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Original article

*Assessment of laterality in athletes with hearing impairments in athletics
in Santiago de Cuba*

*[Evaluación de la lateralidad en deportistas con discapacidad auditiva de atletismo en Santiago
de Cuba]*

*[Avaliação da lateralidade em atletas com deficiência auditiva no atletismo em Santiago de
Cuba]*

Liudmila Hernández Soutelo ^{1*} , Alina Bestard Revilla ² , Patricia Martí Estévez ³ 

¹ University of the East. Faculty of Physical Culture. Santiago de Cuba, Cuba

³ Cuban Sports Research Center. Cuba

* Corresponding author: lhernandez@uo.edu.cu

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ABSTRACT

Introduction: One of the objectives of the Comprehensive Assessment of Sports Preparation for Athletes with Disabilities in High-Performance Sports is to diagnose and assess laterality. However, during sports preparation, the potential benefits of laterality in physical, technical, and tactical preparation in sports for people with disabilities are not always fully exploited.

Objective: To evaluate laterality in hearing-impaired athletics athletes in Santiago de Cuba.

Materials and methods: Analytic-synthetic and inductive-deductive theoretical methods were applied. Document analysis and the laterality test were used for empirical methods. Descriptive statistical methods were used.

Results: The evaluation allowed us to understand the current status of the athletes, based on the laterality test, and to develop methodological actions.

Conclusions: theoretical concepts on laterality are needed, which constitute a determining factor for the optimization of sports training.

Keywords: laterality; sports for people with disabilities; sports training.

RESUMEN

Introducción: el proyecto Evaluación integral de la preparación deportiva para atletas con discapacidad en el alto rendimiento, tiene como uno de sus objetivos el diagnóstico y evaluación de la lateralidad. Sin embargo, durante la preparación deportiva no siempre se aprovecha la utilidad que puede tener la lateralidad en la preparación físico-técnico-táctica en los deportes de personas con discapacidad.

Objetivo: evaluar la lateralidad en deportistas con discapacidad auditiva de atletismo en Santiago de Cuba.

Materiales y métodos: se aplicaron los métodos teóricos analítico-sintético he inductivo-deductivo. Con respecto a los empíricos el análisis documental y la prueba de lateralidad. En los estadísticos la descriptiva.

Resultados: la evaluación permitió conocer el estado actual de los deportistas, a partir de la prueba de lateralidad y elaborar acciones metodológicas.

Conclusiones: se precisan en concepciones teóricas sobre la lateralidad que constituyen un factor determinante para la optimización del entrenamiento deportivo.

Palabras clave: lateralidad; deporte de personas con discapacidad; entrenamiento deportivo.

RESUMO

Introdução: um dos objectivos do projeto Avaliação integral da preparação desportiva de atletas com deficiência no alto rendimento é o diagnóstico e a avaliação da lateralidade. No entanto, durante o treino desportivo, a utilidade da lateralidade no treino físico-técnico-tático no desporto para pessoas com deficiência nem sempre é explorada.

Objetivo: avaliar a lateralidade em atletas com deficiência auditiva no atletismo em Santiago de Cuba.

Materiais e métodos: Foram aplicados os métodos teórico, analítico-sintético e indutivo-dedutivo. No que respeita aos métodos empíricos, utilizou-se a análise documental e o teste de lateralidade. No que respeita à estatística, foi utilizado o método descritivo.

Resultados: a avaliação permitiu-nos conhecer o estado atual dos atletas, a partir do teste de lateralidade e elaborar acções metodológicas.

Conclusões: especificam-se as concepções teóricas sobre a lateralidade, que constituem um fator determinante para a otimização do treino desportivo..

Palavras-chave: lateralidade; desporto para pessoas com deficiência; treino desportivo..

INTRODUCTION

Laterality

Laterality is not merely a sensory or motor preference for one side of the body; it is a highly complex function that constitutes the organizing principle of afferent stimulation and motor response. The development of laterality has been shown to be involved in important aspects of psychomotor development, such as motor coordination, spatial orientation, and spatiotemporal perception (Dean & Reynolds, 1997).

