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## *The selection of school-aged Taekwondo talents based on explosive strength levels*

*[La selección de talentos taekwondistas escolares según los niveles de fuerza explosiva]*

*[A seleção de talentos escolares de taekwondo de acordo com os níveis de força explosiva]*

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### **ABSTRACT**

**Introduction:** Taekwondo predominantly utilizes explosive techniques; therefore, understanding the development level of this capacity is crucial for selecting talented individuals in this discipline. While explosive strength alone does not determine talent,



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it is a factor to consider. However, theoretical and methodological insufficiencies were detected in sporting practice.

**Objective:** To determine the levels of explosive strength in school-aged Taekwondo athletes for talent selection.

**Materials and Methods:** The theoretical methods employed were analytical-synthetic and inductive-deductive. Empirical methods included documentary analysis, surveys, and measurements. Descriptive statistics, using mean and standard deviation, were employed as mathematical-statistical methods.

**Results:** The standing long jump test was administered to 10 Taekwondo athletes. After obtaining individual results, the group mean and standard deviation were calculated to determine the corresponding levels for each athlete.

**Conclusions:** By determining the performance levels of the Taekwondo athletes, the coach has benchmark values to set goals for training and workload assimilation for their athletes.

**Keywords:** Physical capacity, talent selection, combat sports.

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## **RESUMEN**

**Introducción:** en el taekwondo existe un predominio de técnicas con carácter explosivo, por lo que se hace necesario conocer el nivel de desarrollo de esta capacidad como primicia fundamental al seleccionar talentos para esta disciplina. Aunque la fuerza explosiva no determina por si sola al posible talento, es un factor a tener en consideración. Sin embargo, se detectó insuficiencias teórico-metodológicas en la práctica deportiva.

**Objetivo:** determinar los niveles de fuerza explosiva en taekwondistas escolares para seleccionar los talentos deportivos.

**Materiales y métodos:** se emplearon como métodos teóricos de la investigación científica el analítico-sintético y el inductivo-deductivo. De los empíricos, el análisis documental, la encuesta y medición. Como métodos matemático-estadísticos, la estadística descriptiva, con la media y desviación estándar.



**Resultados:** el test de salto de longitud sin carrera de impulso se le aplicó a 10 taekwondistas, una vez obtenido el resultado individual se halló la media y desviación estándar del grupo para determinar los niveles a los que correspondían cada uno de ellos.

**Conclusiones:** al determinar los niveles de comportamiento de los resultados de los taekwondistas, el entrenador tiene los valores de correspondencia para trazarse metas sobre el trabajo y la asimilación de las cargas de sus deportistas.

**Palabras clave:** capacidad física, selección de talentos, deportes de combate.

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## RESUMO

**Introdução:** no taekwondo há predominância de técnicas de caráter explosivo, por isso é necessário conhecer o nível de desenvolvimento desta habilidade como um primeiro passo fundamental na seleção de talentos para esta disciplina. Embora a força explosiva por si só não determine o talento potencial, é um fator a ter em consideração. Entretanto, foram detectadas insuficiências teórico-metodológicas na prática esportiva.

**Objetivo:** determinar os níveis de força explosiva em praticantes escolares de taekwondo para seleção de talentos esportivos.

**Materiais e métodos:** métodos analítico-sintéticos e indutivo-dedutivos foram utilizados como métodos teóricos de pesquisa científica. Dos empíricos, a análise documental, o levantamento e a mensuração. Como métodos matemático-estatísticos, utiliza-se a estatística descritiva, com média e desvio padrão.

**Resultados:** o teste de salto em distância sem corrida de impulso foi aplicado a 10 jogadores de taekwondo. Uma vez obtido o resultado individual, foi encontrada a média e o desvio padrão do grupo para determinar os níveis aos quais cada um deles correspondia.

**Conclusões:** ao determinar os níveis comportamentais dos resultados dos jogadores de taekwondo, o treinador tem os valores correspondentes para traçar metas de trabalho e assimilação das cargas de seus atletas.



