Mode	50.00	Mode	40.00
Standard Deviation	4.23	Standard Deviation	8.14
Sample Variance	17.86	Sample Variance	66.25
Kurtosis	-0.69	Kurtosis	1.15
Skewness	0.52	Skewness	-0.11
Range	14.00	Range	35.00
Minimum	48.00	Minimum	25.00
Maximum	62.00	Maximum	60.00
Sum	857.00	Sum	678.00

Table 7. *t-Test: Two-Sample Assuming Equal Variances*

	Team A	*Team B*
Mean	53.56	42.38
Variance	17.86	66.25
Observations	16.00	16.00
Pooled Variance	42.06	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	4.88	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.00	
t Critical two-tail	2.04	

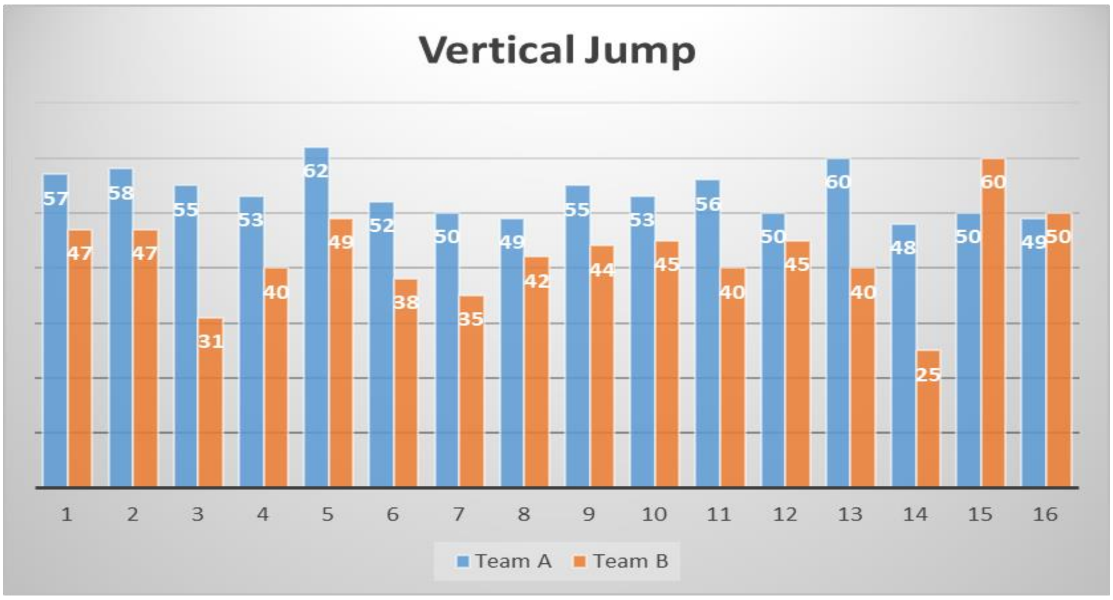

Figure 4. Difference between team A and team B Laguna Sharks for vertical jump

Table 6 indicates major differences in the Vertical jump test, the level of team A (M = 53.56, SD = 4.22, n = 16) being much better than the level of team B (M = 42.38, SD = 8.13, n = 16). Statistical significance was set at an alpha level of 0.05. This difference was significant, $t(30) = 2.04$ (two-tail), $p = 0.00$ (one-tail). From the analysis of this test, it appears that team B athletes are less prepared in terms of strength, which is also confirmed by their results in the Standing long jump test.

Table 8. Descriptive statistics for small marathon

Team A		*Team B*	
Mean	24.85	Mean	25.33
Standard Error	0.29	Standard Error	0.41
Median	24.90	Median	24.81
Mode	25.10	Mode	26.87
Standard Deviation	1.15	Standard Deviation	1.63
Sample Variance	1.32	Sample Variance	2.66
Kurtosis	−0.81	Kurtosis	−1.16
Skewness	0.36	Skewness	0.46
Range	3.60	Range	5.10
Minimum	23.30	Minimum	23.22
Maximum	26.90	Maximum	28.32
Sum	397.60	Sum	405.20
Count	16.00	Count	16.00

Table 9. t-Test: Two-Sample Assuming Equal Variances

	Team A	*Team B*
Mean	24.85	25.33
Variance	1.32	2.66
Observations	16.00	16.00
Pooled Variance	1.99	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	-0.95	
P(T<=t) one-tail	0.17	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.35	
t Critical two-tail	2.04	