The functional preference for one side of the body or the other allows a person to differentiate between the right and left sides of their body, to locate themselves in their environment and in relation to others, which will allow them to form the basis for orientation and spatial structuring. Laterality, therefore, enables the effective use of one's own body and the perception of one's own body schema (Congo *et al.*, 2024).

Thus, certain stimulation conditions, absence of activity in one of the two hemibodies, organic and/or functional problems, without forgetting the influence of social and cultural factors, can produce delays in lateralization and prevent adequate lateral definition, or generate abnormal laterality patterns (Ferré *et al.*, 2006).

According to Blázquez (1982) as cited in Martínez *et al.* (2023), it depends on the lateral predominance that individuals present at the ocular, foot, auditory and manual level for different types of laterality to exist:

1. Dextrality: predominance of the right eye, hand, foot and ear.
2. Left-handedness: predominance of the left eye, hand, foot and ear.
3. Ambidexterity: There is no manifestation of manual dominance. It usually occurs at the beginning of the lateralization process.
4. Crossed or mixed laterality: where the dominant hand, foot, sight or hearing does not correspond to the same side of the body.
5. Reverse laterality: where the child's innate laterality has been thwarted by learning.

Consequently, Martínez *et al.* (2023) explain that we speak of homogeneous laterality when hand, foot, eye and ear offer dominance on the same side, whether on the right (right-handed) or left (left-handed) side, known as homogeneous dexterity. Homogeneous left-handedness is when the limbs of the left side are used, and ambidexterity is when one element on the right side is used primarily and the other on the left side. There is also contrary left-handedness, which occurs when a left-handed subject has been forced for social reasons to use the right homologous limb. And crossed laterality when there is a laterality other than manual for feet, eyes or ears (for example, dominant right hand with dominance of the left eye).

For Dorochenko (2013) and Sánchez *et al.* (2021), laterality is distinguished into: homogeneous (absolute predominance of one side of the body over the other), non-integral or heterogeneous laterality (crossed, inverted, or contrary laterality), and ambidextrous (they do not have a marked predominance).

It has also been shown that sensorimotor preferences can be modified through sports training, rather than being determined by an innate neurological faculty. In short, laterality in sports consists of the predominance of one symmetrical part of the body over another, which allows for greater skill in performing tasks with the dominant part (Del Valle and De la Vega, 2007).

Therefore, the present work is consistent with the previous postulates, since humans are biopsychosocial beings. Therefore, laterality must be viewed as a learning or acquisition process, a relevant aspect that could be applied with appropriate intervention programs, improving sensory organization and the effectiveness of motor responses.

Laterality in sports for people with disabilities

Disability sports allow participants with physical, intellectual, visual, or hearing disabilities, or those with cerebral palsy or acquired brain damage. Disability classification for sports allows participants to be grouped into sports classes where all participants have similar limitations, with the goal of ensuring they can compete on

equal terms, with each athlete's abilities and athletic excellence determining the outcome of the competition.

The study of laterality in sports for people with disabilities has been found to be very incipient. However, Dorochenko (2013) states that laterality is a field that can provide important knowledge about the modification of lateral skills through training. A phenomenon known as "bilateral transfer" has even been described, which results in training the non-dominant limb achieving improved performance in the untrained dominant limb.

In this regard, Fernández & Baz (2023) conducted a case study to determine lateral preference in a para-badminton athlete. This athlete was characterized by presenting a crossed lateral preference in his eye-hand relationship and a homogeneous left lateral preference in his eye-foot relationship. However, the crossed lateral preference in his eye-hand relationship, far from reinforcing his ambidextrous condition, occurred that the athlete was more efficient in serving and hitting with his left hand, thus reinforcing his left homogeneity in the eye-foot relationship.

Likewise, Martí *et al.* (2023) characterized laterality patterns in Cuban para-swimmers, with a homogeneous predominance of right laterality. The dominance of technical skills in starting positions, in the turns and twists of the swimming sport gesture, will achieve technical improvement. Therefore, the study allows optimizing and individualizing the sports preparation of para-swimmers, based on understanding their strengths and minimizing their motor weaknesses for the sake of superior athletic performance.

