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Original article

Methodology for bilateral learning of tachi-waza in judokas aged 9-10 years based on functional motor laterality

[*Metodología para el aprendizaje bilateral del tachi-waza en judocas de 9–10 años basada en la lateralidad motriz funcional*]

[*Metodologia para o aprendizado bilateral de tachi-waza em judocas de 9–10 anos baseada na lateralidade motora funcional*]

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ABSTRACT

Introduction: Difficulties in technical execution on the non-dominant side are evident in children's judo, limiting bilateral transfer and competitive performance in the 9–10 age group.

Objective: To develop and validate a methodology for the bilateral learning of *tachi-waza* (standing techniques) based on functional motor laterality.

Methods: A quasi-experimental pretest-posttest design with a control group was employed (n=26; 13 experimental, 13 control). Specific laterality tests (5 tests) and observation guides for technical, tactical, and competitive aspects were applied; these were validated via expert judgment ($k \geq 0.8$) and test-retest reliability using the kappa coefficient. The methodology was structured into three levels of systematic progression and a system of progressive tasks, accounting for homogeneous and crossed motor patterns.

Results: After a six-month intervention, the experimental group increased execution on the non-dominant side from values below 27% to approximately 50%, achieving significant bilateral balance, whereas the control group retained asymmetries.

Conclusion: Integrating laterality assessment, functional technique classification, and bilateral instruction from an early-stage fosters motor transfer and improves technical-tactical performance under real combat conditions. The methodology serves as an effective tool for sports training during school age.

Keywords: motor laterality, school judo, methodology, bilateral transfer, technical learning.

RESUMEN

Introducción: en judo infantil se evidencian dificultades en la ejecución técnica por el lado no dominante, lo que limita la transferencia bilateral y el rendimiento competitivo en la categoría 9-10 años.

Objetivo: desarrollar y validar una metodología para el aprendizaje bilateral del tachi-waza basada en la lateralidad motriz funcional.

Metodos: se empleó un diseño cuasi experimental con pretest-postest y grupo de control (n=26; 13 experimental y 13 control). Se aplicaron pruebas específicas de lateralidad (5 pruebas), guía de observación técnica, táctica y competitiva, validadas por juicio de expertos ($k \geq 0,8$) y fiabilidad test-retest mediante coeficiente de kappa. La metodología se estructuró en tres niveles de sistematicidad y un sistema de tareas progresivas, considerando la motricidad homogénea y cruzada.

Resultados: tras seis meses de intervención, el grupo experimental incrementó la ejecución por el lado no dominante desde valores inferiores a 27 % hasta aproximadamente el 50 %, logrando un equilibrio bilateral significativo, mientras que el grupo control mantuvo asimetrías.

Conclusión: la integración del diagnóstico de lateralidad, la clasificación funcional de las técnicas y la enseñanza bilateral desde etapas tempranas favorecen la transferencia motriz y mejoran el desempeño técnico táctico en condiciones reales de combate. La metodología constituye una herramienta efectiva para la formación deportiva en edades escolares.

Palabras clave: lateralidad motriz, judo escolar, metodología, transferencia bilateral, aprendizaje técnico.

RESUMO

Introdução: No judô infantil são evidenciadas dificuldades na execução técnica do lado não dominante, o que limita a transferência bilateral e o rendimento competitivo na categoria 9-10 anos.

Objetivo: desenvolver e validar uma metodologia para o aprendizado bilateral do tachi-waza baseado na lateralidade motora funcional.

Métodos: foi implementado um projeto quase experimental com pré-pós-teste e grupo de controle (n=26; 13 experimentais e 13 de controle). Se aplicam testes específicos de lateralidade (5 testes), guia de observação técnica, tática e competitiva, validados por critério de especialistas (k ≥ 0,8) e confiabilidade teste-reteste por meio de coeficiente kappa. A metodologia foi estruturada em três níveis de sistematização e um sistema de tarefas progressivas, considerando a motricidade homogênea e cruzada.

