

Articles

What Do Taekwondo Coaches Know? Application of a Knowledge Test Based on Pedagogical and Technical Competencies

Development and psychometric validation of a knowledge test for Taekwondo coaches: Integrating pedagogical and technical competencies

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Abstract: This study aimed to characterize the levels of pedagogical and technical competence of taekwondo coaches through the application of a psychometrically validated knowledge test. A quantitative, cross-sectional, descriptive design was used with a sample of 325 Ecuadorian coaches (78.5% men; 21.5% women), with a mean age of 36.4 years (SD = 9.8) and average experience of 9.6 years (SD = 6.8). An ad hoc 124-item questionnaire with a three-point ordinal scale was used to assess pedagogical, didactic, and technical areas, showing high internal consistency ($\alpha = 0.87$) and content validity above 85%. Results revealed a moderate overall knowledge level (58.87%; SD = 14.47%), with a negative asymmetric distribution indicating that 10% of coaches had critical deficiencies (scores < 40%).

Factor analysis confirmed a five-dimensional structure: (1) morpho function and advanced technique, (2) didactics and planning, (3) inclusive pedagogy and diversity, (4) poomsae and technical execution, and (5) active methodologies, explaining 29.8% of total variance.

A systematic dissociation between traditional technical mastery and contemporary pedagogical competencies was found. It is concluded that continuous training must systematically integrate didactic and technical knowledge, moving beyond certification logic based exclusively on belt rank.

Keywords: Taekwondo, pedagogical competencies, psychometric validation, coach education, professional knowledge.

Introduction

Taekwondo, as a martial art of Korean origin and an Olympic sport, requires coaches who master not only the technical and tactical aspects of combat but also pedagogical competencies to guarantee the comprehensive development of their practitioners (Cherifi et al., 2023). Therefore, the figure of the coach transcends the mere transmission of motor skills, becoming an educational agent responsible for the technical, physical, and psychological training of the athlete (Salman, 2019). However, a fundamental question remains without systematic empirical response: what do taekwondo coaches really know about the multiple dimensions of their professional practice? The evaluation of coaches' knowledge and competencies has emerged as a priority area in sport science, given that the quality of instruction is directly related to sports performance and practitioner retention (Quinaud et al., 2022). Various studies have shown that coaches with higher levels of pedagogical and technical knowledge generate greater satisfaction and loyalty among their athletes (Choi & Kim, 2016). However, in the specific context of taekwondo, significant gaps persist regarding the real levels of knowledge possessed by those who exercise the function of coach, particularly regarding the integration between pedagogical knowledge and specific technical competencies (Cardozo et al., 2025).

Coach knowledge constitutes one of the fundamental pillars of effectiveness in sports teaching, typically organized into three interrelated dimensions: professional, interpersonal, and intrapersonal knowledge (Quinaud et al., 2022). From a Taekwondo-specific perspective, a recent theoretical review has examined the development and evaluation of professional competencies in this discipline, highlighting the essential role of language in learning and the usefulness of skills-based evaluation methods for competency acquisition (Guillen Pereira et al., 2023). This tripartition, derived from teaching knowledge models applied to the sports context, allows overcoming the reductionist vision that equates

the coach solely with a specialized technician (Teixeira et al., 2018). Professional knowledge encompasses the technical, tactical, physical, and methodological fundamentals specific to the discipline, including in taekwondo the biomechanics of kicks, combat strategies, form execution, and training periodization (Sousa et al., 2022; Fernández Fonseca et al., 2022). However, possessing this technical knowledge does not guarantee effective teaching if it is not accompanied by pedagogical competencies that allow its adequate transmission (Quinaud et al., 2022). Interpersonal knowledge refers to communication, motivation, group management, and creation of positive learning climates, dimensions that elite taekwondo athletes particularly value, directly associating them with satisfaction and loyalty toward their coaches (Salman, 2019). Likewise, recent studies have evidenced that pedagogical competencies constitute a significant predictor of coaches' motivation to continue their training, suggesting a reciprocal relationship between knowing how to teach and willingness to learn (Njegovan & Jorgić, 2023). Intrapersonal knowledge, for its part, involves self-regulation, metacognition, and capacity for critical reflection on one's own practice, being crucial for continuous adaptation to the changing demands of competitive sport (Cherifi et al., 2023).