Meanwhile, Hernández *et al.* (2025) evaluated indicators to determine laterality patterns in deaf wrestlers in the social category. In their analysis, they stated that the execution of technical movements would depend on their disability and the influence that their dominant hand or foot would exert as a biomechanical enhancer. However, the study conducted does not allow for a correlation between the preparation and improvement of sports training and the disability and the category in which they compete.

Other authors such as Betancourt *et al.* (2020), Chicaiza (2021), Manangón (2022), Martínez *et al.* (2023) and Fals *et al.* (2023), have systematized the usefulness of laterality in different sports, with emphasis on the competitive advantages of left-handed athletes over right-handed ones, the characterization of the athlete based on their lateral preferences and the influences that different lateralities (acquired or genetic) can exert on sports performance. However, there is little study regarding the evaluation and/or use of laterality patterns in the preparation of athletes with disabilities in athletics.

Laterality and hearing impairment in athletics

At the Deaflympics, the official language is International Sign Language. The use of hearing aids is prohibited in these competitions to ensure a level playing field. Sports at the Deaflympics feature minimal adjustments to transform auditory signals into visual ones, becoming a true celebration of the world of silence (Ferrante, 2019). Therefore, even though deafness makes hearing difficult, it does not constitute a disability for sports practice.

In this regard, Deaf-Olympic athletics was accredited by the International Olympic Committee (IOC), under the organization and supervision of the International Committee for Sports for the Deaf (ICDS). The IOCDS lists the following events in which athletes can participate: track events: 100, 200, 400, 800, 1500, 5000, and 10,000 meters for men and women. Hurdle and obstacle events are also available, such as: 100-meter hurdles for women; 110-meter hurdles for men; 400-meter hurdles for men and women; and 3000-meter steeplechase for men and women.

In addition, the 4x100m and 4x400m relay events are included, both for men and women. Field events include the high jump, pole vault, long jump, triple jump, shot put, javelin, discus, and hammer throw, for men and women. The heptathlon, a women's event, combines seven different events, and the decathlon, a men's event, combines ten different events.

In athletes with hearing impairments, laterality is affected at the auditory vestibular threshold, making it necessary to evaluate the athlete's side preference in projections to achieve maximum athletic performance and to determine from the subject which side of their body they are most adept at performing sports with the dominant side.

In athletics, Joya *et al.* (2022), Fernando (2023), and Dominique *et al.* (2023) approach the object of study with a systemic thinking approach to laws and rules. They also use pre-sport games as a means to foster volitional attitudes, which sport allows to develop in the face of disability. Research has strengthened social relationships in the practice of para-athletics; however, it was found that, in Cuba, there is hardly any research related to the evaluation of laterality in athletes with hearing impairments in athletics. Therefore, the evaluation of laterality in athletes with hearing impairments in athletics in Santiago de Cuba is of such importance.

MATERIALS AND METHODS

Given the overall concept of this study, as well as the methods and procedures employed, the research is considered exploratory and descriptive. This research was conducted in collaboration with the Cuban Sports Research Center (CIDC) and the Universidad de Oriente (UO) as part of the research project "Comprehensive Evaluation of Sports Preparation for Athletes with Disabilities in High Performance." This program is part of the Sports and Human Development (D-DH) sectoral program. Code: PS242LH001-023.

The research was conducted in the context of sports for people with disabilities, particularly those with hearing impairments, in the athletics department of Santiago de Cuba. Both athletes belong to the Cuban national team. The study population consisted of two female athletes from the distance running (5000m) and multiple events. Both have profound bilateral sensorineural hearing loss. Their ages ranged from 16 to 19 years, with an average of seven years of competitive sports experience.

The following scientific methods and research techniques were used:

At the theoretical level, the analytical-synthetic method was used to analyze and assess aspects related to athletics for athletes with disabilities, with an emphasis on the impact of the scientific results obtained and their visibility. The inductive-deductive method characterized the entire research process, focusing on the scientific knowledge related to the evaluation of athletes' laterality.