Resultados: após seis meses de intervenção, o grupo experimental incrementou a execução pelo lado não dominante desde valores inferiores a 27% até aproximadamente 50%, logrando um equilíbrio bilateral significativo, enquanto o grupo controlava mantuva assimetrias.

Conclusão: a integração do diagnóstico de lateralidade, a classificação funcional das técnicas e o aprendizado bilateral desde etapas temporárias favorecem a motivação de transferência e melhoram o desempenho técnico tático em condições reais de combate. A metodologia constitui uma ferramenta efetiva para a formação esportiva em idades escolares.

Palavras-chave: lateralidade motriz, judô escolar, metodologia, transferência bilateral, aprendizagem técnica.

INTRODUCTION

Judo, since its inception by Jigoro Kano, has been structured as a discipline in which balance, body control, and technical execution depend on harmonious coordination between both sides of the body. According to the International Judo Federation (IJF), there are more than 100 official techniques, and at least 67 are throws, all of which can be executed by either side (right or left). However, in training, especially at

younger ages, there is a marked preference for executing techniques from the dominant side.

Motor laterality is one of the fundamental dimensions of human psychomotor development. It is defined as the particular manifestation of the set of predominant tendencies that determine the complex movements of each hemisphere of the body, shaping motor organization patterns (Azémar, 2003; Sánchez Rodríguez & Briones, 2022). In the sports context, it is not a fixed trait of exclusively genetic origin, but rather an intersegmental functional system that emerges from the interaction between the individual's natural predisposition and the practice patterns to which they are exposed during development. From this, two key concepts arise: preferential motor laterality, which refers to the side of the body that the individual uses spontaneously and effectively in their daily and sporting motor actions, and which can be shaped through systematic practice; and determining motor laterality, which refers to the structural demands that each sports technique places on body segments for its optimal execution.

Judo is a predominantly bilateral sport, which implies a high level of coordination (Joaquím *et al.,* 2025). However, practice reveals that, at an early age, most judokas develop a strong motor asymmetry, executing throws almost exclusively on their dominant side.

This limitation is due to the absence of a methodology that considers laterality.

One of the neurophysiological phenomena that has most revolutionized our understanding of motor learning is bilateral transfer (or *cross-education)*, understood as the ability to execute a motor skill with the contralateral limb after having learned it with the dominant side (Iglesias Soler, 2018). For decades, the traditional approach to sports instruction has postponed work with the non-dominant side until the complete automatization of the pattern with the dominant side, based on a restrictive interpretation of the progression of difficulty (Iani *et al.,* 2025). However, contemporary evidence has shown that this sequencing is not only unnecessary but counterproductive at early ages.

Between the ages of 9 and 10, neurocognitive structures reach a level of maturity sufficient to coordinate actions with both sides of the body in situations of opposition. Studies on joint action in children aged 6 to 8 demonstrate that the mechanisms of co-representation and social transfer of learning are active in early school years, making this period a window of opportunity for the development of functional laterality (Iani *et al.,* 2025).

From a biomechanical perspective, children have not yet completed the ossification of key structures such as the wrists, shoulders and spine (Forero Milán *et al.,* 2026), so it is essential to avoid unnecessary overloads and to focus technical work on clean, fluid and coordinated execution rather than on strength or speed.

Dapi & Cleather (2024) have shown that bilateral training is superior to training exclusively with the dominant hand, with no asymmetry observed in the transfer effect between limbs. In the specific context of judo, the study by Iglesias Soler *et al.* (2018) demonstrates that young judokas who systematically trained with their non-dominant side drastically reduced their lateral preference in real combat situations (randori), going from 77.8% of actions with the dominant side to 23.3% after the intervention, while the groups that maintained traditional training did not change their dominance. These findings indicate that early bilateral practice is capable of modulating lateral preference, taking advantage of the high neuronal plasticity characteristic of childhood.