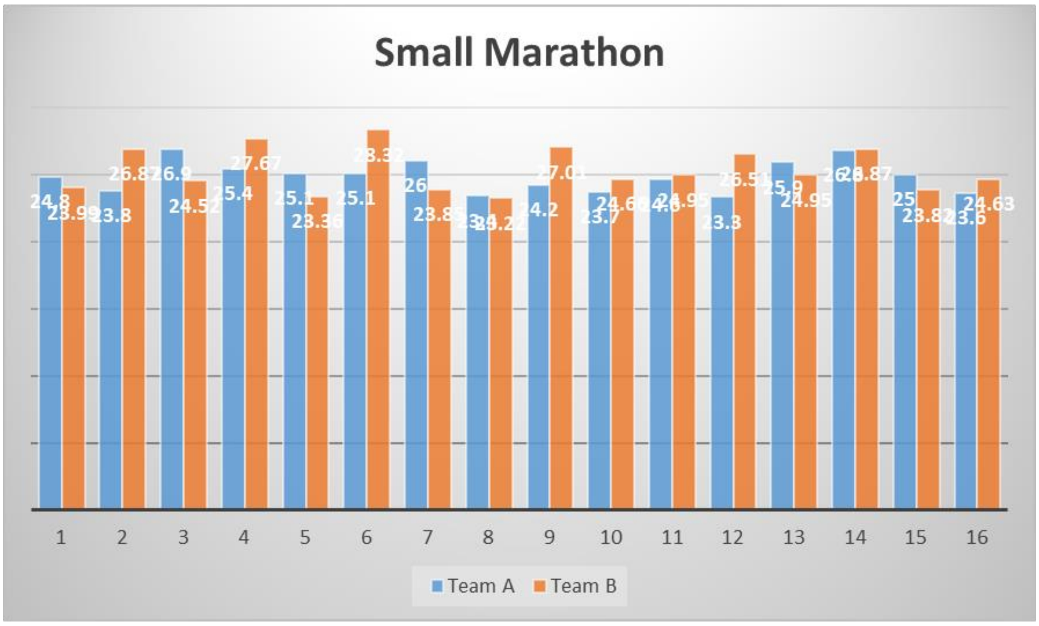

Figure 5. Difference between team A and team B Laguna Sharks for small marathon

Table 8 shows the difference between the two teams in the Little Marathon test, where the level of team A (M = 24.85, SD = 1.15, n = 16) was better than the level of team B (M = 25.33, SD = 1.63, n = 16), although the difference was not very large. Statistical significance was set at an alpha level of 0.05. This difference was significant, $t(30) = 2.04$ (two-tail), $p = 0.17$ (one-tail). From the analysis of this test, it appears that team A is slightly more prepared in terms of endurance than team B, although both of them are very close according to the obtained results.

Table 10. Descriptive statistics for height

Team A		*Team B*	
Mean	1.75	Mean	1.74
Standard Error	0.02	Standard Error	0.02
Median	1.75	Median	1.74
Mode	1.84	Mode	1.78
Standard Deviation	0.07	Standard Deviation	0.06
Sample Variance	0.00	Sample Variance	0.00
Kurtosis	-1.22	Kurtosis	0.27
Skewness	0.00	Skewness	0.04
Range	0.20	Range	0.25
Minimum	1.65	Minimum	1.62
Maximum	1.85	Maximum	1.87
Sum	28.03	Sum	27.80
Count	16.00	Count	16.00

Table 11. t-Test: Two-Sample Assuming Equal Variances

	Team A	*Team B*
Mean	1.75	1.74
Variance	0.00	0.00
Observations	16.00	16.00
Pooled Variance	0.00	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	0.63	
P(T<=t) one-tail	0.27	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.53	
t Critical two-tail	2.04	

