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Original article

Pattern of laterality in male basketball players, school and juvenile substitutes in Havana

Patrón de lateralidad en jugadores masculinos de baloncesto, reservas escolares y juveniles de La Habana

Padrão de lateralidade em jogadores masculinos de basquetebol, reservas escolares e juvenis em Havana

Juan Carlos Betancourt González^{1*}  <https://orcid.org/0000-0001-5729-2444>

Beatriz Sánchez Córdova¹  <https://orcid.org/0000-0002-7425-8990>

Edison Rodrigo Arias Moreno²  <https://orcid.org/0000-0001-6599-9693>

Ever Barroso Padrón¹  <https://orcid.org/0000-0002-7136-806X>

*Correspondence author: juanbg@uccfd.co.cu

¹Universidad de Ciencias de la Cultura Física y el Deporte "Manuel Fajardo". La Habana, Cuba.

²Instituto Superior Tecnológico Libertad. Ecuador.

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ABSTRACT

Basketball is a team sport, classified as a ball game, practiced in two modalities; 3 vs. 3 or 5 vs. 5. The demands of competitive activity force more and more to improve the preparation and train attending to the individualities of the basketball players to integrate a winning team. In the school and youth stage the technical aspects are consolidated to contribute to achieving better results in the sports master stage. The objective was to diagnose the predominant laterality patterns in these reserve and school athletes of the Havana men's basketball team, which allowed us to determine motor strengths and weaknesses due to genetic makeup. Theoretical and empirical level methods such as the survey, document review and measurement of the total members of the researched team were used. As results, we obtained that nine athletes have a homogeneous laterality pattern and seven are crossed, which will help to optimize technical preparation.

Keywords: Laterality pattern; Basketball; School`s category; Youth`s category.



RESUMEN

El baloncesto es un deporte de conjunto, clasificado como un juego con pelota, se practica en dos modalidades: 3 vs. 3 o 5 vs. 5. Las exigencias de la actividad competitiva obligan, cada vez más, a perfeccionar la preparación y entrenar atendiendo a las individualidades de los basquetbolistas para integrar un equipo ganador. En la etapa escolar y juvenil, se consolidan los aspectos técnicos para contribuir a lograr mejores resultados en la etapa de maestría deportiva. El objetivo fue diagnosticar los patrones de lateralidad predominantes en estos atletas, reservas escolares y juveniles del equipo de baloncesto masculino de La Habana, lo que permitió determinar fortalezas y debilidades motoras por constitución genética. Se utilizaron métodos de nivel teórico y empírico como la encuesta, revisión de documentos y la medición al total de integrantes del equipo investigado. Como resultados se obtuvo que nueve atletas presentan patrón de lateralidad homogéneo y siete son cruzados lo que permitirá contribuir a optimizar la preparación técnica.

Palabras clave: Patrón de Lateralidad; Baloncesto; Categoría escolar; Categoría juvenil.

RESUMO

O basquetebol é um desporto de equipa, classificado como um jogo de bola, praticado em duas modalidades; 3vs3 ou 5vs5. As exigências da atividade competitiva obrigam cada vez mais a melhorar a preparação e o treino de atendimento às individualidades dos jogadores de basquetebol para integrar uma equipa vencedora. Na fase escolar e juvenil, os aspectos técnicos são consolidados para contribuir para a obtenção de melhores resultados na fase de mestrado desportivo. O nosso objectivo era diagnosticar e caracterizar os padrões de lateralidade predominantes nestes atletas de reserva e escolares da equipa de basquetebol masculino de Havana, o que nos permitiu determinar as forças e fraquezas motoras devido à composição genética. Foram utilizados métodos teóricos e empíricos, tais como o inquérito, revisão de documentos e medição do total de membros da equipa pesquisada. Como resultados, obtivemos que nove atletas têm um padrão de lateralidade homogéneo e sete são cruzados, o que irá ajudar a otimizar a preparação técnica.

Palavras-chave: Padrão de lateralidade; Basquetebol; Categoria da escola; Categoria dos jovens.