From a neurophysiological perspective, *cross-education* involves cortical and spinal adaptations that allow for the activation of similar motor patterns in the contralateral hemisphere. These adaptations are particularly sensitive in the pediatric population due to the neuronal plasticity characteristic of this developmental stage. By ages 9-10, neurocognitive structures reach a level of maturity sufficient to coordinate actions with both sides of the body in situations of opposition. Therefore, bilateral instruction should not be conceived as a final addition, but rather as a transversal component that permeates the entire educational process.

In Cuba, research on laterality in combat sports includes studies by Martínez Pérez *et al.* (2026), who characterized laterality patterns in 222 elite athletes from judo, karate, taekwondo, boxing, and wrestling, identifying a majority of right-handed athletes (n=127), followed by cross-handed athletes (n=77). Specifically in judo, Prieto Pérez *et al.* (2022) studied laterality in junior judokas from the Cuban national team, reporting 66.7% as right-handed and 33.3% as cross-handed. Meanwhile, Martínez Pérez *et al.* (2023) analyzed offensive technical mastery in elite Cuban karatekas, observing a marked lateral asymmetry in technical execution during competition.

These studies share a common approach: they diagnose and characterize laterality in high-performance athletes, but they do not propose pedagogical interventions to modify the observed lateral asymmetry. In fact, the systematization by Martínez Pérez *et al.* (2023) itself concludes that "no studies were found that addressed the use of laterality patterns in technical-tactical preparation in combat sports," explicitly acknowledging a gap in the national literature. In accordance with these assumptions, it is proposed to design a specialized methodology that links preferred motor laterality with the technical components of judo to enhance bilateral transfer of learning in 9–10-year-old children.

MATERIALS AND METHODS

The research was developed under a mixed approach, with a qualitative predominance in the exploratory phase and a quantitative predominance in the verification phase, assuming a quasi-experimental pretest- posttest design with a control group.

The materials used were: 10×10 m tatami mats, judogis for each participant, digital stopwatches for recording the executions, digital stopwatches for time control in the randoris, and a computer with the SPSS statistical package version 25 for data processing.

To ensure that the sample size (n=26; 13 per group) was sufficient to detect statistically and practically significant differences, a priori power calculation was performed using G*Power 3.1 (Faul *et al.,* 2007). Considering previous studies on bilateral transfer in children's judo (Iglesias et al., 2018), which report large effect sizes ($d \geq 0.80$), a significance level of $\alpha = 0.05$ and a desired power $(1-\beta) = 0.80$ were established. The analysis yielded a minimum of 21 subjects per group for parametric tests; however, when using non-parametric tests (Mann-Whitney U test), which require approximately 15% more subjects (Field, 2018), the sample size was adjusted to 26 subjects. The post-hoc calculation, based on the effect sizes obtained ($r = 0.741$-0.814), confirmed a power greater than 0.99 in all comparisons, exceeding the recommended threshold and validating the sampling decision.

Theoretical methods. Historical-logical analysis was used to reconstruct the evolution of the concepts of motor laterality and bilateral transfer in children's judo. Through analysis and synthesis, technical execution was broken down into determining body segments (hips, head, arms, legs) and then integrated into the understanding of homogeneous and cross-lateral motor skills. Induction-deduction, based on observations made during competitions, allowed for the identification of regularities regarding laterality difficulties and, subsequently, the deduction of the principles of the proposed methodology. A review of specialized literature provided the theoretical foundation for the concepts of laterality, bilateral transfer, and motor learning in childhood.

Empirical methods. Structured observation was applied using technical, tactical, and competitive observation guides to record deficiencies in training and competitions. Measurement was used through five specific laterality tests to determine the preferred leg in the guard stance, the preferred hand for the initial grip, the preferred hip rotation, the laterality in shoulder rotations, and the preferred arm in the fall (ukemi). Semi-structured interviews were conducted with six coaches with more than ten years of experience in children's judo to identify the body segments that determine the techniques. A pedagogical experiment with a quasi-

experimental pretest- posttest design and control group was implemented to verify the effectiveness of the methodology.