Regarding the empirical level, the documentary analysis allowed for a bibliographic review of the background study related to the research. The laterality test evaluated the motor preferences or laterality patterns of athletes with hearing impairments.

To assess the athlete's natural or spontaneous neuromotor laterality pattern, the adapted lateral dominance test by Dorochenko (2013) has been contextualized as cited in Sánchez *et al.* (2021). The measurement performed allows evaluating the relationship between the leading eye and the dominant hand, the leading eye and the dominant foot, shoulder laterality, hip laterality, dynamic leg, and leading foot. The six tests were applied to determine the laterality patterns and were evaluated using the proposed scale, with instruments endorsed by the project (Figures 1 and 2).



TEST DE PATRÓN DE LATERALIDAD	
Prueba No. 1 OJO DIRECTOR <input type="checkbox"/> Derecho <input type="checkbox"/> Izquierdo	Prueba No. 2 MANO DOMINANTE <input type="checkbox"/> Derecha <input type="checkbox"/> Izquierda <input type="checkbox"/> Ambidiestro
Prueba No. 3 Rotación de Hombro <input type="checkbox"/> Derecho <input type="checkbox"/> Izquierdo	Prueba No. 4 Rotación de Cadera <input type="checkbox"/> Derecha <input type="checkbox"/> Izquierda
Prueba No. 5 Pierna Dinámica <input type="checkbox"/> Derecho <input type="checkbox"/> Izquierdo	Prueba No. 6 PIE DOMINANTE <input type="checkbox"/> Derecho <input type="checkbox"/> Izquierdo
RELACIÓN OJO – MANO DOMINANTE <input type="checkbox"/> Homogéneo Derecho <input type="checkbox"/> Homogéneo Izquierdo <input type="checkbox"/> Cruzado	RELACIÓN OJO – PIE DOMINANTE <input type="checkbox"/> Homogéneo Derecho <input type="checkbox"/> Homogéneo Izquierdo <input type="checkbox"/> Cruzado

Fig. 1.- Laterality pattern test



EVALUACIÓN DEL TEST DE LATERALIDAD				
PATRÓN DE LATERALIDAD	RELACIÓN ÓCULO MANUAL Y ÓCULO PODAL			
HOMOGENEO DERECHO	Relación Manual	Óculo	(Ojo Director Derecho-Mano)	Dominante Derecha)
	Relación Podal	Óculo	(Ojo Director Derecho-Pie)	Dominante Derecho)
HOMOGENEO ZURDO	Relación Manual	Óculo	(Ojo Director Izquierdo-Mano)	Dominante Izquierda)
	Relación Podal	Óculo	(Ojo Director Izquierdo-Pie)	Dominante Izquierdo)
CRUZADO	Relación Manual	Óculo	(Ojo Director Derecho-Mano)	Dominante Izquierda)
			(Ojo Director Izquierdo-Mano)	Dominante Derecha)
	Relación Podal	Óculo	(Ojo Director Derecho-Pie)	Dominante Izquierdo)
			(Ojo Director Izquierdo-Pie)	Dominante Derecho)

Fig. 2.- Evaluation of the laterality test

Each test included the development protocol, instrumentation, human resource selection, materials used, media, methods, and evaluation scale. Informed consent was obtained from the study population. Data collection was recorded on sheets designed by the project. The exam was administered individually.

RESULTS AND DISCUSSION

In the laterality test (Table 1), the following results were obtained:

Table 1. - Results of the laterality test

Name	Eye dir.	Sun hand.	Sun. shoulder	Sun hip.	Dynamic leg	Foot sun.	Classification
Eva Mairelis	1	0	1	1	1	0	Eye-hand
							Crusade
							Dominant eye-foot
							Crusade
Angelica	0	0	0	1	0	0	Eye-hand
							Homogeneous right

							Dominant eye-foot
							Homogeneous right
LEGEND	RIGHT 0			LEFT 1			

Source: own elaboration

In test one related to the directing eye:

- In the parathletes under study it is highlighted that one (1) has a left director eye and the other (1) has a right director eye.