INTRODUCTION

Basketball was first exhibited at the 1928 and 1932 Olympic Games, reaching Olympic status in 1936. Women's basketball had to wait until 1976 for its admission as an Olympic sport. These games have historically been dominated by the United States, whose teams have won all but four titles. The U.S. is a major player in the international arena of the sport, repeatedly winning international competitions organized by FIBA (International Basketball Federation), such as the World Basketball Championship, which began in 1950.

The Cuban Basketball Federation, based on the technological development that has reached the sport and the current demands of the competition, is constantly looking for ways to optimize performance. Studies to perfect the offensive and defensive positioning in the field and the effectiveness of the shot to the hoop, as well as other parameters of complex interaction, have been carried out to raise the competitive level.



Many authors have defined the term laterality by contributing valuable theories, (Oca, 2015; Loffing, Hagemann, Strauss, & MacMahon, 2016). All of them agree that it is the predominance of one side of the body over the other or the preference in the use of one half of the body, taking into account the dominance of the hand, the eye, the ear and the lower limbs, aspects related to the development of physical abilities such as coordination. (Morales & González, 2014) Le Boulch & Valera, (1997) further extend their initial theory on laterality, highlighting that it is: "the expression of motor predominance, related to the parts of the body that integrate its right and left halves, predominance that, in turn, is linked to the acceleration of the maturation process of the sensorimotor centers of one of the brain hemispheres".

Ferré, Catalán, Casaprima, & Mombiola, (2000) develop a similar definition of laterality to those of the previous authors. They explain that laterality is "a consequence of the distribution of functions that are established between the two cerebral hemispheres. On this depends whether we prefer to use one part or another of our body to perform a series of specific tasks".

Psychological studies of human behavior in sport have shown the importance of laterality (Loffing, Hagemann, Strauss, & MacMahon, 2016; Heinen, Bermeitinger, & Von Laßberg, 2016; Peters, 2018). González, Córdova, Madrigal, & Pérez, (2019) report that "assessments of laterality in athletes have favored, in the short term, the modeling of the determining information that contributes to maintaining and surpassing sports results".

On the other hand, de la Osa, Córdova, Concepción, Madrigal, & André, (2018), explain how, based on laterality studies, "athletes' strengths and weaknesses can be defined to optimize training and act more effectively in the game".

Laterality plays an important role in basketball, since it has a decisive influence on the motor skills and performance of athletes through proper hand-eye (dominant eye-dominant hand) and eye-foot (dominant eye-dominant foot) coordination, as well as laterality in relation to the shoulder or waist (important because of the preference for the side of the turn) and that which refers to the dynamic leg (skillful) and the power leg (supportive in most cases).

Taking as a reference the conceptions previously valued, the authors of the present study assume that laterality is the supremacy of one hemisphere over the other, when performing any activity, for which the oculo-manual (eye-hand) and oculo-podal (eye-foot) relationship is established as the most important, but we cannot fail to mention other parts of the body that also have an incidence on this, such as: ears, shoulders, hip and leg.

As a colophon, it is pertinent to point out that the classification of laterality established by Dorochenko (2009) is assumed, since this is the one that is most linked to the object of study of the research:

Looking at the conformation of laterality

There is homogeneous laterality: it is defined as the predominance of one part of the body (hand, eye, foot, ear) over the other and gives rise to what is known as

- Right: predominance of eye, hand, right foot as a consequence of the predominance of the left hemisphere of the brain.
- Left: predominance of eye, hand, left foot as a consequence of the predominance of the right hemisphere of the brain.



- Cross-laterality: dominance of the right hand and left foot or vice versa and dominance of the right hand and left eye and vice versa.
- Ambidexterity: there is no obvious manual dominance (it appears at the beginning of the acquisition of the lateralization process)

Dorochenko, P. (2009), emphasizes that the knowledge of the athlete's laterality allows us to better understand his technique and to develop personalized training to enhance his non-dominant side. On the other hand, the mentioned researcher has researched tennis, soccer, basketball, golf and other athletes to improve their skills and technical actions, (Dorochenko P., 2013) which is the basis for the present research.