The evaluators of the observation guides remained blinded to group assignment, recording the judokas' performances without knowing whether they belonged to the experimental or control groups. Blinding participants and coaches was not possible due to the nature of the intervention.

Statistical methods and data processing techniques. Data were processed using SPSS version 25. Descriptive statistics were used to calculate frequencies, percentages, and medians of the actions performed on each side and the percentage of bilaterality. The Wilcoxon signed-rank test for paired samples ($\alpha=0.05$) was used to compare pretest and posttest results within each group (experimental and control). The Mann-Whitney U test was used to compare posttest results between the experimental and control groups. To assess the temporal reliability of the laterality tests, Cohen's Kappa coefficient was applied ($\kappa \geq 0.61$ as the acceptance criterion). Qualitative data obtained from interviews and open-ended questions in the user questionnaire were processed using thematic content analysis to identify recurring categories.

Ethical considerations: Written informed consent was obtained from the parents or guardians of the participating judokas. Data confidentiality and anonymous processing were guaranteed. The research was approved by the participating sports institutions and the relevant ethics committee.

RESULTS AND DISCUSSION

Structure and components of the methodology

The methodology developed is based on a functional conception of judo technique, considering the relationship between preferred motor skills and the tactical demands of real-life situations. It is structured into five main components:

According to the classical structure of projection techniques (nague According to Jiménez (2009), the technical execution of judo techniques (waza) is broken down into three essential phases: unbalancing (kusushi), entry (tsukuri), and projection (kake). However, for didactic purposes and for a more precise diagnosis of functional laterality at early ages, these phases are operationalized into four action moments: gripping (kumikata), unbalancing (kusushi), entry (tsukuri), and projection (kake). This breakdown allows for the identification of the determining body segments for each phase and provides the basis for the design of specific laterality tests for judo.

In phase one, the grip (kumikata), the dominant hand determines the initial control of the opponent, while both hands must coordinate opposing forces during the action (one pulls, the other lifts). This requires a differentiated laterality. In phase two, unbalancing (kuzushi), the hips generate the torso's twist to break uke 's axis, while the shoulders transmit that force toward their center of gravity. Rotation in the same or opposite directions, depending on the technique, defines the homogeneous versus crossed classification of the actions.

In the entry (tsukuri), the supporting leg acts as a base of support while the active leg executes the sweep or hook, coordinating with the hip rotation; both, by working on the same side or opposite sides depending on the type of technique, define the homogeneous vs. crossed classification of the actions. In the throw (kake), the hip and active leg generate the final rotational moment in sync while the arms maintain differential traction.

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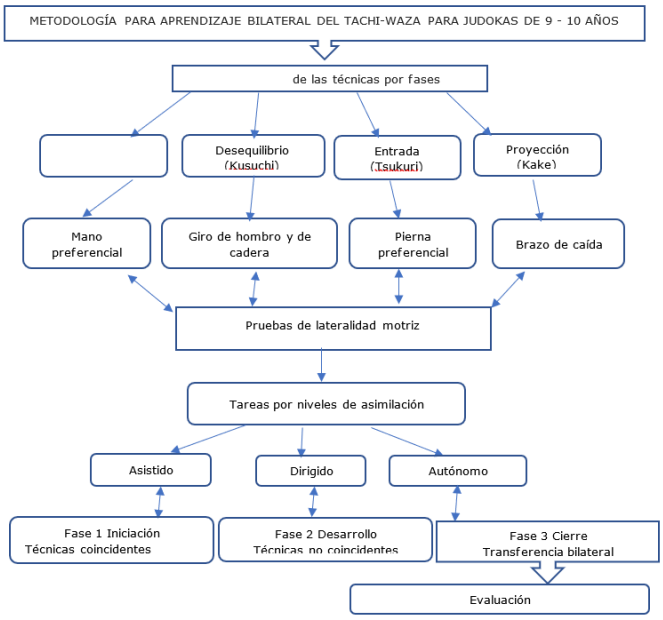


Figure 1. *- Structure and components of the methodology*

Classification of techniques according to their demand on body segments

Based on the previous analysis, each technique can be classified according to the action of the determining segments (hip, active leg, arms), whether they act from the same side (homogeneous motor skills) or from opposite sides (crossed motor skills).