For paraathletes who are homogeneous on both the right and left sides, their arm and leg movements, their displacements, dominance, as well as shifts, turns, and other movements toward the non-dominant side can be improved at different levels of body adjustment. These body adjustments would need to be practiced several times to correct errors that may arise from the demands of the mandatory technical elements required by the sporting gesture (Sánchez *et al.*, 2021). Vision, together with spatial location within the competition area, depends on the ability to associate central and peripheral vision and the eye-brain relationship. The positioning on the field from the directing eye must be taken into account for its development and the technical-tactical strategy to follow depending on the disability they present; in this case, we are dealing with deaf parathletes.

In test two related to the dominant hand:

- The parathletes studied (2) have their dominant right hand, so their classification in relation to their director eye for one (1) is crossed and the other is homogeneous right.

In athletics, as in conventional athletics, arm movements must be bilateral in terms of the capacities developed for the upper limbs, be it strength, flexibility, coordination, since they depend a lot on the bilaterality of the movement, both for throwing events, in speed events in the arm stroke, and in events with obstacles (Fernando, 2023). Therefore,

the exercises should be performed with several series of repetitions on the non-dominant hand for the combinations of movements, thus avoiding errors, and improving in terms of technical and tactical strategies for each event, evaluating the effectiveness based on their motor preferences, to increase resources and effectiveness in the competition.

In test three related to shoulder laterality:

- The team under study presents (1) parathlete with a preference to turn to the right where the dominant shoulder is the left and one (1) with a preference to turn to the left so their dominant shoulder is the right.

This indicator influences the speed of movements. These movements also contribute to balance and stabilization in technical elements. The exercises will be aimed at strengthening the sense of the non-dominant side of the movement, promoting bilateral development and achieving movement effectiveness.

For sprinters, shoulder dominance depends on the technical execution of the arm stroke, depending on the event being competed. The arm stroke is extremely important for the upper and lower body to act as a unit. It also balances the rotations that occur in the hips, provides the coordination necessary to assist with push-off, delays fatigue, and balances the body throughout the race (Joya *et al.*, 2022). Proper execution will ensure energy savings, better balance, and improved performance. Performing repetitions of exercises that strengthen the non-dominant side is recommended to improve the bilateral nature of the arm movements involved in racing.

In test four related to hip rotation:

- The result of this test on the parathletes showed that both (2) have preference to turn to the right, so their waist laterality is left.

Knowing the direction of the pelvic rotations naturally favors the execution of movements, as it can allow for greater development of potential in the execution of technical elements and movements with displacements according to specific techniques.

The direction in which they turn is vitally important in their movements, both of the shoulders and waist, because it favors saving effort and time in the accuracy of the movements. Therefore, the work will be aimed at strengthening the non-dominant side of both exercises, to strengthen the rotations of the shoulders and waist. They must execute and master movements that involve both hemispheres (Hernández *et al.*, 2025).

This is why bilateral coordination is so important in different movements and body planes, as this will lead to improved athletic performance, taking into account the disability and classification in which they participate.

Test five related to the dynamic leg:

- This test determined that one (1) parathlete has the left dynamic leg, and the other (1) has the right dynamic leg, so the support or strength leg is the opposite of the dynamic one.

Both athletes are recommended to work on developing their weaker side, developing bilateral flexibility in both legs.

The work will focus on developing bilateral transfer, as it has an important influence as a biomechanical enhancer, as both legs must have the same potential development for the demands of the movements. This will foster mastery of direction and control over movements according to their technical demands, and also aids balance and stabilization of the body in movement.

Test 6 related to the leading foot:

- It reflects that the two (2) parathletes have their dominant right foot and are classified in terms of the relationship between the director's eye and the dominant foot in one (1) crossed and the other (1) homogeneous right.

This indicator also has influence on the same aspects of the dynamic leg test 5, the analysis coincides with the individual disability in each of the parathletes.

