ASCERTAINING STUDY ON SOMATIC, MOTOR AND TECHNICAL ASSESSMENTS IN JUNIOR BASKETBALL TO IDENTIFY SPECIFIC STANDARDS

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Abstract. *Basketball is a sport with predominantly aerobic requirements and high-intensity anaerobic requirements. In recent years, this characteristic has changed in terms of demands on the player and intensity of the competition, involving an increase in the number and duration of explosive actions. The purpose of this paper was to determine the motor, somatic and technical levels of U14 players in order to make up the expanded junior team of Romania. To identify the values specific to the age of 14, three trials were organised over the course of a year. As a result, 49 athletes from all over the country were selected and tested, and then they followed centralised training sessions within the expanded national junior team of Romania. The somatic and motor test battery consisted of: body weight (kg), body height (cm), body mass index (BMI), arm span, 10 m sprint, 20 m sprint, 3 x 10 m shuttle run, standing long jump, vertical jump, t-Test, Beep Test, Little Marathon, hip mobility, and universal throw. The research methods used in this paper were: literature review, observation, mathematical statistics, tabular method and graphical method. The research results were compared with international values. In conclusion, the current somatic and motor potential of junior basketball players does not fit into the models developed at a national and international level, given that their performance was poorer, therefore our hypothesis is not validated.*

Keywords*: physical characteristics; anthropometric characteristics; young male basketball players.*

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Introduction

Basketball, which was invented in the United States in the late 19th century, is a sport with predominantly aerobic requirements (Korkmaz & Karahan, 2012) and high-intensity anaerobic requirements. In recent years, this characteristic has changed in terms of demands on the player and intensity of the competition, involving an increase in the number and duration of explosive actions (Padulo et al., 2016). According to a study by Nuñez and Lyras (2018), the number of basketball players, coaches and spectators has increased significantly since the 20th century. Nowadays, basketball is a sports activity played all over the world by millions of people of various ages. It is one of the most popular sports in the US, as well as in European and Asian countries. Many leagues and tournaments, such as NBA and Euroleague, are organized every year (Paulauskas et al., 2018).

Basketball is a fast-paced team sport that combines both physical and mental elements, for example, individual technique and collective tactics. To be successful in matches and tournaments, basketball players need to possess a high level of motor skills and athletic ability (Ostojic et al., 2006). During a game, players demonstrate a variety of characteristics specific to basketball (dribbling, shooting, passing, throwing, rebounding, blocking) but also related to physical training (running, jumping, change of direction).

The success of basketball players is determined by a combination of physical and psychological factors (Muratovic et al., 2014). Appropriate body size plays a key role because body height and arm span can influence on-court performance. Technical development is crucial, involving skills (such as dribbling, shooting and passing) that must be improved through constant training (Kostopoulos, 2015).

Motor and tactical development is also vital, given that players must be able to move quickly and efficiently, coordinate their movements and make fast decisions during the game (Stojanović et al., 2019). Moreover, the psychological factor, including concentration, mental toughness and the ability to manage stress, is also essential for peak performance.

Players' physiological potential, namely their ability to adapt and excel under intense physical conditions, is another key element. Strength, power, agility and speed are fundamental attributes that contribute to a player's overall performance (Hoover et al., 2017). Strength and power allow players to withstand physical duels and perform explosive movements, while agility and speed gives them the ability to move quickly and change direction efficiently on the court (Ziv & Lindor, 2009). Thus, basketball success is the result of a complex interaction between physical characteristics, technical and motor skills, tactical strategies and the psychological state of players.

In the selection process for this sport, coaches need to identify young athletes with potential who demonstrate the ability to reach maximum performance levels in senior competitions. It is important to avoid early specialisation and unnecessary expenditure on early intensive training, which may not bring long-term benefits. Studies (Edwards et al., 2018) show that early success and early specialisation are not reliable predictors of long-term success for elite athletes across various sports disciplines.

In team sports such as basketball, the age period between 11 and 14 years is crucial for the intensive development of athletes. In this phase, young athletes develop fundamental skills and build the foundation for future performance. Talent should be identified during this period while taking into account the biological maturity status of each athlete, given that physical and emotional development varies considerably from one individual to another (Barreiros et al., 2014).