Homogeneous motor skills techniques

In these techniques, the hip and active leg act from the same side of the body, and the arms maintain a relationship of opposing forces, but from an ipsilateral base: osoto-gari, ouchi-gari, okuri-ashi barai and kosoto gake .

Cross-motor techniques

In these techniques, the hip and active leg act from opposite sides of the body, or the arm-hip relationship involves an intersegmental dissociation: sasae tsuri komi ashi, o-goshi , uki-goshi , seoi nage and koshi guruma.

Based on this classification, the laterality tests were designed, taking into account the determining segments identified according to the type of action (Table 1).

Table 1. *- Relationship between functional structure and laterality tests*

Phase of the technique	Segment evaluated	Designed laterality test	Justification
Grasp (Kumikata)	Preferred hand	Test 2: Hand for initial grip	Determine the side from which the judoka controls the opponent
Imbalance (Kuzushi)	Hip rotation	Test 3: Preferential hip rotation	Determine the natural direction of the imbalance
Imbalance (Kuzushi)	Shoulder roll	Test 4: Laterality in shoulder rotations	Determine trunk alignment for imbalance
Entrance (Tsukuri)	Supporting/active leg	Test 1: Preferred leg (guard stance)	Determine the base of support and the leg that executes
Security (Ukemi)	Reflex arm	Test 5: Arm in the fall (yoko) ukemi)	Determines deep and involuntary laterality

Specific motor laterality test for judokas

Recent research in the educational field has demonstrated that diagnosing laterality using tests such as the Harris Test allows for the identification of motor preferences in school-aged children, facilitating subsequent educational intervention (Sánchez Rodríguez & Briones Moreira, 2022). This background supports the relevance of applying a specific laterality diagnosis for the context of judo, which was based on the work of the following authors:

- Regarding the dominant leg, authors such as Dorochenko (2013) distinguish between the dynamic (dominant) leg and differentiated functions. Mayolas Pi and Peñarrubia (2016) demonstrated that lower limb tests are not correlated with each other, justifying the inclusion of multiple tests to differentiate their functions. More recently, Loffing *et al.* (2024) pointed out that general measures of laterality (such as kicking foot) do not predict laterality in specific combat situations, an argument that supports the design of tests contextualized to tachi waza . Based on this, the Solin test (1990), collected by Dorochenko (2013), was adapted, incorporating the guard posture as an

indicator of the supporting leg and the execution of a sweep as an indicator of the dynamic leg.

- Preferred hand for initial grip. Mayolas *et al.* (2011) proposed objective tests to determine lower limb laterality through accurate kicking, static balance and stride jumping, adapted to judo, considering the guard posture and initial grip.
- Preferential hip and shoulder rotation. Solin (1990) developed specific tests for preferential shoulder and waist rotation, consisting of turning to catch an object thrown from behind and 360-degree jumps. Dorochenko (2013) compiled and adapted these tests for application in sports. In the proposed test, these tests were adapted to judo by incorporating a grip on a partner and the execution of turns with the intention of throwing, respecting the functional structure of the tachi (the body's stance). waza.
- Saraiva *et al.* (2025), in a study with judokas aged 9 to 10, demonstrated that combat sports produce significant improvements in motor coordination and segmental control, justifying the use of specific tests that evaluate laterality in sport-specific actions, such as the fall (ukemi). Likewise, Loffing *et al.* (2024) warn that general measures of laterality (kicking foot, writing hand) do not predict lateral behavior in combat situations, making the use of contextualized tests essential. In this regard, the assessment of arm position during a fall (yoko) ukemi), due to its reflexive and involuntary nature, constitutes a valid indicator of functional motor laterality in children's judo, as proposed by Harris (1958) and Zazo (1960).
- Based on the tests carried out, 15 subjects with homogeneous preferential motor skills and 11 with crossed preferential motor skills were identified, all of which provides the possibility of establishing two groups with different motor priorities, to which different technical groups are inherent to start and continue the teaching-learning process, since in this way, by corroborating the relationship of the motor crossing or its homogeneous manifestation with the demanding motor skills in the functional structure of judo techniques.