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**Palavras-chave:** capacidade física, seleção de talentos, esportes de combate.

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## INTRODUCTION

Taekwondo in Cuba is a traditionally medal-winning sport in the Olympic Games, which is why it is considered a strategic sport. Its achievements include six Olympic medals, demonstrating the consistency and preparation of its athletes (Montejo *et al.*, 2014).

These results are supported by the infrastructure of Cuban sports, and Taekwondo in particular. The planning of Taekwondo training for each of the phases of long-term sport preparation is continuously designed and restructured from the Integral Program for the Preparation of the Athlete (PIPD by its acronym in Spanish), which is composed of four levels:

- Basic Level: Includes the children's category (6-10 years old), ranging from familiarizing children with the sport to introducing them to competitive activity.
- Intermediate Level: Pioneer category (11-12 years old), the beginning of sports specialization and preparation for the technical tests to enter the Sports Initiation School (EIDE by its acronym in Spanish).
- Advanced Intermediate Level: School category (13-15 years old) (the subject of this research). This is a prolonged stage, where the final year marks the transition to the youth stage.
- Advanced Level: The contents of the previous levels and those specific to this level are consolidated and refined.

The 13–15-year-old age group in Taekwondo marks the beginning of the high-performance pyramid, and one specific objective of the Program for the Preparation of the Athlete (PIPD) is the appropriate selection of athletic talent. One aspect to consider in talent selection is physical capacity, both general and specific (Quintana & Quintana, 2023)



In this regard, Morales *et al.* (2023) give greater importance to lower-body explosive strength, considering it one of the most crucial conditional capacities to develop due to the numerous explosive actions performed in combat. This involves achieving acceleration in strikes with jumps, turns, and the Taekwondo athlete's movements. However, the logical specifics of this content are still insufficient in the school-age category.

According to Alberto & Moreno (2018), Romero *et al.* (2020), Díaz *et al.* (2023), and Antunes *et al.* (2024), explosive strength is the amount of internal force that the neuromuscular system can mobilize per unit of time (speed and amount of force developed) and the duration of this force. Explosive strength is one of the main forces used in sports requiring rapid, explosive, and ballistic movements, as it is the first force utilized in quick and precise actions. However, these studies lack specific methods and tests to consider in athletic selection.

In-depth studies on this topic, such as that by Bacuilima *et al.* (2023), highlight the limited management of the talent search and selection process in young Taekwondo athletes. This is due to the scarcity of records showing the use of physical, anthropometric, or psychological tests within sporting organizations. Consequently, this has led athletes to stagnate at a certain point in their competitive stage, limiting their potential for long-term national and international achievements.

Other authors, such as Sánchez *et al.* (2020), Muñoz *et al.* (2022), and Jiménez *et al.* (2024), explain that the selection of athletic talent is a top priority for federations, clubs, and sports schools worldwide, particularly emphasizing the urgent need for talent selection in combat sports. However, according to Orellana *et al.* (2022), the methodology applied to select Taekwondo talent is limited to recruitment through invitations to practice the sport, lacking scientific backing and relying on the coach's empirical judgment based on wins in official and unofficial competitions during the athlete's identification, selection, and training phases.



These elements demonstrate the need for a scientific reference to determine the explosive strength levels of female Taekwondo athletes for sports selection and their correspondence with current competitive demands. Therefore, this research aimed to determine the levels of explosive strength in school-aged female Taekwondo athletes to select athletic talent.

## *MATERIALS AND METHODS*

This study was conducted in La Habana province, Cuba, at the Mártires de Barbados Sports Initiation School (EIDE). The research was carried out with Taekwondo athletes in the school category (ages 13-15), with a sample size of ten Taekwondo athletes. Four coaches working with this category served as information sources. They have over eight years of coaching experience, are black belts, 2<sup>nd</sup> *dan*, with two holding bachelor's degrees and two holding master's degrees in Sports Training.

