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Original article

Study of laterality patterns in youth soccer players

Estudio de patrones de lateralidad en futbolistas juveniles

Estudo dos padrões de lateralidade em jogadores de futebol juvenil

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ABSTRACT

The insufficient study of laterality patterns in sport limits the diagnosis of the type of motor skills and significantly hinders the training planning processes, from the individualities of the soccer players, to seek optimal performance. The objective of the study was to characterize the predominant laterality patterns in male soccer players of the Havana team,



youth category. An exploratory and descriptive study was developed that applied theoretical, empirical (interviews and surveys), and statistical-mathematical methods (using Excel spreadsheets). Six *tests* were applied (Directing eye, Directing hand, Laterality of the hip, Laterality of the shoulder, Dynamic leg and Directing foot), with contextualized international instruments and endorsed by specialized research for their use in Cuba. The heterogeneity of the sample showed the generic trend in the preferential behavior of the soccer players studied.

Keywords: Youth category, soccer, laterality pattern.

RESUMEN

El insuficiente estudio de los patrones de lateralidad en el deporte limita el diagnóstico del tipo de motricidad y obstaculiza notablemente los procesos de planificación del entrenamiento, desde las individualidades de los futbolistas, para buscar el rendimiento óptimo. El objetivo del estudio fue caracterizar los patrones de lateralidad predominantes en futbolistas masculinos del equipo Habana, categoría juvenil. Se desarrolló un estudio exploratorio y descriptivo que aplicó métodos de carácter teórico, empírico (entrevistas y encuestas), y estadístico-matemático (por medio de hojas de cálculo de Excel). Fueron aplicados seis *test* (Ojo director, Mano directora, Lateralidad de cadera, Lateralidad de hombro, Pierna dinámica y Pie director), con instrumentos internacionales contextualizados y avalados en investigaciones especializadas para su uso en Cuba. La heterogeneidad de la muestra mostró la tendencia genérica en el comportamiento preferencial de los futbolistas estudiados.

Palabras clave: Categoría juvenil, fútbol, patrón de lateralidad.

RESUMO



O estudo insuficiente dos padrões de lateralidade no esporte limita o diagnóstico do tipo de motricidade e dificulta significativamente os processos de planejamento do treinamento, a partir das individualidades dos jogadores de futebol, a fim de buscar um desempenho ideal. O objetivo do estudo foi caracterizar os padrões predominantes de lateralidade em jogadores de futebol masculino da equipe Habana, categoria juvenil. Foi realizado um estudo exploratório e descritivo com métodos teóricos, empíricos (entrevistas e pesquisas) e estatístico-matemáticos (por meio de planilhas do Excel). Foram aplicados seis testes (Olho Direcionado, Mão Direcionada, Lateralidade do Quadril, Lateralidade do Ombro, Perna Dinâmica e Pé Direcionado), com instrumentos internacionais contextualizados e aprovados em pesquisas especializadas para uso em Cuba. A heterogeneidade da amostra mostrou a tendência genérica no comportamento preferencial dos jogadores de futebol estudados.

Palavras-chave: Categoria juvenil, futebol, padrão de lateralidade.

INTRODUCTION

The researches on the patterns of body laterality constitute one of the approaches, with newer perspectives, applied in Cuban sports, in recent years; its study on soccer confirms the possibilities of understanding the complexity of a sport which social and cultural factors have required the increasing presence of science and knowledge with different approaches and perspectives. Consequently, the study that is presented emerges from the need to deepen the profiles of the male soccer players of the Havana team, youth category and their reserves, to optimize planning-preparation, in the search for superior performance.

As a technological demand, the general direction of high performance of the National Institute of Sports, Physical Education and Recreation (INDER) requires the diagnosis of the laterality of soccer players, as an integral part of the Comprehensive Athlete Preparation Programs (PIPD).



In the researches of Harris (1961), Zazzo (1963), Rigal (1988), Le Boulch and Valera (1997), Romero (2000), Azémar (2003), Dorochenko (2013), Oca (2015) and Loffing et al. (2016) is revealed the relationship of laterality with the development of sports physical capacities. For their part, Morales and González (2014), Heinen *et al.* (2016), Peters (2018), González *et al.* (2019) and Granero *et al.* (2020) delve into the use of laterality in the modeling of determining information to maintain and improve sports results; meanwhile, Dorochenko (2009) and De la Osa *et al.* (2018) refer to laterality studies, to optimize individual training and act more effectively in the collective game.

In soccer, Haaland and Hoff (2003), Petro and Szabo (2016) and Noa (2017) address the object studied in a decisive way in the motor skills and performance of athletes; in addition to, the requirements for the selection and specialization regarding the direction of the movements and the use of the symmetrical organs of the body. De Dorochenko (2009) uses the characterization of dominant laterality in soccer and its classification.