Progressive organization of content

Three levels of systematicity were established:

- Level 1 (assisted bilateral assimilation): Execution of the technique on both sides (dominant and non-dominant) under facilitated conditions, with emphasis on postural control and understanding of the movement's functional structure. The non-dominant side is worked on from the beginning with verbal prompts, demonstrations, and partial physical assistance. Analytical exercises are used with no opposition or with passive opposition (uke assists). Example: the tori executes osoto gari if it is homogeneous, koshi Guruma if it is of crossed laterality by its dominant side and then by its non-dominant side from a static position, with the partner facilitating imbalance and fall.
- Level 2 (Directed Bilateral Transfer): Execution of the same technical pattern with both sides in a controlled opposition situation, incorporating work by the other side (judokas with homogeneous laterality work on a group of cross-techniques and vice versa). The coordination demands are increased, and external assistance is reduced. The judoka must deliberately alternate attacks with the dominant and non-dominant sides and begin with simple combinations, applying the technique with footwork, changes of direction, and against real but conditioned opposition (randori with lateral restrictions). Emphasis is placed on the ability to choose the side of attack according to the situation. Example: In conditioned randori, the tori must link at least two attacks with the non-dominant side per minute of combat, applying the practiced technique in different directions against real opposition, but without counterattacks.
- Level 3 (bilateral automation): execution of complex combinations and tactical transfer. Both groups (judokas with homogeneous and crossed laterality) practice all the techniques in the program on both sides spontaneously in real combat. They perform complex combinations (three or more linked techniques, including changes of sides during the combination), selecting the side of attack

based on the opponent's stance and movements. Example: free randori and competition.

System of methodological tasks

A set of exercises was designed and applied to:

- Alternating displacements with changes of direction (directionality).
- Mirror turns with partner (crossed laterality).
- Mirroring tasks in pairs (bilateral imitation).
- Technical-tactical combinations on both sides (renraku-waza).
- Alternating projections with rotating uke (stimulation of passive and active laterality).

These tasks aim not only to develop technical skill, but also to generate body awareness, coordinated rhythm, and tactical adaptability.

Subsequently, the methodology was applied. The experimental group (n=13) worked for six months with the methodology, structured in three phases of two months each:

Initiation phase: This phase focuses on using the preferred center of gravity once the body segments with the greatest coherence (homogeneous or crossed) have been identified through laterality assessment. This phase prioritizes techniques whose determining laterality coincides with the judoka 's preferred laterality, so that learning is based on their natural motor strengths.

Development phase: the contralateral limb is incorporated. Techniques are introduced whose determining laterality differs from the judoka 's preference, taking advantage of the turning points and motor patterns already consolidated in the previous phase. This phase aims to expand the technical repertoire to the non-dominant hemisphere.

Closing phase: Bilateral transfer is promoted in opposition situations. Combinations of homogeneous and cross-techniques are practiced, as well as specific exercises for developing the non-dominant side in conditioned and free randori. At the end of this phase, assessment tools are applied to verify the level achieved using scales appropriate to the nature of the indicators in the technical and tactical guides and the competition.