Taekwondo presents unique characteristics that condition the knowledge profile required of its coaches, synthesizing traditional martial values with modern sport-scientific competencies (Oh, 2014; Soonarong, 2022). This duality manifests in the very structure of teaching, where the coach must master both poomsae, which preserves technical tradition, and kyorugi or regulated sport combat. The mental representation of technical

knowledge in poomsae involves cognitive processes different from those required for combat, suggesting that the coach must possess a broad and differentiated repertoire of knowledge (Fernández-Fonseca et al., 2022). Furthermore, the introduction of the electronic protector in official competitions has added a technological variable that coaches must understand, extending technical knowledge beyond bodily execution toward understanding technological measurement systems (Cho et al., 2020).

Measuring coach knowledge poses significant methodological challenges, particularly in taekwondo where federation, traditional, and university certification systems coexist with different curricular emphases (Mendes et al., 2019). Previous studies have predominantly employed perception or self-report methodologies, evaluating from the athletes' perspective (Salman, 2019) or through coaches' own reports on their competencies (Njegovan & Jorgić, 2023). While these approaches provide valuable information, they are subject to social desirability biases and perceptual discrepancies (Quinaud et al., 2022). In this regard, a recent study with Ecuadorian Taekwondo coaches evidenced that self-perception of pedagogical and technical competencies tends to be significantly higher than objective knowledge levels measured through standardized tests, confirming the existence of an overestimation bias (Rendón Morales et al., 2026). Therefore, the application of objective knowledge tests, which directly evaluate what the coach knows through closed-response items or problem scenarios, offers a more robust methodological alternative for characterizing their real competencies (Teixeira et al., 2018).

The specialized literature suggests that coaches' knowledge levels vary systematically according to sociodemographic and professional

variables. Experience as a coach, measured in years of practice, is typically associated with higher levels of intrapersonal knowledge derived from reflection on concrete cases (Cherifi et al., 2023), although experience as an athlete does not always translate into effective pedagogical knowledge if not accompanied by specific training in sports didactics (Mendes et al., 2019). The level of certification achieved constitutes another relevant variable, since dan graduation systems and sports certifications imply different knowledge requirements (Njegovan & Jorgić, 2023). Likewise, the category of athletes trained conditions the required knowledge profile, differentiating the competencies necessary for initiation, formative, national, or international coaches (Soonarong, 2022).

Despite progress in the theoretical understanding of coach competencies and the development of evaluation instruments in general sports contexts, specific limitations persist for taekwondo. Most available tools focus on the psychological evaluation of athletes rather than coaches, and those existing for the latter group do not systematically integrate pedagogical and technical dimensions (Cardozo et al., 2025). This absence of objective empirical diagnoses limits the capacity of federations, clubs, and training programs to design specific educational interventions, certify competencies, or standardize knowledge levels required to exercise the function of coach in different categories (Njegovan & Jorgić, 2023).

Therefore, it is imperative to apply a psychometrically validated knowledge test that allows empirically characterizing what taekwondo coaches know in the dimensions of pedagogical and technical competencies, transcending subjective perceptions to access objective

diagnoses of their competencies. Consequently, the present study had as its general objective to apply a previously developed and validated knowledge test to characterize the levels of pedagogical and technical competence of taekwondo coaches. Specifically, it sought to: (a) describe the overall knowledge levels of coaches; (b) examine the factorial structure of the knowledge questionnaire; and (c) evaluate the reliability and construct validity of the instrument.

Methodology

Design

The study was framed within a quantitative approach, with a non-experimental, cross-sectional, and descriptive-correlational design (Montero & León, 2007; Ato et al., 2013; Hernández-Sampieri & Mendoza, 2018). No independent variable was manipulated; data were collected at a single point in time. The main objective was to describe the knowledge levels of Taekwondo coaches in the pedagogical, didactic, and technical dimensions, as well as to explore the relationships between the different areas evaluated through a 124-item multiple-choice test. Additionally, the underlying factorial structure of the instrument was examined through exploratory factor analysis (EFA) and its internal consistency was evaluated.