Correct identification of talent at this age requires a careful assessment of motor, technical and tactical skills, as well as growth and development potential (Myburgh et al., 2019). Psychological aspects and athlete motivation, which play an essential role in achieving top performance, should also be taken into consideration (Bompa, 2000). Coaches should promote a balanced approach to training by encouraging movement diversity and sports experiences, as well as preventing athletes from overexertion and the risk of injury.

Thus, long-term success in basketball and other team sports is more likely to be achieved through the holistic development of athletes, which includes not only physical and technical

training but also the psychological and social aspects of their development. This will contribute to building complete athletes who are ready for future competitions.

Changes in body structure and neuromuscular and cardiorespiratory systems that occur during growth and puberty have a significant impact on the motor performance of young basketball players. During these critical periods of development, children's strength and motor skills progressively improve; these improvements are mainly observed in middle childhood and adolescence, but the general pattern of motor development is not universally applicable to all motor tasks (Malina et al., 2004). For example, running speed constantly increases in boys aged 5-18 years, which indicates a continuous improvement in their physical abilities. Acceleration, on the other hand, shows significant improvements especially after the age of 13, when neuromuscular development is more pronounced (Martins Santos & Janeira, 2011). Vertical jumping ability, which is essential in basketball, has its best development period between 13 and 15 years of age, and the values obtained for vertical jumps largely depend on the player's explosive power (Malina et al., 2004).

Scientific studies show that biological maturity not only influences the physical performance of young basketball players, but can also be a predictor of team performance. This maturity includes physical and neuromuscular development, which is crucial for success in competition (Guimarães et al., 2019). For example, a player who reaches a high level of biological maturity at an early age may have advantages in terms of strength and coordination, which are decisive in team games (Arede et al., 2019).

In conclusion, the process of growth and puberty is vital for the development of motor performance in young basketball players. This development directly influences their physical skills such as speed, acceleration and jumping ability, having a significant contribution to their potential for long-term success. Biological maturity thus becomes an important factor not only for individual performance but also for team efficiency and success in competition.

Modern basketball is characterised by a remarkable combination of athletic qualities, technical diversity and physical intensity, which add special dynamism to the game. This sport requires not only advanced technical skills but also a high level of physical fitness, as it frequently involves physical contact between players. Some experts (Andrianova et al., 2021) point out that basketball is a high-intensity sport in which anaerobic metabolism plays a key role, allowing players to perform at their best during the short and intense game phases. This makes basketball not only spectacular but also extremely physically demanding.

The rigorous requirements of the basketball game expose players to fierce competition from an early age. To meet this challenge and identify the most promising talents, anthropometric measurements, physical analysis and somatotype determination become essential. These assessments allow coaches and head coaches to identify players with high potential, thus ensuring more accurate and efficient selection. In this way, competitive teams can be formed, and the development of players' individual skills can be maximised for long-term success (Vaquera et al., 2015).

The literature indicates that the age between 14 and 18 years has not received sufficient attention in national research, thus leaving a significant gap in the knowledge of somatic and motor characteristics for this age group.

The present study aims to contribute to filling this gap by providing data and analyses to support the development of specific standards for juvenile basketball. We will thus check whether the hypothesis according to which the somatic and motor potential of junior basketball players falls within national and international standards is validated. Also, the second hypothesis is – The somatic sphere significantly influences athletes' motor skills.

Methodology

Participants

The study was conducted with 49 basketball players participating in the U14 National Championships. The best players in this age group were selected from the sports clubs affiliated with the Romanian Basketball Federation in order to make up the expanded U14 men's national team, as well as to create the selection base for the U16 national team with a view to their participation in the future European Championships.

Procedure

To identify the values specific to the age of 14, three trials were organised over the course of a year in the cities of Ploiești, Târgoviște and Cluj-Napoca with the purpose of making up and training the U14 men's national team. In the three trials organised by the Romanian Basketball Federation, 49 athletes from all over the country were selected and tested, and then they followed centralised training sessions within the expanded national junior team of Romania.