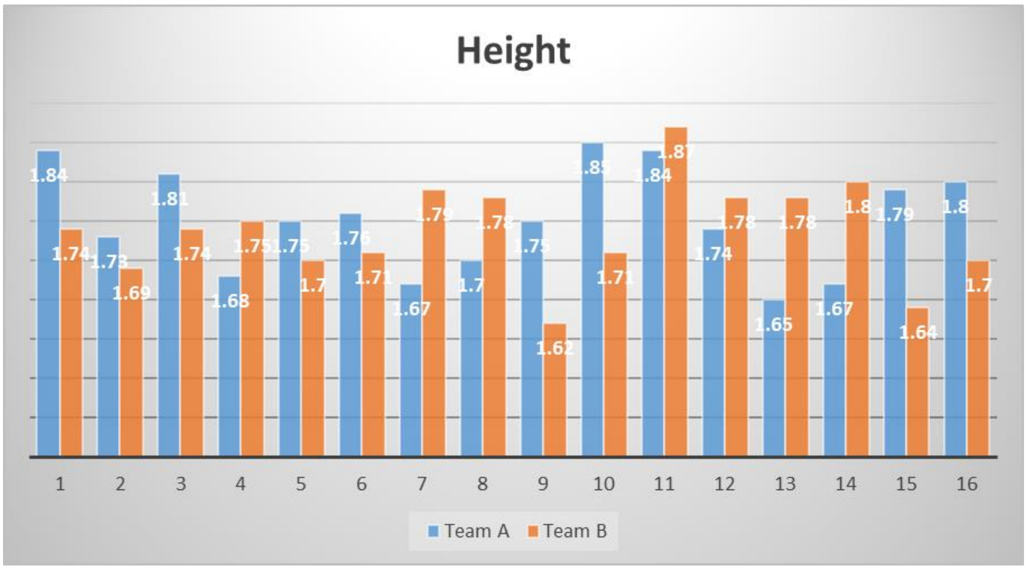

Fig. 6. Difference between team A and team B Laguna Sharks for height

Table 10 shows the anthropometric difference in height between the two teams. Thus, the height of team A (M = 1.75, SD = 0.07, n = 16) is slightly greater than that of team B (M = 1.74, SD = 0.06, n = 16). Statistical significance was set at an alpha level of 0.05. This difference was significant, $t(30) = 2.04$ (two-tail), $p = 0.27$ (one-tail). Therefore, in terms of height, we can say that none of the teams has very tall players, and in Romania, the 5th position characterised by tall players is critical because they are totally missing.

Table 12. Descriptive statistics for arm span

Team A		*Team B*	
Mean	1.82	Mean	1.76
Standard Error	0.01	Standard Error	0.02
Median	1.83	Median	1.77
Mode	1.85	Mode	1.79
Standard Deviation	0.06	Standard Deviation	0.07
Sample Variance	0.00	Sample Variance	0.01
Kurtosis	0.87	Kurtosis	0.28
Skewness	–0.85	Skewness	0.31
Range	0.21	Range	0.28
Minimum	1.68	Minimum	1.64
Maximum	1.89	Maximum	1.92
Sum	29.07	Sum	28.14
Count	16.00	Count	16.00

Table 13. t-Test: Two-Sample Assuming Equal Variances

	Team A	*Team B*
Mean	1.82	1.76
Variance	0.00	0.01
Observations	16.00	16.00
Pooled Variance	0.00	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	2.54	
P(T<=t) one-tail	0.01	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.02	
t Critical two-tail	2.04	

Figure 7. Difference between Team A and Team B Laguna Sharks in terms of wingspan

Table 12 shows the results for arm span, indicating that the level of team A (M = 1.82, SD = 0.06, n = 16) is considerably higher than the level of team B (M = 1.76, SD = 0.02, n = 16); to note that, although the height difference between the two teams is very small, team A has better results for the Arm spam variable. Statistical significance was set at an alpha level of 0.05. This difference was significant, $t(30) = 2.04$ (two-tail), $p = 0.1$ (one-tail). Following these results, we assume that both teams have players in full development, who will continue to grow in height.

Table 14. Descriptive statistics for weight

Team A		*Team B*	
Mean	61.24	Mean	63.34
Standard Error	1.58	Standard Error	1.58
Median	60.00	Median	63.00
Mode	56.00	Mode	69.00
Standard Deviation	6.31	Standard Deviation	6.33
Sample Variance	39.86	Sample Variance	40.09
Kurtosis	0.09	Kurtosis	−0.12
Skewness	−0.11	Skewness	−0.27
Range	24.10	Range	24.00
Minimum	47.60	Minimum	51.00
Maximum	71.70	Maximum	75.00
Sum	979.90	Sum	1013.50
Count	16.00	Count	16.00

Table 15. t-Test: Two-Sample Assuming Equal Variances

	Team A	*Team B*
Mean	61.24	63.34
Variance	39.86	40.09
Observations	16.00	16.00
Pooled Variance	39.98	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	-0.94	
P(T<=t) one-tail	0.18	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.36	
t Critical two-tail	2.04	

Figure 8. Difference between Team A and Team B Laguna Sharks in terms of weight

Table 14 reveals the weight difference between team A and team B. Thus, the weight of team A players (M = 61.24, SD = 6.31, n = 16) is lower than that of team B (M = 63.34, SD = 6.33, n = 16). Statistical significance was set at an alpha level of 0.05. This difference was significant, $t(30) = 2.04$ (two-tail), $p = 0.18$ (one-tail). Following these results, we can say that both teams have players within normal weight limits, the differences being very small.