The following scientific methods were employed:

From a theoretical level, the analytical-synthetic method was used to delve into all stages of the research process. The inductive-deductive method was used for a comprehensive understanding of the research problem, supported by current documents from relevant institutions.

At the empirical level, the documentary analysis method was used, allowing for a bibliographic review of background studies related to the subject matter. The review consulted research articles published in national and international journals and normative documents (PIPD) on Taekwondo.

A survey technique was applied to understand how the explosive strength levels of school-aged Taekwondo athletes were determined. This involved open and closed-ended questions designed to gather as much information as possible on the procedures used for explosive strength testing and evaluation.



Measurement was employed using the standing long jump test. The objective was to determine the lower limb explosive strength of the school-aged Taekwondo athletes. The materials used were a measuring tape and chalk or adhesive tape to mark the jump line.

*Methodological steps for performing the test*

The subject stands behind the marked line with their feet slightly apart. In the phase preceding the jump, they may swing their arms and bend their knees to gain greater impetus. The jump should be initiated with both feet and landed similarly, maintaining foot placement and the initial point of contact, maintaining balance without using their hands for support. Measurement is taken from the heel of the foot closest to the starting line.

- Two attempts are performed, and the best result (in centimeters) is recorded.
- Once this data is obtained, the following procedure is followed:

1. Independent scoring.

2. All test results are processed using:

- Mean: the average value of the behavior of all elements in a group.
- Standard Deviation: The degree of dispersion of each element from the average value. In this research, five of the seven proposed levels were assumed, considering the average level as the range between +/- one standard deviation.
- Then, considering the mean and standard deviation, the level to which each obtained result belongs is determined. Five levels of individual behavior within a given population are established based on central tendency statistics.

Using these statistics, the behavior of each individual within a group can be evaluated, provided they are part of it and meet the conditions guaranteeing their membership. In this specific case, the group would consist of all 13–15-year-olds belonging to the EIDE.

In order to apply consistently the selection criterion, the subject must demonstrate overall behavior at levels IV and V, guaranteeing that they possess aptitudes and attitudes significantly superior to the population.





The application of these central tendency statistics allows the establishment of the following behavior levels (Table 1):

*Table 1. - Central Tendency Statistics*

Very High	Level V	$R \geq x+2s$
High	Level IV	R is between $x+2s$ y $x+s$
Average	Level III	R is between $x+s$ y $x$
Low	Level II	R is between $x-s$ y $x-2s$
Very Low	Level I	$R \leq x-2s$

*Source: Own elaboration*

### **Legend:**

R: Result of the element's behavior within the group, in this case, the child's behavior in a specific indicator.

X: Average (mean) behavior of all individuals in the study population.

S: Standard deviation; the dispersion of each individual's behavior with respect to the average behavior of the study population.

To apply consistently the selection criteria, it is required that the Taekwondo practitioner demonstrates overall behavior at levels V and VI. These levels guarantee that the individual possesses aptitudes and attitudes significantly superior to the general population.

Descriptive statistical methods, such as the mean and standard deviation (central tendency and dispersion statistics), were used to process the results. These statistics describe how the values are distributed, and how close or far they are from the mean. SPSS version 10.0 for Windows was used as the software for performing the statistical analysis of the mean and standard deviation of the obtained results.

## **RESULTS AND DISCUSSION**

Analysis of the survey administered to the four coaches revealed the following:

- Question 1: Regarding guidelines for talent selection, 100% stated that the PIPD only addresses requirements for Immediate Perspective Athletes (API by its



acronym in Spanish) for EIDE and that the fundamental factor was athletic performance.

- Regarding physical testing, only flexibility is considered, requiring maximum amplitude in the three splits.
- Question 2: What importance do you attach to explosive strength in sport? The 100 % determined that it was decisive because of the movements performed and the character of these movements.
- Question 3: Do they take into account the levels of explosive strength to select the talents in this category? The 100 % stated that they performed the explosive strength tests of lower limbs, but the evaluation is conducted individually, not by levels or for talent selection in this category.