Data collection

Anthropometric measurements (body weight, body height, arm span, body mass index), physical tests (10 m sprint, 20 m sprint, 3 x 10 m shuttle run, standing long jump, vertical jump, t-Test, Beep Test, Little Marathon, hip mobility) and a technical event (universal throw) were performed to identify specific standards of the athletes' physical and anthropometric performance. Testing was conducted in a sports hall covered with hardwood floors. First, the measurements were taken, after which the tests were performed, maintaining the same test battery for all three trials.

Anthropometric measurements

Participants' body weight, body height and arm span were measured by means of standardised techniques and calibrated equipment. Body weight (in kg) was determined using a Tanita digital scale with an accuracy of 0.1 kg. Body height (in cm) was measured using a stadiometer with an accuracy of 0.1 cm. Body mass index (BMI) was calculated using accredited software after entering body weight and body height.

Motor test battery

Acceleration and travel speed for the 10-m and 20-m sprint events with a standing start, 3 x 10 m shuttle run, T-Drill Agility Test, Little Marathon and Beep Fitness Test were assessed in the basketball hall on hardwood flooring. Times were recorded electronically with a photocell timing device using the Microgate Witty Timing system.

Standing long jump or the explosive power test was performed on the basketball court; each participant was given two attempts, and the best performance was recorded. For vertical jumping, the explosive leg power was determined using the OptoJump device. Hip mobility was assessed after an appropriate warm-up session during which the degree of flexibility was gradually increased.

Statistical analysis

Statistical analysis was performed using the SPSS software package. Data are expressed as means with standard deviation (M ± SD). The Shapiro-Wilk Test was used to check the normality. As variances showed a normal distribution, paired t-tests were used for within-group comparisons. The statistical significance level was set at 0.05 for all analyses. Confirmatory Factor Analysis (CFA) was used.

Results

Table 1. *Descriptive statistics – somatic assessment*

Somatic assessment	Height	Arm span	Weight	BMI
Mean	1.77	1.78	63.61	20.34
Standard error	0.01	0.01	1.24	0.30
Median	1.77	1.78	63.4	20.4
Mode	1.75	1.81	56	20.8
Standard deviation	0.07	0.08	8.68	2.07
Variance	0.00	0.01	75.27	4.30
Kurtosis	0.82	0.30	1.23	2.94
Skewness	0.29	0.10	0.52	0.88
Minimum	1.62	1.59	47.6	16
Maximum	1.97	1.99	92.2	27.8
Confidence interval (95.0%)	0.02	0.02	2.49	0.60

Standard deviations and variance are small, so our series are somewhat homogeneous (except for weight). Variance reaches very high values for body weight, namely between 47 and 92 kg, with very large fluctuations. Considering the descriptive statistics in Table 1, we can state that our series are very close to the normal (Gaussian) curve. A higher curve describes the BMI variable but does not exceed the cut-off threshold of 3. BMI values range between the minimum threshold of 16 and the maximum threshold of 27.8.

To ensure group homogeneity, participating athletes were divided by playing position.

Table 2. *Average values of somatic assessment by playing position*

Playing position	Height RO	Arm span RO	Weight RO	BMI RO
Playmaker (1)	1.68	1.69	56.99	20.16
Shooting guard (2)	1.75	1.75	59.45	19.36
Small forward (3)	1.79	1.81	66.15	20.68
Power forward (4)	1.82	1.85	72.49	21.98
Centre (5)	1.84	1.84	67.90	20.10
Total	1.77	1.78	63.61	20.34

Table 2 shows that the power forward (position 4) is the heaviest (72.49 kg), followed by the centre (position 5) who weighs 67.9 kg, the small forward (position 3) whose weight is 66.15 kg, the shooting guard (position 2) with 59.45 kg and the playmaker (position 1) who has the lowest weight (56.99 kg). The tallest players are the centre (1.84 m) and the power forward (1.82 m), the small forward and the shooting guard are almost the same height (1.79 m and 1.75 m, respectively), while the playmaker is the shortest (1.68 m). We can say that these basketball-specific results are far below the model for junior players in terms of somatic development compared to the indicative values of height and arm span, considering a later layout (in junior II) of players by position (Table 3). However, BMI has very similar values for all positions (around 20).