Table 16. Descriptive statistics for BMI

Team A		*Team B*	
Mean	19.83	Mean	20.64
Standard Error	0.37	Standard Error	0.46
Median	19.90	Median	21.15
Mode	19.30	Mode	17.70
Standard Deviation	1.49	Standard Deviation	1.84
Sample Variance	2.21	Sample Variance	3.39
Kurtosis	0.80	Kurtosis	−0.92
Skewness	−0.44	Skewness	−0.17
Range	6.10	Range	6.20
Minimum	16.50	Minimum	17.70
Maximum	22.60	Maximum	23.90
Sum	317.30	Sum	330.30
Count	16.00	Count	16.00

Table 17. t-Test: Two-Sample Assuming Equal Variances

	Variable 1	*Variable 2*
Mean	19.83	20.64
Variance	2.21	3.39
Observations	16.00	16.00
Pooled Variance	2.80	
Hypothesised Mean Difference	0.00	
df	30.00	
t Stat	−1.37	
P(T<=t) one-tail	0.09	
t Critical one-tail	1.70	
P(T<=t) two-tail	0.18	
t Critical two-tail	2.04	

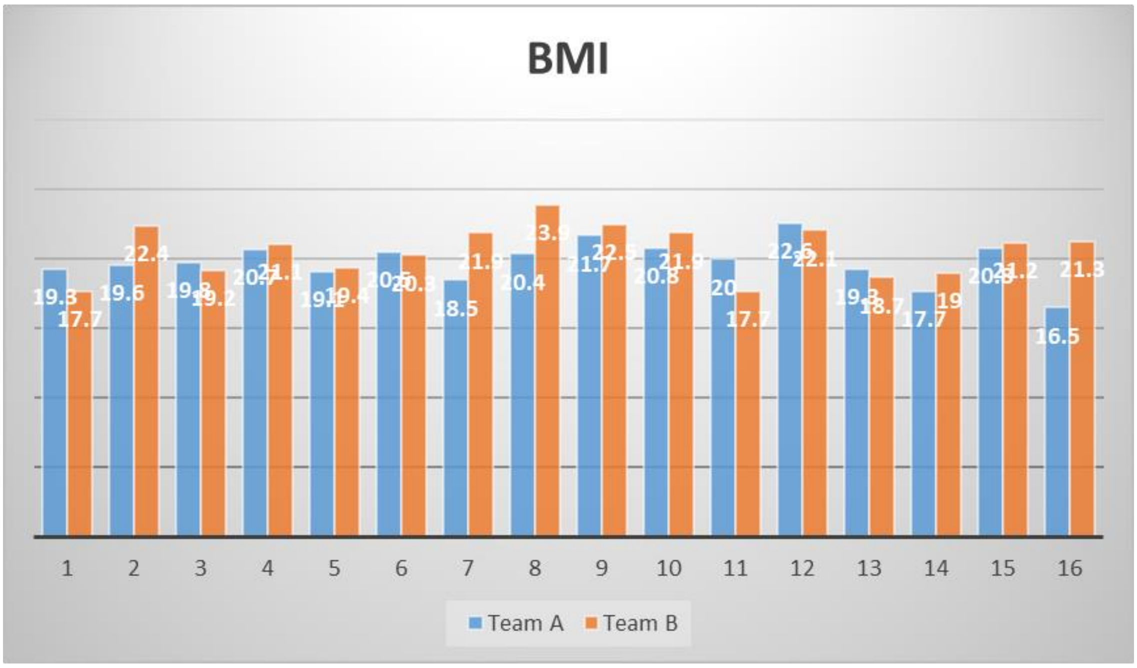

Figure 9. Difference between team A and team B Laguna Sharks in terms of BMI

Table 16 highlights the BMI difference between team A (M = 19.83, SD = 1.48, n = 16) and team B, which has more adipose tissue (M = 20.64, SD = 1.84, n = 16). Statistical significance was set at an alpha level of 0.05. This difference was significant, $t(30) = 2.04$ (two-tail), $p = 0.09$ (one-tail). Although team B has more adipose tissue than team A, their data fall within the normal limits provided by the World Health Organization, so they have healthy weight for their age.

Conclusions

The analysis and generalisations made allow us to draw the following conclusions:

1. Both tested groups are homogeneous in terms of physical development specific to the age addressed in this study.

2. Statistically significant differences can be observed between the two teams as follows: for physical tests – 10 m Sprint, 1.83 (A) < 2.04 (B) and Vertical jump, 53.56 (A) > 42.38 (B); for anthropometric measurements, large differences in arm span are recorded between the two teams, 1.82 (A) > 1.76 (B), despite the small height difference between them, 1.75 (A) > 1.74 (B). As expected, the research hypothesis is confirmed through the significant differences between the results obtained by the two basketball teams in both physical tests and anthropometric measurements.

Given that the results of team A are better than those of team B, we justify the presence of elite team (A) in the U15 National Basketball Championship, where it ranked 5th in the 2022–2023 competitive season, and the presence of semi-elite team (B) in the Municipal Basketball Championship, where only clubs from the Bucharest Municipality participate.

The general conclusion that can be drawn from the research results is that, considering the "cadet" age of our male players, we can improve the future teams by selecting taller athletes (because they are missing in both teams) and by increasing the endurance, running speed (with and without the ball) and lower limb strength of young basketball players during the training process. The number of individual work sessions with the club's players should also be increased.

Authors' Contributions

All authors have equally contributed to this study.

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