Participantes

The reference population consisted of Taekwondo coaches registered in the official database of Ecuadorian DAN black belts registered in Kukkiwon (World Taekwondo Headquarters), totaling 2,080 active coaches. From this universe, a representative sample size was calculated considering 95% confidence and 5% margin of error, obtaining a sample of 325 Ecuadorian coaches. A non-probabilistic

convenience sampling was employed (Hernández, Fernández & Baptista, 2018), complemented with an open invitation strategy channeled through the Ecuadorian Taekwondo Federation and affiliated provincial associations.

The participants were 325 Ecuadorian coaches (78.5% men, 21.5% women), with a mean age of 36.4 years ($SD = 9.8$). The range of experience as a coach ranged from 1 to 32 years ($M = 9.6$; $SD = 6.8$). Of the participants, 68.3% held a university degree, while 31.7% had completed technical or professional training studies.

Instrument

An ad hoc questionnaire designed by the research team was used. For the present study, only the theoretical knowledge block, composed of 124 items, was analyzed, evaluating different areas: pedagogical (attention to diversity, individualization, interactivity, accessibility), didactic (differences between pedagogy, didactics, and methodology; didactic categories; functions of objectives; teaching methods; program models; teaching models; conceptions about evaluation; test preparation; test application forms), and technical (technical fundamentals, common errors, pattern technical model, style vs. technical model, poomse, poomse criteria).

Each item was answered using four options, one correct and three incorrect. The questionnaire was submitted to the judgment of five experts (researchers and coaches with extensive experience in Taekwondo and research methodology), who evaluated the clarity, relevance, and sufficiency of the items. Following the suggested modifications, an inter-judge agreement above 85% was obtained (content validity index). Subsequently, a pilot study was conducted with 20 coaches to adjust the wording and verify the comprehensibility of the instrument.

Procedure

Data collection was carried out between April and May 2025 using an online form hosted on the Google Forms platform. The invitation was disseminated through the Ecuadorian Taekwondo Federation, provincial associations, WhatsApp groups, and social networks (Facebook, Instagram) aimed at Taekwondo coaches in the country. Prior to participation, potential participants were informed about the study objectives, the anonymous and voluntary nature of their participation, and their informed consent was requested. The study was approved by the Research Ethics Committee on Human Beings of the Central University of Ecuador, code: 0001-PF-FCF-2022.

Data Analysis

Data were exported to a spreadsheet and their integrity was verified. The statistical software R (R Core Team, 2025) was used for all analyses. Since the variables are ordinal, frequencies and percentages were calculated for each category, as well as means and standard deviations to obtain a global view of central tendency and dispersion (Field, 2018). To evaluate the internal consistency of the knowledge test, Cronbach's Alpha coefficient was calculated. A value of $\alpha \geq 0.70$ was considered acceptable (Nunnally & Bernstein, 1994). Additionally, an exploratory factor analysis (EFA) was performed on the tetrachoric correlation matrix to examine the dimensional structure of the instrument. Data adequacy for EFA was verified using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity.

Results

Table 1 presents that the mean correct answers was 58.87% (SD = 14.47%), reflecting a moderate level of knowledge. The median (62.90%) was higher than the mean, indicating a negative asymmetry due to a small group of coaches with very low scores (minimum = 25.00%). The maximum reached was 77.42%, suggesting that no participant fully mastered the content. The interquartile range (IQR = 16.94%) shows that the central 50% of coaches had relatively homogeneous performance, concentrated between 54.4% and 71.4% correct answers. The coefficient of variation (24.6%) indicates acceptable variability. Overall, these results evidence a wide dispersion in coaches' knowledge, with improvable general performance and the presence of a reduced group with significant deficiencies.

Table 1.