As a result of the documentary review to support the approach to the subject, it was found that, in Cuba, there are hardly any researches in this regard; for this reason, this article aims to characterize the predominant laterality patterns in male soccer players of the Havana team, youth category.

MATERIALS AND METHODS

Due to the general conception of this study, as well as the methods and procedures used, the research is declared exploratory and descriptive. A population study was carried out, in collaborative work of the Cuban Sports Research Center (CIDC) and the Manuel Fajardo University of Physical Culture and Sports Sciences (UCCFD) and as part of the research project "Studies of laterality patterns of Cuban elite athletes", belonging to the CIDC research program.

The real data-producing sample consisted of 38 players who were part of the pre-selection of youth men's soccer in the province of Havana. The age of the players included athletes



between 15 and 17 years, whose average is 15.26 years, with a sports-competitive experience that averages seven years. The selected sample corresponded to the youthful age, due to the athlete condition of immediate perspective to the High Performance and their condition of athletic quarry of the Provincial Soccer Academy of Havana.

The six tests were applied to determine laterality patterns, with international instruments contextualized and endorsed by research from the CIDC research project (Sánchez et al., 2021). The patterns were evaluated, based on the tests proposed by the project, which are listed below:

- Test 1: sighting test (Zazzo), in order to determine the directing eye.
- Test 2: dominant hand test (exclusive use by goalkeepers), in order to determine the dominant hand.
- Test 3: shoulder laterality (J. Solin test), with the aim of determining the preference for turning the shoulders.
- Test 4: laterality of the waist (J. Solin test), with the aim of determining the preference for turning the waist.
- Test 5: the dynamic leg, in order to determine the dynamic leg and the strength leg.
- Test 6: leading foot, in order to determine the leading foot.

In each test, the corresponding development protocol was considered, the instruments, the selection of human resources, the materials to be used, the means, methods and the evaluation variants were taken into account. Informed consent was required from the entire real sample that produced data. The data collection was recorded in special sheets designed for this purpose and were processed in the EXCEL 2019 database. The examination was carried out individually.

These laboratory tests were developed with the perspective of standardization (on schedule, setting, with the same means and materials). There was support from three municipal



trainers-educators who decided to observe the execution and order of these tests, for the subsequent practices with the teams.

To strengthen the study of laterality patterns, interviews were conducted with the 38 players and surveys with 15 coach-educators, with the aim of determining knowledge about the importance of laterality in sports training, as well as obtaining information on the dynamics regarding the use of laterality in the training process.

RESULTS AND DISCUSSION

The main results of the study were provided by the application of tests and empirical techniques in the sample:

- The 15 specialists, 100 % of the sample, agreed that being able to have instruments and methodological tools that allow this capacity to intervene during training or in its planning represents a novelty.
- 100 % of those surveyed stated that the study can have a certain influence on the selection of talents, allows to act effectively in the dynamics of the game, determine strengths and weaknesses of a team or player and also helps the coach to optimize the planning of the practice, depending on the results.
- There are different criteria on the subject analyzed. 60% raised the treatment from the empirical and a total agreement for its application in training.

Next, the results of the applied laterality tests are presented and it is highlighted that this study has no precedents with the analyzed sample.

The found results took many players (8) by surprise, 21.0 5%, who believed that their dominant side was the opposite of that found in this study; which underlined the importance of real knowledge by the team and the coaching staff. Test 1 that determined the directing eye revealed the right eye as the dominant eye with 58%; the rest, the left



(Figure 1). As a result of this test, it was possible to specify the guiding eye that will directly influence how the players should be and how they should play.