Table 3. *Indicative values of height and arm span according to age* (Moanță et al., 2023)

	Age	Centres		Forwards		Guards	
		B	G	B	G	B	G
Height	13	1.79	1.80	1.74	1.76	1.70	1.68
	14	1.85	1.85	1.80	1.80	1.75	1.71
Arm span	13	1.84	1.85	1.79	1.81	1.75	1.73
103% of height	14	1.87	1.89	1.82	1.86	1.73	1.76

Table 4. *Average values of somatic assessment by playing position compared to international standards*

Playing position	Height RO	Height S	Arm span RO	Arm span S	Weight RO	Weight S	BMI RO	BMI S
Playmaker (1)	1.68	1.69	1.69	1.74	56.99	57.10	20.16	19.88
Shooting guard (2)	1.75	1.69	1.75	1.74	59.45	57.10	19.36	19.88
Small forward (3)	1.79	1.82	1.81	1.84	66.15	63.71	20.68	19.11
Power forward (4)	1.82	1.82	1.85	1.84	72.49	63.71	21.98	19.11
Centre (5)	1.84	1.85	1.84	1.90	67.90	74.02	20.10	21.28
Total	1.77	1.77	1.78	1.81	63.61	63.13	20.34	19.85

In Table 4, a comparison is made between the somatic assessment results of Romanian players and players from the Mazovia regional team (age: 14.09 ± 0.30 years) that qualified for the 2014-2016 Polish Championships of Regional Teams, and considerable differences can be observed in terms of arm span, weight, BMI and height (Gryko et al., 2018).

It can be seen that the average arm span value of Romanian athletes is lower than the international average value. An exception is noted for position 2 (shooting guard), where the average value of Romanian athletes (1.75 m) is slightly higher than the international average value (1.74 m). Regarding body weight, Romanian players are heavier compared to the international average value, as later confirmed by BMI analyses.

Table 5. *Descriptive statistics – motor assessment*

Motor assessment	10 m sprint	20 m sprint	3 x 10 m shuttle run	Standing long jump	t-Test	Vertical jump	Beep Test	Mobility	Little Marathon
Int. standards	1.92	3.13 ± 0.13		1.84	10.10 ± 0.42	60.2			
Rom. standards		2.9				57-58	9.9		23
Mean	2.04	3.50	7.47	1.99	10.86	49.86	8.40	4.81	25.86
Standard error	0.02	0.03	0.04	0.03	0.06	0.90	0.20	0.63	0.22
Median	2.05	3.49	7.48	1.99	10.81	50	8.5	4.75	25.9
Mode	2.18	3.6	7.99	1.9	10.5	50	8.19	2	24.8
SD	0.11	0.21	0.29	0.19	0.41	6.28	1.41	4.34	1.54
Variance	0.01	0.04	0.08	0.04	0.16	39.50	1.98	18.80	2.37
Kurtosis	-0.81	-0.73	-1.02	0.01	0.68	-0.40	-0.59	0.98	-0.75
Skewness	-0.23	0.15	0.24	-0.19	0.60	0.16	-0.20	0.74	0.09
Minimum	1.82	3.1	7	1.54	10.02	39	5.41	-5	23.2
Maximum	2.25	3.95	7.99	2.42	11.99	64	11.35	17	29.01
Confidence interval (95.0%)	0.03	0.06	0.08	0.05	0.12	1.81	0.41	1.26	0.44