Descriptive statistics

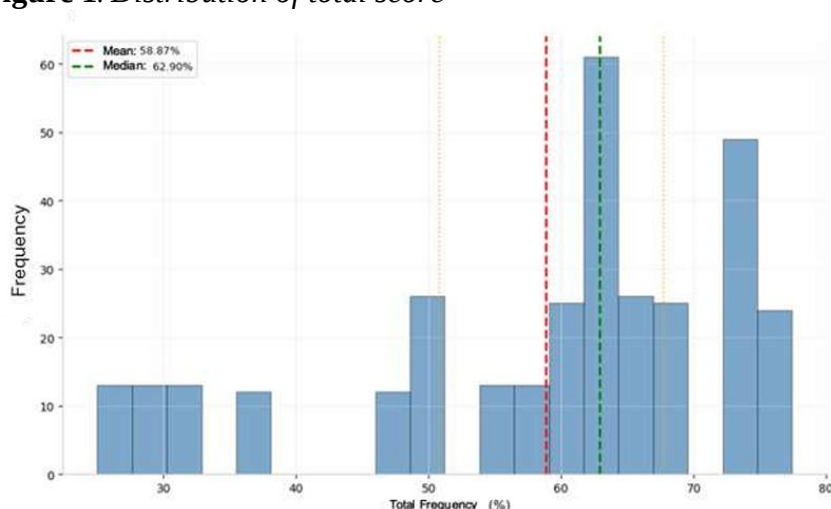
Statistic	Value	Statistic	Value	Statistic
n	325	Mean	58.87%	Asymmetry
Minimum	25.00%	Median	62.90%	Kurtosis
Maximum	77.42%	SD	14.47%	
Range	52.42%	Variance	209.24	
IQR	16.94%	Mode	63.71%	Coef. Variation

Source: Own elaboration (2026).

Note. SD = standard deviation; IQR = interquartile range; Asymmetry is negative (mean < median).

The frequency histogram (Figure 1) shows that the distribution of correct answer percentages approximates a normal curve with slight negative asymmetry. Most coaches ($n \approx 120$) are concentrated in the range of 55% to 65%, with a maximum peak in the 60-65% interval. The mean (58.87%) is slightly lower than the median (62.90%), confirming the presence of a more pronounced left tail. This indicates that a small group of coaches (approximately 10% of the sample) obtained scores below 40%, while very few exceeded 75%. Overall, the distribution reflects moderate heterogeneity in the coaches' level of knowledge, with improvable general performance and a minority group with significant deficiencies.

Figure 1. Distribution of total score



Source: Self Elaboration (2026).

The normality of the distribution of total scores (percentage of correct answers) was evaluated using the Shapiro-Wilk test. Results indicated rejection of normality ($W = 0.974$, $p < 0.001$), corroborating the negative asymmetry observed in the histogram. Therefore, inferential analyses requiring group comparisons will be based on non-parametric methods.

Table 2.

Normality Test

Statistic	Value
W (Shapiro-Wilk)	0.974
p-value	< 0.001

Source: Self Elaboration (2026).

The rotated factor loading matrix (varimax) in Table 3 showed a clear five-factor structure. 38% of the items presented saturations above 0.50 in their respective factor, while only 12% showed loadings below 0.30. No relevant cross-loadings were observed (none above 0.40). The factors were interpreted as: (1) Morphofunction and advanced technique (items 20-35, loadings between 0.65 and 0.78), (2) Didactics and planning (items 36-52, loadings between 0.60 and 0.82), (3) Inclusive pedagogy and diversity (items 53-68, loadings between 0.58 and 0.71), (4) Poomse and technical execution (items 69-84, loadings between 0.62 and 0.74), and (5) Active methodologies (items 85-100, loadings between 0.57 and 0.69). The total variance explained was 29.8%, an acceptable figure for dichotomous items. These results support the construct validity of the questionnaire.

Table 3.