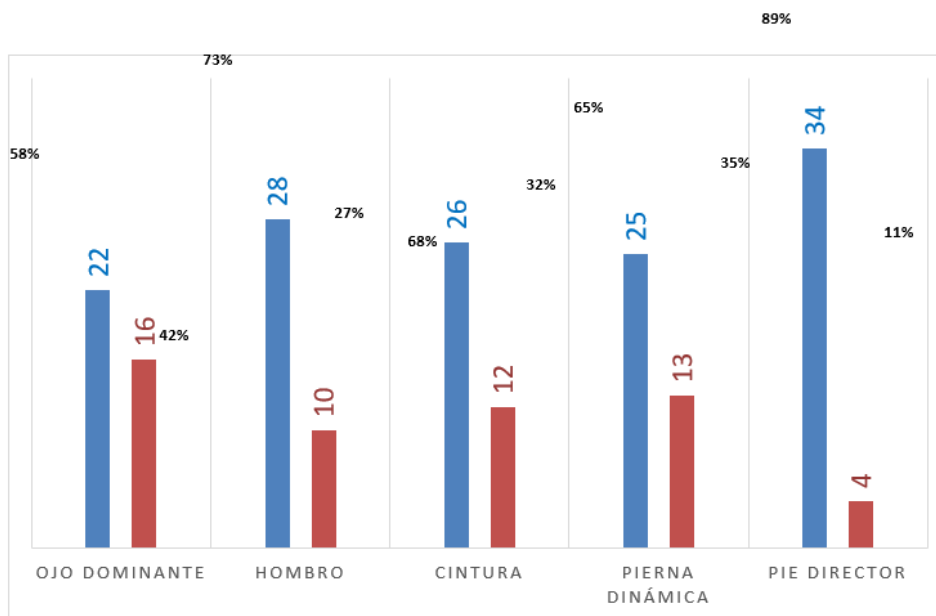


Fig. 1. Analysis of the laterality of the Havana team

As a generic trend, in the preferential behavior of soccer players, oculo-podal laterality is framed in field players, at the level of the dominant hemisphere.

Next, the 2-dominant hand test showed the preferential behavior of the goalkeepers framed by oculo-manual laterality. Of the five goalkeepers on the team, three perform manual skills or abilities, as well as the technical actions of the game with their right hands and one with their left; that is claimed to be his dominant hand, and like the value found in his directing eye, it matched his dominant hand in value. It was concluded that they are homogeneous in relation to their laterality, which represents 80 %. The remaining player with left dominant hand and right directing eye is crossed (Figure 2).



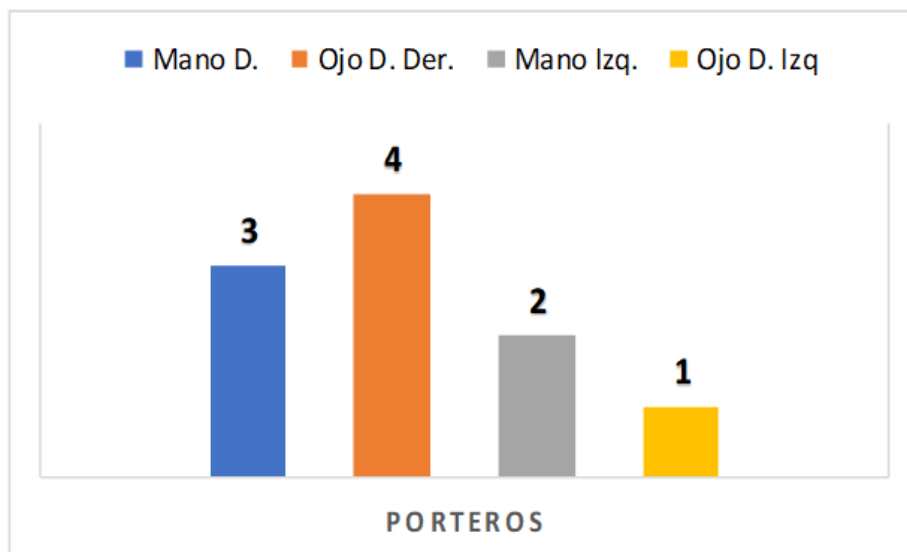


Fig. 2. - Dominant hand test in goalkeepers (eye-hand relationship)

The specific test, carried out on goalkeepers, showed that oculo-manual laterality and oculo-podal laterality play a role of similar importance; contrary to field players, where oculo-manual laterality has a relative importance.

Test 3, shoulder laterality, described the players' preferred turning direction; 27% of the soccer players analyzed had a preference for turning to the left, therefore, they are right shoulder and 73%, to the right, and left shoulder (Figure 1).

The types of turns present in certain offensive-defensive situations in football, as well as in shots on goal, guarantee getting unmarked, feinting, dodging, passing, controlling and scoring the ball at the opponent's goal, among other abilities and skills, for what test 3 reports that in 28 players their shoulder turn power is to the left and ten to the right, which should be used in combination with the information from tests 1 and 2 to properly complete and plan the joint work of different planes (Pietsch and Jansen, 2018).

Test 4, hip laterality, is closely related to the soccer player's preparation in relation to turns; this was evidenced crossing the ball at the end line, coming off a spin-oriented catch, executing a dribble, using shifts and turns to gain position, and in complex technical moves such as aerobatics, off-mark spins, and changes of direction.



In this test, which represented the preferred hip rotation of the players, the following values were obtained. Of the total of 38 players examined, 32 % had a left-hip preference, so they are right-hip, and 68 %, a right-hip preference, so they are left-hip according to that proposed by Dorochenko (2013) and was assumed, for this indicator, in graph 1.