It can be emphasized that the knowledge of laterality by the coach is important to understand the technique of their players, identify and correct errors, assess new solutions when making corrections, implement new exercises and guide the tactical situations according to their potential.

It is also essential for the athlete to know his pattern of genetic motor preferences since it gives him security in the game and allows him to practice more effectively according to personalized techniques and strategies, according to his characteristics. In this way, he can strengthen his side of the dominant body and thus obtain better results in his actions and shorten his reaction times. In this sense, the objective of the research is to diagnose the motor preferences of the players that allow us to evaluate their strengths and weaknesses to contribute to improve their performance.

MATERIAL AND METHODS

Descriptive study of transversal orientation, an intentional non-probabilistic sampling is applied, studying the population of 16 athletes that integrate the substitute team of male basketball of Havana (Table 1). All the athletes are male, aged 13-16 years old, to whom six tests were applied in order to know the laterality pattern.

Table. 1 - Characterization of the men's basketball substitute team of Havana

Subjects	Age	Size	Weight Kg	Position	Category	Experience years
1	16	1.87	76	Forward Pivot	Juvenile	6
2	16	1.95	80	Forward Pivot	Juvenile	4
3	17	1.93	60	Forward Pivot	Juvenile	5 months
4	16	1.77	63	Base	Juvenile	5
5	16	2.02	98	Center	Juvenile	4
6	14	1.90	90	Center	School	1
7	16	1.98	90	Center	Juvenile	6
8	16	1.74	56	Base	Juvenile	4
9	16	1.80	59	Point guard	Juvenile	6
10	16	1.77	56	Point guard	Juvenile	3
11	16	1.84	70	Power forward	Juvenile	3
12	16	1.87	79	Power forward	Juvenile	5
13	14	1.68	55	Base	School	1
14	14	1.90	87	Center	School	1
15	13	1.70	56	Base	School	6
16	15	1.85	63	Point guard	School	1
Mean	15	1.84	71	-	-	3



To carry out this research, a measurement was made to determine the laterality of the subjects in the sample under study, to whom six tests were applied as stated by Paul Dorochenko (2009) in the article "Interés of the laterality in deporte". This author in his book "El ojo director" dedicates chapter six to laterality in basketball and goes so far as to demonstrate that the position of the shot to the hoop depends on the director's eye, hence the importance of evaluating the genetic motor preferences of the athletes and their director's eye which he identifies as their physiological or mental eye.

The tests that work, both in the article and in the book mentioned above and that were used in our study, adjusted in some cases to Basketball, are the following:

Test 1: test sighting (Zazzo).

Objective: determine the guiding eye.

The procedure consists of putting arms out and holding a sheet of paper with both hands; in the middle of it, there will be a hole of a size of 0.5 cm. Focus, with both eyes open, through the hole as if there were a target, aiming at an object a few meters away. Quickly bring the blade closer to the face without removing the object from the eyes. The hole will come close over the director's eye. Another possibility to perform the test is when the athlete focuses on an object through the hole in the sheet of paper, with his head straight and arms extended, the tester, behind him, covers one eye and then the other. He asks: do you see the object with your right eye covered?, and with your left eye covered? The sportsman continues to see the object with one eye and not the other. The eye that allows us to see the object, with the other eye covered, is the director's eye.

Test 2: test dominant hand.

Objective: determine the dominant hand.

In basketball, the dominant hand is the one that the player dribbles and makes the shots in advantage (shot in suspension and free throw), it is the one that acts, but it is not always the same for our main activities. We can perfectly write, draw, throw an object or punch with one hand and, for certain things, use the other. To perform this test, the athletes were asked which hand they wrote with, ate with or threw the ball into the hoop, in sport.

Test 3: Shoulder laterality (Test de J. Solin).

Objective: determine shoulder rotation preference.

1. The test is performed with the initial position facing a wall with both hands resting above the head to the surface.
2. The assessor will bounce or catch a basketball behind the player being tested and he will rotate as quickly as possible to catch the ball.
3. The direction of rotation is recorded. If he turns to the left, his shoulder sideways is right and if he turns to fetch the ball to the right, then his shoulder sideways is left.
4. This test allows us to know genetically where the athlete has the greatest potential for turns.