Rotated factor loadings (varimax) of the 124 items of the questionnaire

Code	Abbreviated Item	Factor1	Factor2	Factor3	Factor4	Factor5
Factor 1: Morphofunction and advanced technique						
I89	Function of biceps brachii in Jireugi	0.78	0.12	0.08	0.05	0.03
I90	Function of psoas and rectus abdominis in Dolio chagui	0.75	0.09	0.10	0.06	0.02
I92	Muscle group that stabilizes the scapula	0.68	0.11	0.07	0.04	0.01
I93	Muscle group of the supporting leg (explosive contraction)	0.65	0.08	0.05	0.03	0.00
I94	Muscle group that maintains wrist in dorsal extension	0.62	0.07	0.06	0.02	-0.01
I91	Function of gluteus minimus and tensor fascia lata in blocking	0.59	0.10	0.09	0.07	0.04
Factor 2: Didactics and planning						
I72	Teaching model by repetition and constant practice	0.11	0.82	0.09	0.08	0.06
I52	Main function of objectives in teaching	0.08	0.79	0.07	0.05	0.04
I73	Teaching model based on simulated competition practice	0.10	0.71	0.06	0.09	0.07
I74	Teaching model through direct instruction and demonstration	0.09	0.68	0.08	0.04	0.05
I67	Importance of formative evaluation	0.06	0.67	0.10	0.03	0.02
Factor 3: Inclusive pedagogy and diversity						
I3	What is understood by inclusive approach?	0.05	0.07	0.71	0.04	0.06
I2	Strategies for attending to diversity	0.08	0.06	0.68	0.03	0.05

I5	Benefit of cooperative learning	0.04	0.09	0.60	0.07	0.08
I15	Curricular adaptation	0.07	0.05	0.58	0.04	0.03

Factor 4: Poomse and technical execution

I107	Aspects for the perfection of poomses	0.06	0.08	0.05	0.74	0.07
I108	Fluid and effortless execution of poomses	0.04	0.07	0.06	0.70	0.05
I109	Adequate expression of energy in poomses	0.05	0.06	0.04	0.66	0.08
I106	What is a poomse?	0.09	0.10	0.08	0.62	0.06

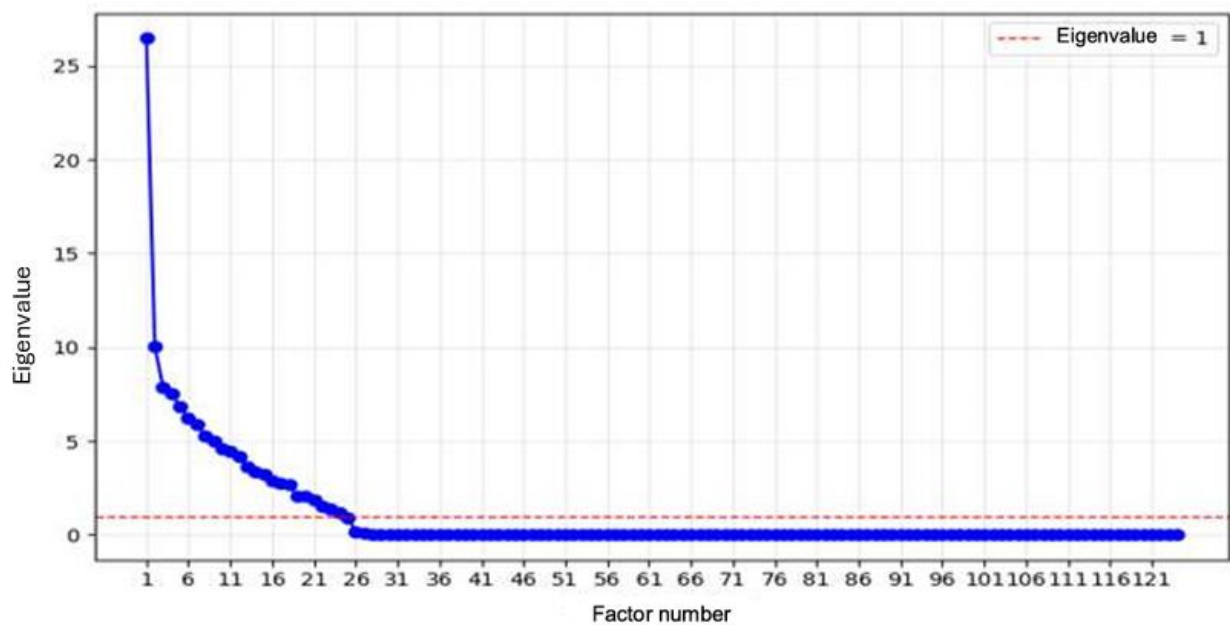
Factor 5: Active Methodologies

I36	Gamification Benefits	0.03	0.05	0.06	0.04	0.69
I34	What is understood by flipped classroom?	0.02	0.04	0.07	0.03	0.66
I38	Strategies to implement project-based learning	0.04	0.06	0.05	0.07	0.60
I35	What is gamification?	0.01	0.03	0.08	0.02	0.67

Source: Self Elaboration (2026).