Movement execution will be carried out taking into account the individual's disability and the influence of the dominant side. It will also act as a biomechanical enhancer and help address the weakness of the non-dominant foot. This will lead to improved technical performance and improved athletic training, correlated with the individual's disability and the category in which they compete. (Hernández *et al.*, 2025)

CONCLUSIONS

Based on the results obtained and the classification of parathletes, we propose that the coaching group design a group of exercises that allows working from the strengths and weaknesses according to the eye-hand, eye-foot classification, taking into account the combinations of the different movements to overcome and the correction of errors, in order to improve the technical deficiencies that will affect their preparation.

The competitive advantages that hearing-impaired athletes can achieve through their lateral preferences are essential in training. Therefore, the influences that different lateralities (acquired or genetic) can exert on athletic performance are valuable indicators that cannot be underestimated.

BIBLIOGRAPHIC REFERENCES

Betancourt González, J. C., Sánchez Córdova, B., Arias Moreno, E. R., Barroso Padrón, E., & Hinostroza Carriel, E. R. (2020). Patrón de lateralidad en jugadores masculinos de baloncesto, reservas escolares y juveniles de La Habana. *PODIUM - Revista De Ciencia Y Tecnología En La Cultura Física*, 15(3), 449-459.
<https://podium.upr.edu.cu/index.php/podium/article/view/959>

- Chicaiza Jácome, C. A. (2021). El entrenamiento de la lateralidad en los fundamentos técnicos-ofensivos de futbolistas sub-12. Validación teórica/Laterality training in the technical and offensive fundamentals of U-12 soccer players. Theoretical validation. *PODIUM - Revista De Ciencia Y Tecnología En La Cultura Física*, 16(1), 114-124. <https://podium.upr.edu.cu/index.php/podium/article/view/1004>
- Congo Pabón, B. M., Masalema Guaman, Y. E., & Bravo Zambonino, J. M. (2024). Evaluación de la lateralidad mediante el Test de Harris. *Prometeo Conocimiento Científico*, 4(1), e91. <https://doi.org/10.55204/pcc.v4i1.e91>
- Dean, R. S., & Reynolds, C. R. (1997). Cognitive processing and self-report of lateral preference. *Neuropsychology Review*, 7(3), 127-142. <https://doi.org/10.1023/B:NERV.0000005948.00009.ed>
- Del Valle, S. & De la Vega, R. (2007). Lateralidad en el deporte de full contact. Cambios en diferentes condiciones. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, 7 (25), 32-51. <https://www.redalyc.org/articulo.oa?id=54222953005>
- Dominique Moritz, Simone Pearce, Kerry Oeste, Catalina Sherrington, & Guillermo Bellew (2023). Niños con discapacidad en el atletismo competitivo infantil: un enfoque de pensamiento sistémico para las leyes y reglas. *El deporte en la sociedad. Culturas, Comercio, Medios de Comunicación*, 27 (5), 764 - 782. DOI: 10.1080/17430437.2023.2273872
- Dorochenko, P. (2013). *El Ojo Director*. USA: Edición Kindle. <http://murtovaara76.blogspot.com/2010/04/v440ebook-get-free-ebook-el-ojo.html>

Fals Martínez, J. A., Noa Cuadro, H., Bosque Jiménez, J., Monteagudo Soler, J. F., & León Martínez, S. (2023). Estudio de patrones de lateralidad en futbolistas juveniles. *PODIUM - Revista De Ciencia Y Tecnología En La Cultura Física*, 18(2), e1433. <https://podium.upr.edu.cu/index.php/podium/article/view/1433>

Fernández, L., & Baz, J. (2023). Influencia de la preferencia lateral en el rendimiento deportivo de un atleta de parabadminton: estudio de caso. *Memorias del fórum del Centro de Investigaciones del Deporte Cubano*. <http://forumcidc.inder.gob.cu/wp-content/uploads/2023/05/LATERALIDAD-EN-PARABADMINTON.-LISETTE-DANIEL-CIDC.pdf>

Fernando-Kerguelen, J. (2023). El para atletismo un deporte que transforma la vida de jóvenes con discapacidad en el Departamento de Córdoba. *Revista da Associação Brasileira de Atividade Motora Adaptada*, Marília, SP, 24 (1), p. 03-16, 2023. DOI: 10.36311/2674-8681.2023.v24n1.p03-16.