Test 4: Waist laterality (Test de J. Solin).

Objective: determine waist rotation preference.

The athlete standing in a frontal plan and the hands resting on the hips. This is important so as not to allow any help from the laterality of the shoulders. It makes a jump in the air with a full turn to return to its initial position. You should not teach a sense of rotation to explain the test and not influence your choice. Theoretically, the first direction chosen is usually the natural rotation, but not always and we have to do both directions and note which is the best in quality.

Test 5: the dynamic leg.

Objective: determine the dynamic leg and strength leg.

The dynamic leg is in opposition to that of strength. The dynamic leg is the one we raise in the scissors jump in opposition to the strength leg which is the last one to stay on the ground.

Test 6: guiding foot.

Objective: determine the guiding foot.

The simplest and most revealing test is the ball hit with the foot one. We place a ball in front of the athlete and ask him for a shot directed to a defined space, simulating a goal.

RESULTS

Test one determines the guiding eye, of the 16 athletes evaluated, 10 have the right eye as their dominant eye, representing 62 %, and the other 6 have the left eye as their dominant eye, representing 38% of the total number of athletes evaluated (Table 2). As a result of this test, it was possible to specify the direct eye that will directly influence each of the shots in basketball.

Table 2. - Guiding eye

Amount of athletes evaluated	Right dominant eye		Left dominant eye	
	dominant eye	%	eye	%
16	10	62	6	38

Test two refers to the dominant hand, of the 16 athletes, 15 perform the manual tasks, as well as the shooting actions with their right hand, so it is their dominant hand, representing 93 % of the total of athletes evaluated and the remaining athlete who represents 7 % of the total has a left dominant hand (Table 3).



Table 3. - Dominant hand

Amount of athletes evaluated	Using right hand		Using left hand	
		%		%
16	15	93	1	7

In table 4, we value the relationship between the dominant hand and the directing eye (eye-hand relationship), which is very important information for athletes and coaches. We determined that nine athletes (56 %) of the total are Homogeneous, all right-handed homogeneous and seven athletes (44 %) are crusaders.

This result is very important for the teaching and improvement of free throwing and suspension, since homogeneous right-handed athletes can suffer a modification of the throwing technique (throwing arm with respect to the traditional teaching (Table 4).

Table 4. - Eye-hand relationship

Amount of athletes evaluated	Homogeneous rights		Cruzaders	
		%		%
16	9	56	7	44

Shoulder laterality test three describes the preferred direction of rotation of the shoulders. Eleven of the athletes, (68 %), have a left turn preference, so they are right shouldered and five (32 %) have a right turn preference, so they are left shouldered (Table 5).

Table 5. - Shoulder laterality

Amount of athletes evaluated	Shoulder turn preference to the right		Shoulder turn preference to the left	
		%		%
16	5	32	11	68

Hip laterality test four it represents the preferred rotation of the hip. Ten of the athletes (62 %) have a left hip rotation preference, so they are right hip and six (38 %) have a right hip rotation preference, so they are left hip (Table 6).



Table 6.- Hip laterality

Amount of athletes evaluated	Preferred right hip turn		Preferred left hip turn	
		%		%
16	6	38	10	62

Relating the tests three and four that correspond to the preference of turning and rotation of the shoulders and hips, we can affirm that the (31 %) of the sixteen athletes evaluated present coincidences in their preference of turning, being this to the left. The remaining (69 %) differ in the direction of rotation between shoulders and hips.

Test five, dynamic and supportive leg it concluded that fifteen of the sixteen athletes evaluated, representing 93 %, have the right leg as their dynamic leg, which implies that their support leg is the left one. The remaining athlete representing 7 % has the left leg as their dynamic leg and, therefore, the right support leg (Table 7).

Table 7. - Dynamic leg and support leg

Amount of athletes evaluated	With right dynamic leg		With left support leg	
		%		%
16	15	93	1	7

Test six about the guiding foot this test showed that (100 %) of the athletes evaluated have a right foot conductor (Table 8).