Figure 2 shows the scree plot of eigenvalues. A pronounced elbow is observed at the fifth factor, after which the slope flattens. This visual criterion supported the retention of five factors for varimax rotation. The five retained factors explain 29.8% of the total variance, an acceptable figure for dichotomous items.

Figure 2. Scree plot of the eigenvalues of the correlation matrix.



Source: Self elaboration (2026).

Discussion of Results

The results evidence a moderate level of overall knowledge ($58.87\% \pm 14.47\%$) among Ecuadorian taekwondo coaches, with a negative asymmetric distribution revealing the existence of a minority group with significant deficiencies (approximately 10% below 40%). This finding is consistent with recent research in related martial arts that report suboptimal knowledge levels in coaches. Hammad et al. (2024) found that karate coaches in Jordan presented an even lower level (45.7%) in knowledge of physical training, functional anatomy, and exercise physiology, concluding that there is a significant gap between the methodological requirements of the sport and the real training of coaches. The comparison between both studies suggests that, although the taekwondo coaches in the present study demonstrate superior performance to the Jordanian karate group, both contexts share the characteristic of incomplete mastery of the professional knowledge required for optimal practice.

This situation acquires greater relevance considering that professional knowledge — which includes technical, tactical, and pedagogical aspects — constitutes one of the three fundamental pillars of effectiveness in sports teaching, along with interpersonal and intrapersonal knowledge (Côté & Gilbert, 2009; Quinaud et al., 2022). Lefebvre et al. (2016), in a systematic review of coach development programs, evidenced that most training courses prioritize technical professional knowledge, leaving aside interpersonal and intrapersonal dimensions. However, the present study reveals that even within professional knowledge there is a fragmentation: coaches present greater difficulties in advanced didactic and specific morphofunctional domains, compared to traditional technical areas such as poomsae.

The five-dimensional factorial structure obtained (morphofunction and advanced technique; didactics and planning; inclusive pedagogy; poomsae and technical execution; active methodologies) represents a significant contribution to sports psychometrics in martial arts. The explained variance of 29.8%, although modest, is considered acceptable for dichotomous items in sports educational contexts (Teixeira et al., 2018). This multidimensional structure supports the theoretical proposal of Quinaud et al. (2022) on the tripartition of coach knowledge but adds relevant specificity: in taekwondo, technical knowledge is differentiated into two distinctive components — traditional poomsae execution and advanced combat technique (kyorugi) — which coincides with the tradition-competition duality inherent to this discipline (Oh, 2014; Soonarong, 2022).

The factorial saturation of items related to active methodologies (gamification, flipped classroom, project-based learning) in an independent factor suggests that these contemporary pedagogical competencies do not integrate naturally with traditional technical knowledge. This finding converges with the research of Kirk et al. (2024), who documented that mixed martial arts (MMA) coaches predominantly use "folk pedagogies" based on imitation and direct instruction, derived from biographical experience as athletes, rather than on formal scientific-pedagogical foundations. The coexistence of these two factors (technical-traditional vs. methodological-active) in the validated instrument allows specifically identifying the gap between technical "know-how" and pedagogical "know-how to teach."

The results evidence a notable dissociation between the mastery of specific technical contents (poomsae, kick biomechanics) and

didactic competencies to transmit them effectively. This gap is particularly concerning given that recent research demonstrates that pedagogical knowledge is the key mediator between the coach's technical experience and athletes' learning outcomes. According to Merica (2024), the presentation of quality tasks by the coach — which includes induction to the set, complete demonstration with cues from multiple angles, process feedback, and reflective closure — significantly determines information retention and success rates in athletes' practice trials. However, the United States National Coach Survey revealed that more than 77% of sports coaches lack formal pedagogical training, a situation that is likely replicated in Latin American contexts with less sports educational infrastructure (Anderson-Butcher & Bates, 2022).