Table 6. *Average values of motor assessment by playing position*

Playing position	10 m sprint	20 m sprint	3 x 10 m shuttle run	Standing long jump	t-Test	Vertical jump	Beep Test	Mobility	Little Marathon
Int. standards	1.92	3.13 ± 0.13		1.84	10.10 ± 0.42	60.2			
Rom. Standards		2.9				57-58	9.9		23
Power forward (4)	2.06	3.50	7.72	1.93	10.88	48.88	7.63	4.19	26.84
Centre (5)	2.05	3.39	7.37	1.81	11.54	50.67	6.84	7.00	26.60
Playmaker (1)	2.09	3.58	7.43	1.90	11.03	48.88	8.94	4.56	24.91
Shooting guard (2)	2.03	3.47	7.45	2.09	10.81	49.88	8.80	4.88	26.06
Small forward (3)	2.01	3.51	7.39	1.98	10.65	50.79	8.41	4.77	25.46
Total	2.04	3.50	7.47	1.99	10.86	49.86	8.40	4.81	25.86

The average score obtained by the tested athletes in the 10-m sprint event was 2.04. This result is poorer than the international average value of players aged 13-15 (1.92) who train in Polish sports clubs (Gryko et al., 2018), which indicates that Romanian performance is lower in this test compared to the performance of international athletes (Table 5).

The average score obtained by the tested athletes in the 20-m sprint event was 3.50. This result is higher than the international average value of elite players (3.13 ± 0.13) from Portugal (Ramos et al., 2020). As the scores are below the average standards for this age developed by the Romanian Basketball Federation (2.90) - Central Coaches College, we can say that the athletes tested in this research have weaker performance compared to the national and international standards set for this event (Table 5).

In the standing long jump event, the average score obtained by the tested athletes was 1.99. This result is higher than the average value of international standards (1.84), which indicates that Romanian athletes perform better in this test compared to regional international athletes (Table 5).

In the T-Drill Agility Test, the average score of the Romanian players was 10.86. The analysis shows that the players participating in our research have poorer performance compared to the average value obtained in this test by international elite players (10.10 ± 0.42) from Portugal (Ramos et al., 2020) (Table 5).

To assess cardiorespiratory capacity (VO_2 max), the Beep Test was used for basketball players who obtained an average score of 8.4. According to TopendSports standards for the Beep Test, this represents an average result compared to the standards developed by the Romanian Basketball Federation.

The average scores obtained by the investigated players in the physical tests aimed at all 5 playing positions were statistically lower than the international results and national standards. Thus, the players selected for the expanded team should benefit from extensive training to improve their results.

Table 7. *Descriptive statistics – Universal throw*

Technical assessment	Universal throw
International standard	5.23 ± 2.12
Romanian standard	12
Mean	5.12
Standard error	0.23
Median	5
Mode – the most frequent value	4
Standard deviation	1.58
Variance	2.48
Kurtosis	-0.67
Skewness	0.42
Minimum	2
Maximum	8
Confidence interval (95.0%)	0.45

In the technical event, namely universal throw, the average score obtained by the tested players was 5.12. This result is very poor compared to both the standards developed by the Romanian Basketball Federation (FRB), where the average value is 12, and international standards, where the average value is 5.23. However, the research players are very close to this average score that falls into the range [3.11; 7.35]. The existence of important differences between the FRB standards and the results achieved by the selected players is alarming (Table 7).

Table 8. *Standards specific to the age of 14 developed by FRB*

Event	FRB standards	Results achieved	Number of players who meet FRB standards
20 m sprint	2.90	3.50	0/49
Vertical jump	57-58	49.86	7/49
Little Marathon	23.0	25.86	0/49
Beep Test	9.9	8.40	8/49
Shark with the right foot	0	2.58	7/49
Shark with the left foot	0	2.28	7/49
Universal throw	12	5.12	0/49

Thus, the results analysed for the best 49 junior basketball players selected to make up the expanded team of Romania demonstrate that the values achieved are much lower than the standards developed by the Romanian Basketball Federation and, as can be seen in Table 8, extremely few athletes meet FRB standards, the average being less than 8 players.

Table 9. *Average values of technical assessment by playing position*

Playing position	Universal throw
International standard	5.23
Centre (5)	4.67
Playmaker (1)	6.00
Shooting guard (2)	4.56
Small forward (3)	4.93
Power forward (4)	5.88
Total	5.12

The average values obtained by the investigated athletes in the universal throwing event aimed at all 5 playing positions were (generally) lower than the international average result (5.23). Thus, analysing each playing position separately, position 5 had an average of 4.46, which was slightly poorer than position 2 with 4.56 and position 3 with 4.93. The best results were achieved by position 1 with an average of 6.0 and position 4 with 5.88 (Table 9).