When relating tests 3 and 4, which correspond to the preference of rotation and hip and rotation of the shoulders, it was possible to affirm that of the 38 soccer players, 71.05 % presented coincidences in their preference of direction of rotation between shoulders and hip; the above is deduced from the results of the values obtained in the tests.

In test 5, dynamic leg, it was concluded that 65.78% showed the right leg as dynamic; this implies that his supporting and steering leg is the left. 34.21 % had the left leg as the dynamic leg and the right leg as support and directionality of the ball. While the test 6, that looked at the directing foot, found that 89.47% had the right directing foot and 10.52 % the left.

When relating the results of tests 5 and 6, corresponding to the dynamic leg and the directing foot, it was confirmed that more than half of the evaluated group had their right laterality as dominant and preferably dynamic. Based on the generic trend of preferential behavior, in the oculo-podal laterality as an interaction capacity between the sense of sight and the neuromuscular coordination of the feet, the studied sample revealed the following values (Figure 3).



Fig. 3. - Oculo-podal relationship of the Havana team



The different graphs show a declared heterogeneity, to be taken into account when planning sports preparation. The tests carried out revealed, by tactical positions, that in the goalkeepers the homogeneous right laterality predominated in 60%, 20% showed a crossed laterality pattern and the other by 20 %, a left homogeneous laterality pattern. It is important to recognize the need to work the less skilled side to increase preferential versatility.

Regarding the defensive line, the analysis emphasizes that of the 12 soccer players who play, eight are homogeneous right-handers for 60 %. Of them, 15 % were homogeneous left-handed and 25 %, crossed.

In the midline of the field, laterality patterns are defined between crossed and homogeneous (five crossed, 50 %, four homogeneous right for 40 % and one, 10 %, homogeneous left pattern).

Finally, similar values were found in the front line and in the midline, between crossed patterns and homogeneous patterns described as follows: four crossed patterns (40 %), one left-handed homogeneous pattern (10 %), and five with left-handed patterns. homogeneous right laterality (50 %).

A significant increase in homogeneous right laterality was also revealed, almost in the same value as the cross, due to a decrease in left homogeneous laterality, so emphasis should be placed on the search for left-handed players when selecting talents, as well as being able to enhance this body hemisphere during training to gain advantages and opportunities.

This study, which was the first of its kind in soccer in the Cuban capital, confirmed that the coach's knowledge of laterality allows him to understand the technique of his players, to identify and correct errors; assess new possibilities of functional solutions; implement new exercises and training modes, to reorient situations in technical-tactical action, based on potential and achieve personalized strategies, according to individual characteristics.

Among the dissatisfactions of the researchers was not having included the entire team, because some players were not available at the time of the study for personal or family



health reasons, in the context of the Covid-19 pandemic. Also due to the scarcity of scientific literature that addresses this issue, even when it is considered a significant issue in sport.

The research allows to consider the performance, in recent years, of the so-called changed-leg players, a subject that has hardly been studied. With this, it is expected to take advantage of the dominant laterality and open the way for future studies of this fascinating topic.

The study coincides with the theoretical premises used in Cuban research, such as De la Osa *et al.* (2018), Sanchez *et al.* (2021), Garcia *et al.* (2022) and Martínez *et al.* (2023) that were carried out in the sports of table tennis, fencing and boxing, even with the research by González *et al.* (2019) that covered women's football, from a psychological approach.

CONCLUSIONS

The study of the theoretical foundations of functional laterality made it possible to specify that it is evidenced as a determining factor in the search for technical performance and sports success in basic and high-performance athletes, in correspondence with the characteristics of the practiced sport.

The characterization of the predominant laterality patterns in male soccer players from the Havana team showed that the observed laterality phenotype and the motor preferences of the studied sample are diverse.

The research corroborated the need for individualized attention for the teaching and improvement of technical-tactical actions, on the less skilled side, in order to take advantage of the phenotypic potentialities found and the game dynamics. This made it possible to enhance the strengths of these players and minimize their weaknesses in order to achieve greater effectiveness, game performance and give the player greater versatility within the formative stage in which they are.



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Conflict of interests:

The authors declare not to have any interest conflicts.

Authors' contribution:

Juan Alexis Fals Martínez: Original idea, information retrieval, revision, editing,
processing.

Héctor Noa Cuadro: Conceptualization, research-advice, validation.

Jerry Bosque Jiménez: Research, consulting, methodology, validation.

José M. Soler: Research-advice, methodology, validation.

Santiago León: Conceptualization, information retrieval, review/editing, validation.



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