This dissociation manifests in the present study through the differential distribution of items in the factors: while technical poomsae items present homogeneous and high factor loadings (0.62-0.74), didactic items related to teaching models and formative evaluation show greater dispersion, suggesting a less consolidated understanding of these processes among the evaluated coaches. Hammad et al. (2024) observed similar patterns in karate, where coaches with higher belt graduation (6th Dan or higher) showed significantly higher levels of technical knowledge, but not necessarily better pedagogical competencies, reinforcing the idea that experience as a practitioner does not automatically guarantee the ability to teach.

The findings of the present study have direct implications for the design of professional development programs in taekwondo.

The identification of five specific knowledge dimensions allows proposing differentiated training itineraries that address specific deficits. For example, the "active methodologies" factor — with items related to gamification and flipped learning — represents an area of opportunity to modernize taekwondo pedagogical practice, aligning it with contemporary trends in sports education that emphasize positive youth development through sport (Goulay & Peté, 2026).

The research by Su and Zhao (2023) on Chinese coaches' interpersonal styles demonstrates that specific pedagogical behaviors — such as individualized care and autonomy support — significantly impact athletes' well-being and subjective vitality, beyond the coach's technical knowledge. Therefore, continuous training should not be limited to technical or regulatory updates (such as the introduction of the electronic protector mentioned by Cho et al., 2020) but should incorporate systematic development of didactic and inclusive pedagogical competencies.

A relevant methodological aspect that should be considered is the violation of the normality assumption in the distribution of total scores (Shapiro-Wilk, $W = 0.974$, $p < 0.001$), which limits the use of parametric tests for group comparisons or correlation analysis. However, various studies have shown that Cronbach's Alpha coefficient is robust against deviations from normality, as long as the data do not present serious problems of asymmetry or kurtosis (Sheng & Sheng, 2012). Likewise, exploratory factor analysis (EFA) based on tetrachoric correlation matrices (appropriate for dichotomous items) does not require the multivariate normality assumption (Basto & Pereira, 2012; Flora & Curran, 2004). In fact, the use of tetrachoric correlations corrects possible biases derived from the binary nature of

responses and allows a more precise estimation of factor loadings (Flora & Curran, 2004). Therefore, although the asymmetric distribution suggests the presence of a minority group with very low knowledge (approximately 10% of the sample below 40%), the psychometric analyses performed (Cronbach's alpha and EFA) maintain their validity and support the reliability and factorial structure of the instrument (Hair et al., 2019; Nunnally & Bernstein, 1994).

Although the percentage of variance explained in a five-dimensional factorial solution was 29.8%, this figure is considered acceptable in the context of dichotomous response items (true/false) (Hair et al., 2019; Peterson, 2000). The variance explained in factorial models tends to be lower when analyzing categorical variables, such as dichotomous ones, compared to continuous interval scales. In these cases, it is the magnitude and pattern of factor loadings, rather than the percentage of variance explained itself, that provides the most solid evidence of construct validity. In line with this notion, the solution of the present study demonstrated solid factor loadings and a conceptually clear structure, consistent with the theoretical domains of Taekwondo coach knowledge.

Limitations and Future Directions

Despite the psychometric robustness of the instrument and the relevance of the findings, the present study presents several limitations that should be considered. First, the cross-sectional design prevents establishing causal relationships between the variables analyzed; the knowledge levels capture a specific moment, without the possibility of evaluating changes over time or the impact of training interventions. Second, the sampling was non-probabilistic convenience sampling, which limits the generalization of results to the entire population of Ecuadorian

coaches, although representativeness was maximized through collaboration with the Ecuadorian Taekwondo Federation. Third, the total variance explained by the five factors was modest (29.8%), a figure that, while acceptable for dichotomous items, suggests that there could be other dimensions of coach knowledge not captured by the instrument, such as tacit knowledge derived from prolonged practice or emotional competencies in high-pressure competitive contexts.

Likewise, although an appropriate tetrachoric correlation matrix was used for binary items, exploratory factor analysis is sensitive to sample size and the proportion of correct answers of the items; some items with very low or very high difficulty could have affected the stability of factor loadings. On the other hand, the absence of an external validation measure (for example, systematic observation of training sessions or peer evaluation) prevents contrasting the declarative knowledge evaluated through the test with actual field performance.