Confirmatory Factor Analysis (CFA)

SmartPls software offers many tests that can be used to ensure consistent factor analysis and data interpretation, allowing us to assume the research results. For example, the consistency of our model was based on the Composite Reliability Model (> 0.6), Cronbach's Alpha and rho_A (> 0.7 – the lower allowed value).

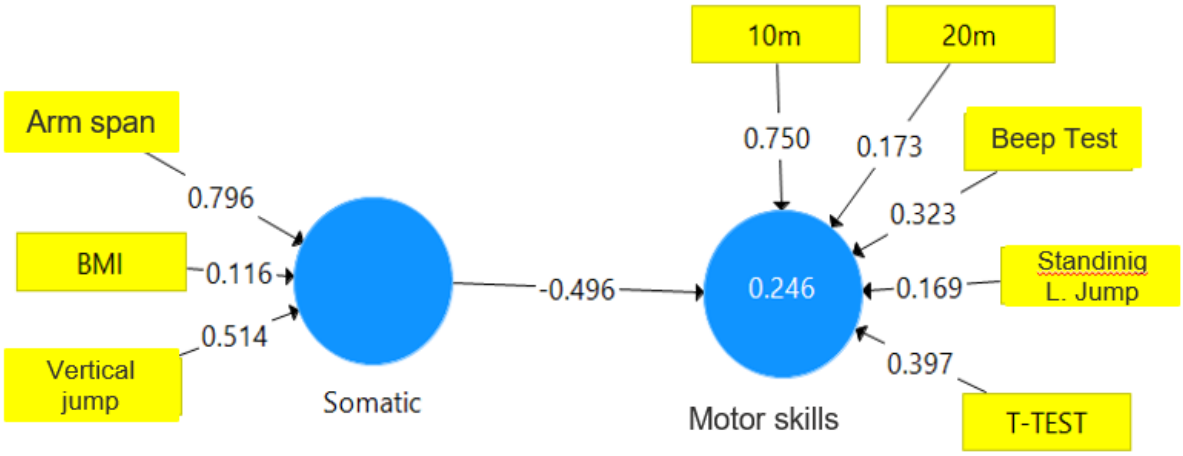

Figure 1. SmartPls path coefficients

The somatic sphere negatively influences motor skills, which means that athletes should follow different diets to positively influence motor skills.

Discussion and Conclusion

Statistical analysis of the data and interpretation of the somatic results highlight that they are far below the model for junior players in terms of somatic development compared to both the indicative values of height and arm span, considering a later layout (in junior II) of players by position (Table 3), and international results.

From a motor point of view, the investigated athletes achieved lower scores in 10 m sprint (2.04), 20 m sprint (3.50), t-Test (10.86), Beep Test (8.4), vertical jump (49.88) and Little Marathon (25.86) compared to the national standards and international results for this age group.

Thus the current somatic and motor potential of junior basketball players does not fit into the models developed at a national and international level due to their poorer results.

Statistical data analysis has, also, revealed that the technical level expressed does not match the model of players in the U14 age group because their average score obtained in the technical event aimed at all 5 playing positions was lower than the international average result (5.23) and the national standard (12.0). Thus, analysing each playing position separately, position 5 obtained an average of 4.46, which was slightly poorer than position 2 with 4.56 and position 3 with 4.93.

In the context of the continuous growth of sports performance, somatic, motor and technical assessments in junior basketball represent an essential component for talent identification and development. At international level, numerous studies have explored these issues, helping to establish specific standards to guide coaches and specialists in the field. For example, the study by Malina et al. (2004) provides details about the influence of biological and motor factors on sports performance, highlighting the importance of comprehensive assessment in juvenile sport. Similarly, the research conducted by Gabbett and Jenkins (2009) focuses on identifying the physical and physiological characteristics that contribute to success

in team sports, including basketball. Thompson et al. (2021) investigated a large sample of American athletes with the purpose of developing specific somatic, motor and technical standards for 14-year-old players; the data obtained were used for the selection of national junior teams.