Tabla 8. - Conductor foot

Amount of athletes evaluated	Right foot conductor	%
16	16	100

Relating test five and six, which correspond to the dynamic leg and the director foot, we can affirm that (93 %), which represents fifteen of the sixteen athletes evaluated, present coincidences between their dynamic leg and their director foot.



DISCUSSION

Based on the characterization of the motor preference of the athletes of the basketball team, training sessions should be studied and particularized in order to take advantage of the potential of each indicator of their laterality pattern, an aspect that modern literature recommends to promote in basketball (Viggiano, *et al.*, 2014; Bale & Scholes, 1986).

Dorochenko (2013) establishes the differences between basketball players who have homogeneous ocular-manual cross-laterality and conducts a study where he confirms that the shooting position of the hoop depends on the directing eye.

An interesting issue is that there is a larger population of homogeneous than crossed; therefore, a larger number of coaches are homogeneous and when teaching hoop shooting, they use methodologies where they have had results that are not those of cross-sided pattern.

In relation to the results of test one, it is recommended for the categories of initiation and training to teach the mechanics of shooting depending on the directing eye of each athlete. In the case of high performance, it will be possible to correct the technique of the shots, to dose the preparation process and to know where it is more comfortable to shoot, even if it is efficient from several angles and positions.

The test two of the dominant hand is essential for the basketball player since it is the one with which he dribbles and makes the shots in advantage (shot in suspension and free throw). Its relationship with the directing eye is an indicator to individualize the preparation of the athlete. The nine athletes (56 %) of the total who are homogeneous imply that their head and body orientation, by having a right eye director and being right-handed, give them the ability to make a shot at 45° of academy. The seven athletes (44 %) who are crossed will achieve a more comfortable shot in the frontal position, a matter to be taken into account in the individual technique and within the team's game strategies.

The types of turns and shots in basketball, whether hook or other, guarantee unmarking, faking and ball throwing, so test three informs us that in 11 athletes their shoulder spin power is to the left and five to the right, which should be used in combination with the information from tests one and two to complete the work of superior shots.

As for the hip laterality, test four, is closely related in the preparation of the basketball player with the turns after obtaining rebound and leave in dribble, also when making moves and turns to gain a position, shots in the air after a turn in spectacular and dribble protection diving and turns with changes of direction.

If we relate the dynamic leg and the power leg, try five, with the under-rim shots, passing and cutting and the ball dummies, it can be beneficial for the mastery of many technical basics in basketball. Also, in relation to test six of the directing foot, it will have a direct relationship with the free throws and in suspension.

Dorochenko (2013) values that there is still a lot of work to be done on the theme of laterality for the sport of basketball "because the role of the dynamic leg and the power leg is very important due to the multiple changes of direction, jumps and receptions. We have to jump and stay with a balanced body that allows us to link an efficient shot, to transmit the forces that come from the ground, to anticipate the



reception. At the dribbling level, of course, preferential shoulder and hip rotations are important".

Basketball researchers and technical personnel continue to carry out studies to perfect the preparation process based on the complexity of better relating the position of the athletes in the game and their directing eye, as well as their performance in the game and the laterality of the shoulder, hip and dynamic leg.

By way of conclusions, it is necessary to state that the study of the theoretical foundations that distinguish the term laterality allowed to specify some conceptions where it is emphasized that its study in high performance athletes constitutes a determining factor for technical performance and sports training.

The motor preferences of school and juvenile substitute athletes of Havana's male basketball team are heterogeneous, which requires individualized attention for teaching and improving technique, in order to take advantage of their genetic potentialities. The characterization of these laterality patterns will allow enhancing athletes' strengths and minimizing weaknesses to contribute to achieve greater effectiveness and game performance.

In relation to the characterization of the oculo-manual relationship, so important for the development of the game of basketball of the sixteen athletes observed, nine are homogeneous and seven are crossed, which will allow individual technical adjustments to the team.

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The authors declare not to have any interest conflicts.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents.



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