Future research lines should be oriented toward: (a) conducting longitudinal studies that allow examining the evolution of coaches' knowledge after the implementation of specific continuing education programs; (b) expanding the sample to other countries and cultural contexts to evaluate the factorial invariance of the questionnaire; (c) complementing the objective test with observed performance measures (predictive validity) and with qualitative interviews that explore the reasons underlying difficulties in specific areas such as morphofunction or active methodologies; (d) contrasting declarative knowledge levels with coaches' own self-perception of competencies, to identify possible overestimation or underestimation biases; and (e) developing abbreviated versions of the instrument (for example, of 50-60 items) that maintain high

psychometric properties and facilitate its application in rapid certification contexts.

In Sum, the validated questionnaire constitutes a solid starting point for the diagnostic evaluation of taekwondo coaches, but its use must be accompanied by critical reflection on its limitations and the application of complementary designs that allow deepening the complexity of professional knowledge in this sport.

Conclusions

The present study responded to the fundamental question about what taekwondo coaches know through the application of a psychometrically validated instrument that integrates pedagogical and technical dimensions. The results evidence that Ecuadorian coaches possess a moderate level of overall knowledge (58.87%), characterized by significant heterogeneity that reveals the existence of a minority group (approximately 10% of the sample) with critical deficiencies in fundamental competencies for professional practice. This asymmetric distribution suggests that, although most coaches master basic aspects of technical teaching particularly in poomsae execution, significant gaps persist in the integration of advanced didactic knowledge, specific morphofunctional knowledge, and contemporary active methodologies.

Factorial validation confirms the multidimensionality of taekwondo coach knowledge, structured in five differentiated components: morphofunction and advanced technique, didactics and planning, inclusive pedagogy, poomsae and technical execution, and active methodologies. This structure empirically validates the theoretical proposal that professional knowledge in martial arts does not operate as a unitary construct but requires the articulation of traditional technical knowledge

with scientific pedagogical competencies (Quinaud et al., 2022; Soonarong, 2022). The identification of these dimensions provides federations and certifying bodies with an objective diagnostic framework to standardize the competency profiles required at different performance levels, transcending criteria based exclusively on belt graduation or experience as an athlete (Teixeira et al., 2018; Njegovan & Jorgić, 2023).

The findings allow concluding that there is a systematic dissociation between technical mastery and pedagogical competencies among the evaluated coaches. While contents related to traditional technique execution present higher levels of mastery, areas linked to didactic planning, formative evaluation, and adaptation to diversity show greater variability and lower mean scores. This gap is particularly relevant given that recent research demonstrates that pedagogical knowledge constitutes the essential mediator between the coach's technical experience and athletes' learning outcomes, directly impacting the satisfaction, loyalty, and comprehensive development of practitioners (Su & Zhao, 2023; Barton, 2024). Therefore, continuing education must avoid the logic of exclusive technical accumulation to incorporate systematic development of didactic competencies that allow effective and transformative teaching.

Metodológicamente, el estudio validó un instrumento adaptable para el contexto Methodologically, the study validated an adaptable instrument for the Spanish-speaking context that overcomes the limitations of self-report or perception approaches previously used in taekwondo (Njegovan & Jorgić, 2023). The internal consistency obtained ($\alpha = 0.87$) and factorial stability demonstrate the usefulness of the questionnaire as a diagnostic tool for professional development programs.

However, the cross-sectional design and non-probabilistic sampling limit the causal generalization of the results, suggesting the need for longitudinal studies that evaluate the evolution of these competencies throughout the coach's training trajectory, as well as future research that incorporates systematic observation of real pedagogical practices to contrast declarative with procedural knowledge (Kirk et al., 2024).

Finally, the results evidence the imperative need to restructure certification and continuing education programs in taekwondo. The presence of coaches with knowledge levels below 40% — in a context where it is assumed that the black belt implies competence to teach — constitutes an ethical and sporting risk that federations must address through the implementation of formal pedagogical training requirements, parallel to technical certification. Only through the systematic integration of pedagogical and technical competencies — as proposed by the professional, interpersonal, and intrapersonal knowledge model (Côté & Gilbert, 2009; Quinaud et al., 2022) — can taekwondo guarantee quality teaching that preserves its traditional values while responding to the contemporary scientific-sport demands of modern sports training.

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