At national level, juvenile age has not been as extensively studied in terms of somatic and motor assessments. However, there are some significant papers that have addressed this topic. For example, Popescu (2019) investigated the somatic and motor profiles of adolescents, providing a basis for understanding physical development during this crucial period. Also, the study by Ionescu (2018) analysed the motor performance of young athletes, highlighting the need for continuous and detailed assessments to improve training and sports results.

Confirmatory Factor Analysis (CFA) has shown that the somatic sphere negatively influences motor skills (-0.496). Following the motor, somatic and technical analysis of the results achieved by the 49 best junior basketball players selected to make up the expanded team of Romania, it has been demonstrated that their scores are much lower than the standards developed by the Romanian Basketball Federation.

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Institutional Review Board Statement: The research was conducted according to the principles stated in the Declaration of Helsinki. Written informed consent was obtained for the athletes to participate in the research. The study was approved by the Ethics Committee of the National University of Physical Education and Sport in Bucharest (ID: 48/1701).

Informed Consent Statement: The written informed consent for the athletes to participate in this study was obtained.

Data Availability Statement: Data can be made available upon request to the contact author.

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References

Andrianova, R. I., Fedoseev, D. V., Chicherin, V. P., Lubyshev, E. A., & Krasilnikov, A. A. (2021). Adaptation of the training process of highly qualified women's basketball teams based on indicators of competitive intensity and calorie consumption during official games. *Journal of Physical Education and Sport, 21*(4), 1897-1903. http://dx.doi.org/10.7752/jpes.2021.04240

Arede, J., Cumming, S., & Leite, N. (2019). Does bio-banding influence physical performance profile in youth basketball? *Journal of Sports Science, 37*: 66.

Barreiros, A., Côté, J., & Fonseca, A. M. (2014). From early to adult sport success: Analysing athletes' progression in national squads. *European Journal of Sport Science, 14*(S1), S178-S182. https://doi.org/10.1080/17461391.2012.671368

Bompa, T. O. (2000). *Total training for young champions*. Human Kinetics.

Edwards, T., Spiteri, T., Piggott, B., Bonhotal, J., Haff, G. G., & Joyce, C. (2018). Monitoring and managing fatigue in basketball. *Sports, 6*(1): 19. https://doi.org/10.3390/sports6010019

Gabbett, T. J., & Jenkins, D. G. (2009). Physical fitness and playing standard in professional rugby league players. *Journal of Strength and Conditioning Research, 23*(2), 485-492.

Gryko, K., Kopiczko, A., Mikołajec, K., Stasny, P., & Musalek, M. (2018). Anthropometric variables and somatotype of young and professional male basketball players. *Sports, 6*(1), 9. https://doi.org/10.3390/sports6010009

Guimarães, E., Baxter-Jones, A., Maia, J., Fonseca, P., Santos, A, Santos, E., Tavares, F., & Janeira, M. A. (2019). The roles of growth, maturation, physical fitness, and technical skills on selection for a Portuguese under-14 years basketball team. *Sports, 7*(3): 61. https://doi.org/10.3390/sports7030061

Hoover, S. J., Winner, R. K., McCutchan, H., Beaudoin, C. C., Judge, L. W., Jones, L. M., Leitzelar, J., & Hoover, D. L. (2017). Mood and performance anxiety in high school basketball players: A pilot study. *International Journal of Exercice Science, 10*(4), 604-618.

Ionescu, D. (2018). Performanțele motrice ale tinerilor sportivi și impactul antrenamentelor specifice [Motor performance of young athletes and the impact of specific training]. *Revista de Kinetoterapie, 14*(3), 45-52.

Korkmaz, C., & Karahan, M. (2012). A comparative study on the physical fitness and performance of male basketball players in different divisions. *Journal of Physical Education and Sport Sciences, 6*(1), 16-23.