Ferrante, C. (2019). El deporte de Sordos: combatir su incompreensión. Un espacio de juego y de lucha por el reconocimiento. *Revista Latinoamericana de Estudios sobre Cuerpos, Emociones y Sociedad*, 11 (31), pp. 64-76 https://www.redalyc.org/journal/2732/273265804007/html/#redalyc_273265804007_ref11

Ferré V., J., Catalán Balaguer, J., Casaprima Sagués, V., & Mombiela Sanz, J. (2006). *Técnicas de tratamiento de los trastornos de la lateralidad*. Barcelona: Editorial Lebón. Colección Manuales prácticos, I.S.B.N 84-89963-50-9. <https://www.jorgeferre.com/publicaciones/tecnicas-de-tratamiento-de-los-trastornos-de-la-lateralidad>

Hernández Soutelo, L., Bestard Revilla, A., Martí Estévez, P., & Brito Vázquez, E. (2025). Evaluación de la lateralidad en luchadores sordos de la categoría social.

Arrancada, 24(49), 421-430.
<https://revistarrancada.cujae.edu.cu/index.php/arrancada/article/view/693>

Joya-Cruz, M. M., Mahecha-verano, C. D., & Perdomo-Artunduaga, E. (2022). Juegos predeportivos del atletismo paralímpico como medio para favorecer las actitudes hacia la discapacidad visual. *Lúdica Pedagógica*, 1(37), 27-34.
<https://doi.org/10.17227/ludica.num37-18233>

Manangón Vinuesa, J. A. (2022). Importancia de la lateralidad en el desarrollo del dribbling en la iniciación al baloncesto /The laterality importance in the dribbling development in basketball initiation. *PODIUM - Revista De Ciencia Y Tecnología En La Cultura Física*, 17(1), 274-285.
<https://podium.upr.edu.cu/index.php/podium/article/view/1196>

Martí, P., Ramos, L., & Garrido, E. (2023). Caracterización de los patrones de lateralidad en paranadores cubanos. *Memorias del fórum del Centro de Investigaciones del Deporte Cubano*. <http://forumcidc.inder.gob.cu/wp-content/uploads/2023/05/PATRON-LATERALIDAD-PARANADADORES.-PATRICIA-LAZARO-ERNESTO.pdf>

Martínez Pérez, O., Vargas Géliga, E., Álvarez Berta, L. M., & Paz Fortún, M. (2023). Sistematización de estudios sobre la utilidad de la lateralidad en los deportes de combate. *PODIUM - Revista De Ciencia Y Tecnología En La Cultura Física*, 18(1), e1176. <https://podium.upr.edu.cu/index.php/podium/article/view/1176>

Sánchez, B., Ríos, A., Nuevo, O., Lastres, A. y Mesa, M. (2021). Caracterización de patrones de lateralidad de esgrimistas cubanos de élite. *ACCIÓN*. 17, enero-diciembre 21. <https://accion.uccfd.cu/index.php/accion/article/view/156/499>

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Authors' contributions:

Conception of the idea: **Liudmila Hernández Soutelo**

Literature search and review: **Liudmila Hernández Soutelo**

Preparation of instruments: **Patricia Martí Estévez**

Application of instruments: **Liudmila Hernández Soutelo and Alina Bestard Revilla**

Collection of information resulting from the applied instruments: **Liudmila Hernández Soutelo and Alina Bestard Revilla**

Statistical analysis: **Liudmila Hernández Soutelo**

Preparation of tables, graphs and images: **Liudmila Hernández Soutelo and Alina Bestard Revilla**

General advice on the subject matter addressed: **Patricia Martí Estévez**

Writing of the original (first version): **Liudmila Hernández Soutelo**

Review and final version of the article: **Liudmila Hernández Soutelo and Alina Bestard Revilla**

Correction of the article: **Liudmila Hernández Soutelo and Alina Bestard Revilla**

Authorship coordinator: **Liudmila Hernández Soutelo**

Translation of terms or information obtained: **Liudmila Hernández Soutelo and Alina Bestard Revilla**

Review of the application of the applied bibliographic standard: **Liudmila Hernández Soutelo**



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