Control group (n=13): worked during the same period with the traditional methodology, based on learning the same technique on both sides (right and left), without considering laterality patterns or the classification of homogeneous and crossed techniques.

Both groups maintained the same training volume (three weekly sessions of 60-90 minutes) and were evaluated with the same instruments in the pre-test and post-test: laterality tests, technical, tactical and competitive guidance.

The results obtained confirm that the specialized methodology based on functional motor laterality substantially improved bilateral execution in 9–10-year-old judokas. The experimental group, which worked for six months with the proposed methodology, increased its percentage of execution on the left (non-dominant) side from values below 27% in the pre-test to figures close to 50% in the post-test, achieving an almost perfect balance between both sides in techniques such as oushi. gari, uki goshi and seoi This behavior contrasts markedly with the control group, which maintained a marked lateral asymmetry (the left side barely exceeded 33% at the end of the study), showing that traditional training does not significantly modify lateral preference.

The results suggest that bilateral transfer is not only possible at an early age, but can be accelerated through a structured educational intervention that integrates the diagnosis of preferred laterality, the classification of techniques according to their determining laterality, and a progressive task system that incorporates work with the non-preferred side from the first sessions. These findings reinforce the thesis that

early bilateral practice, supported by the identification of common limbs and the transition from preferred to contralateral motor skills, is superior to the traditional approach based on the asymmetrical repetition of the same techniques.

In accordance with the above, the results obtained allow us to affirm that the effects of the applied methodology were not only manifested in the level of learning and bilateral transfer of techniques, but were also confirmed in practice within the competitive context. In the provincial championship for the 9–10-year-old category, a substantial improvement in the athletes' tactical performance was evident, expressed in more coordinated execution, greater balance in the use of both sides, and more effective tactical progression during matches (Table 2).

Table 2. *- Distribution of technical actions by laterality before the intervention*

6th Kyu Techniques	Cluster	D(n)	I(n)	Total	D (%)	YO (%)
Okuri ashi barai	Experimental	9	2	11	81.8	18.2
	Control	8	2	10	80.0	20.0
Sasae Tsuri Komi Ashi	Experimental	9	2	11	81.8	18.2
	Control	9	2	11	81.8	18.2
Bear gari	Experimental	11	4	15	73.3	26.7
	Control	10	4	14	71.4	28.6
Ouchi gari	Experimental	10	3	11	76.9	23.1
	Control	11	3	14	78.6	21.4
Kosoto gake	Experimental	8	2	10	80.0	20.0
	Control	7	3	10	70.0	30.0
Uki goshi	Experimental	8	2	10	80.0	20.0
	Control	8	2	10	80.0	20.0
Ogoshi	Experimental	10	3	13	76.9	23.1
	Control	9	3	12	75.0	25.0
koshi guruma	Experimental	9	2	11	81.8	18.2
	Control	10	2	12	83.3	16.7
Seoi nage	Experimental	9	2	11	81.8	18.2
	Control	9	2	11	81.8	18.2

The follow-up at three months post-intervention showed that the bilaterality values in the experimental group remained stable, with a non-significant decrease of 3.2 percentage points ($p > 0.05$), which confirms the permanence of the effects of the methodology over time.

CONCLUSIONS

It was demonstrated that there are structural difficulties in executing techniques on the non-dominant side in child judokas.

Preferred motor laterality should be understood, diagnosed, and used as a teaching resource to structure a more effective and personalized technical preparation.

The proposed methodology contributes to the harmonious development of the judoka in training, enhancing bilateral transfer through specific, progressive motor tasks oriented towards tactical functionality.

The proposal has proven effective in improving technical-tactical skills in real combat conditions, validating itself as a relevant methodological alternative for basic training.

Recommendations

- Include laterality diagnosis in the sports initiation programs of Cuban judo.
- To train coaches in the application of methodologies that consider the bilateral motor structure.
- Extend the validation of the methodology to other provinces and age ranges.
- Study its application in other combat disciplines with similar demands.

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