Kostopoulos, N. (2015). Anthropometric and fitness profiles of young basketball players according to their playing position and time. *Journal of Physical Education and Sport, 15*(1), 82-87. https://doi.org/10.7752/jpes.2015.01014

Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). *Growth, maturation, and physical activity* (2nd ed.). Human Kinetics.

Martins Santos, E. J. A., & Janeira, M. A. (2011). The effects of plyometric training followed by detraining and reduced training periods on explosive strength in adolescent male basketball players. *Journal of Strength and Conditioning Research, 25*(2), 441-452. http://dx.doi.org/10.1519/JSC.0b013e3181b62be3

Moanță, A. D. (2023). *Concepția unitară de joc pe categorii de vârstă* [The unitary game concept by age group]. Discobolul.

Muratovic, A., Vujovic, D., & Hadzic, R. (2014). Comparative study of anthropometric measurement and body composition between elite handball and basketball players. *Montenegrin Journal of Sports Science and Medicine, 3*(2), 19-22.

Myburgh, G. K., Cumming, S. P., & Malina, R. M. Cross-sectional analysis investigating the concordance of maturity status classifications in elite Caucasian youth tennis players. *Sports Medicine Open, 5*(1): 27. https://doi.org/10.1186/s40798-019-0198-8

Nuñez, P. D. P., & Lyras, A. (2018). Basketball, innovation and change agency: Historical overview and current landscape. *Sport and Olympic-Paralympic Studies Journal, 3*(1), 156-164.

Ostojic, S. M., Mazic, S., & Dikic, N. (2006). Profiling in basketball: Physical and physiological characteristics of elite players. *Journal of Strength and Conditioning Research, 20*(4), 740-744.

Padulo, J., Bragazzi, N. L., Nikolaidis, P. T., Iacono, A. D., Attene, G., Pizzolato, F., Pupo, J. D., Zagatto, A. M., Oggianu, M., & Migliaccio, G. M. (2016). Repeated sprint ability in young basketball players: Multi-direction vs. one-change of direction (Part 1). *Frontiers in Physiology, 7*: 133. https://doi.org/10.3389/fphys.2016.00133

Paulauskas, R., Masiulis, N., Vaquera, A., Figueira, B. E., & Sampaio, J. (2018). Basketball game-related statistics that discriminate between European players competing in the NBA and in the Euroleague. *Journal of Human Kinetics, 65*(1), 225-233. http://dx.doi.org/10.2478/hukin-2018-0030

Popescu, A. (2019). Investigarea profilului somatic și motric al adolescenților cu vârsta cuprinsă între 16 și 18 ani [Investigating the somatic and motor profiles of adolescents aged 16-18 years]. *Revista de Sport, 2*(5), 60-70.

Ramos, S., Volossovitch, A., Ferreira, A. P., Barrigas, C., Fragoso, I., & Massuça, L. M. (2020). Differences in maturity, morphological, and fitness attributes between the better- and lower-ranked male and female U-14 Portuguese elite regional basketball teams. *Journal of Strength and Conditioning Research, 34*(3), 878-887. http://dx.doi.org/10.1519/JSC.0000000000002691

Stojanović, E., Aksović, N., Stojilkjković, N., Stanković, R., Scanlan, A. T., & Milanović, Z. (2019). Reliability, usefulness, and factorial validity of change-of-direction speed tests in adolescent basketball players. *Journal of Strength and Conditioning Research, 33*(11), 3162-3173. https://doi.org/10.1519/JSC.0000000000002666

Thompson, A., Tran, V. T., & Rogol, A. D. (2021). Characteristics of young basketball players related to their bodies and physical nature. *Sports Medicine, 51*(9), 1785-1796.

Vaquera, A., Santos, S., Villa, J. G., Morante, J. C., & Garcia-Tormo, V. (2015). Anthropometric characteristics of Spanish professional basketball players. *Journal of Human Kinetics, 46*(1), 99-106. https://doi.org/10.1515/hukin-2015-0038

Ziv, G., & Lindor, R. (2009). Physical attributes, physiological characteristics, on-court performances and nutritional strategies of female and male basketball players. *Sports Medicine, 39*(7), 547-568. https://doi.org/10.2165/00007256-200939070-00003