Analyzing the coaches' responses, the tests proposed by Zatsiorski (1989) were applied and the evaluation was conducted to determine the levels of the Taekwondo practitioners and to enable talent selection based on these results (Table 2).

**Table 2.** - Results of the standing long jump test applied to Taekwondo practitioners

#	Subjects	Sex	Cat 13-15	Jump of length S/CI	Level
1	TKD1-DALRM	15		2.14	III
2	TKD2JAHH	M	13	2.06	III
3	TKD3WBRMM	14		2.29	III
4	TKD4MLM	M	15	2.06	III
5	TKD5OVF	M	13	2.22	III
6	TKD6AMR	M	14	2.35	IV
7	TKD7KRD	M	14	2.10	III
8	TKD8YGH	M	12	1.99	II
9	TKD9LEDR	M	14	2.37	IV
10	TKD10DVG	M	12	1.97	II
	X			2.16	
	S			.014	
	NIVEL V: > X + 2S			> 2.44	
	NIVEL IV: X + S < R < x + 2S			2.30 < R < 2.44	
	NIVEL III: X - S < R < x + S			2.02 < R < 2.29	
	NIVEL II: X - 2S < R < x - S			1.88 < R < 2.01	
	NIVEL I: < X - 2S			< 1.88	

*Source: Own elaboration*



Analysis of the results determined the levels of the Taekwondo practitioners (Table 3).

**Table 3.** - Results showing the levels of Taekwondo practitioners

Very High	Level V	-
High	Level IV	6 y 9
Average	Level III	1, 2, 3, 4, 5 y 7
Low	Level II	8 y 10
Very Low	Level I	-

*Source: Own elaboration*

Considering the talent selection criteria, which requires results above the population average, it was determined that only Taekwondo athletes 6 and 9 are at level IV. Most are within the average, and two are below average, requiring continued work.

By determining the performance levels relative to the population the coach works with, the corresponding values for each Taekwondo athlete can be established, allowing for the setting of goals regarding training and the assimilation of training loads.

The Cuban Taekwondo talent selection system in the initial specialization phase (13-15 years) evaluates performance capacity, readiness for performance, and training capacity through established indicators. It also includes a balance factor that weighs cases of delayed development. Therefore, all evaluations are integrated to establish a comprehensive criterion for each athlete's status and define levels that allow a selection criterion to be issued (Zatsiorsky, 1989; Bacuilima *et al.*, 2023; Morales *et al.*, 2023).

Conversely, other authors (Alberto & Moreno, 2018; Muñoz *et al.*, 2022; Orellana *et al.*, 2022) argue for the implementation of multidimensional models that consider performance capacity, training capacity, and readiness for performance, based on the characteristics of the sport and the biological development phase of the practitioners. This includes considering the pace of improvement in the most relevant aptitudes and the relationship between chronological and biological age of Taekwondo athletes during the initial specialization phase.



Consequently, given the different approaches adopted by the aforementioned researchers, it can be argued that the epistemological limitations detected in their contributions reveal insufficient methodological procedures. Hence the relevance of this research.

## **CONCLUSIONS**

The systematization of the consulted literature allowed us to address the conceptualization of terms such as sports talent and demonstrated the insufficiencies in the topic of explosive strength in sports selection.

The surveys conducted with coaches revealed deficiencies in referencing the levels of lower limb explosive strength among school-aged Taekwondo athletes for talent selection. Evaluations are currently conducted individually, without any guidance on how to select talent in this category.

Explosive strength results were analyzed and distributed into levels according to the proposed scale. Of the total population, only two Taekwondo athletes were identified as sporting talents based on this test.

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**Conflict of interest statement:**

The authors declare having competing interests.

**Author contribution statement:**

The authors have participated in the redaction of the manuscript and the documentary review.



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