Validity and reliability evidence of the TEVOL Brazil instrument for volleyball performance analysis

Evidencia de validez y confiabilidad del instrumento TEVOL Brasil para el análisis del rendimiento en voleibol

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Abstract

Objective: the primary objective of this study was to perform the cross-cultural adaptation and the preliminary validation of the Volleyball Techniques and Effectiveness Observation Instrument (TEVOL) specifically for the Brazilian context.
Methodology: a total of twenty-three specialists participated in four distinct stages: formal translation, content analysis, a pilot study, and the verification of intra- and inter-rater reliability.
Results: statistical analyses performed using SPSS® and Jamovi® software indicated high content validity (CVCc = .94), strong intra-rater reliability (r = .89–1.00), and strong inter-rater reliability (r = .63–.96; ICC ≥ .79).
Discussion: these comprehensive results demonstrate inter-rater consistency and stability in measurements. It is concluded that the TEVOL instrument presents solid preliminary evidence of validity and reliability for technical-tactical analysis, contributing to the standardization of assessments and the advancement of research on athletic performance.
Conclusions: furthermore, it supports its application in academic and professional contexts of contemporary Brazilian volleyball, with rigorous methodological criteria that can be replicated in future empirical research.

Keywords

Performance analysis; psychometrics; reliability; validity; volleyball.

Resumen

Objetivo: el objetivo primordial de este estudio fue realizar la adaptación transcultural y la validación preliminar del Instrumento de Observación de las Técnicas y la Eficacia en Voleibol (TEVOL) específicamente para el contexto brasileño.
Metodología: un total de veintitrés especialistas participaron en cuatro etapas metodológicas distintas: traducción formal, análisis de contenido, un estudio piloto y la verificación de la confiabilidad intra e interevaluador.
Resultados: los análisis realizados con los programas SPSS® y Jamovi® indicaron una alta validez de contenido (CVCc = .94), una fuerte confiabilidad intraevaluador (r = .89–1.00) y una sólida confiabilidad interevaluador (r = .63–.96; ICC ≥.79).
Discusión: estos resultados integrales demuestran consistencia entre evaluadores y estabilidad en las mediciones. Se concluye que el TEVOL presenta evidencias preliminares de validez y confiabilidad para el análisis técnico-táctico, contribuyendo a la estandarización de las evaluaciones y al avance de las investigaciones sobre el rendimiento deportivo.
Conclusiones: además, respalda su aplicación en contextos académicos y profesionales del voleibol brasileño contemporáneo, con criterios metodológicos rigurosos y replicables en futuras investigaciones empíricas.

Palabras clave

Análisis de rendimiento; confiabilidad; psicometría; validez; voleibol.

Introduction

Game analysis has gained prominence in high-performance sports as it is an observational technique of situations that occur during a match, which are filmed, observed, recorded, and transformed into computed information by a specialist in order to investigate the performance and limitations of athletes (Cunha et al., 2001; Nevill et al., 2002; Santos et al., 2017). This technique has been used in several team sports modalities, such as soccer (Clemente et al., 2012; Moreira et al., 2019; Santos et al., 2017; Santos et al., 2024), basketball (Reis et al., 2025; Paulauskas et al., 2024), handball (Afonso et al., 2024; Wagner et al., 2023) and volleyball (Aščić et al., 2025; Silva Lima et al., 2025; González-Silva et al., 2020).

In the context of high-performance sports, one of the modalities that has undergone the most changes over the years is volleyball, due to the evolution of athletes' abilities, tactical play, and technical advancements - factors that have made the sport more attractive and the match faster (Shondell & Reynaud, 2005). Championships have become more competitive, and game analysis has assumed an essential role in understanding the situational characteristics of competitive sports, especially regarding the technical and tactical aspects of the modality, constituting an indispensable area of study for the development of collective sports (Marques Junior, 2013).

In a systematic review study, Otero-Saborido et al. (2021) listed instruments used for game analysis in high-performance volleyball matches, such as DataVolley (Alcaraz et al., 2016a, 2016b, 2017), the Volleyball Information System – VIS (Afonso et al., 2010) and the Volleyball Rally Observation System – VROS (Marcelino et al., 2012). As a practical application of such instruments for the production of scientific investigations, authors have used Data Volley to analyze training in accordance with the characteristics and function of athletes (Harabagiu, 2020), as well as to measure the effectiveness of technical-tactical actions in competitions (Harabagiu & Pârvu, 2023), bringing the use of software closer to the practical reality of the sport. Furthermore, there are companies and institutions specializing in generating information on teams' technical-tactical performance, based on data derived from situational and environmental variables specific to the sport (Otero-Saborido et al., 2021).

Although widely used in practice, these instruments lack standardization for performance analysis and are often developed solely for empirical purposes or specific studies, without undergoing rigorous stages of a formal validation process (Fernandes, 2019). This aspect is reflected in the review conducted by Otero-Saborido et al. (2021), in which only two studies presented instruments that included some stages of the construction and validation process. The (Palao, Manzanares, et al., 2015) study reported psychometric properties related to content validation, validity analysis, and intra- and inter-rater reliability of an instrument designed for Spanish court athletes, the TEVOL-R. In the study by Palao et al. (2015), the psychometric properties presented for TEVEBOL, an instrument intended for beach volleyball, were intra-rater and inter-rater reliability analysis. However, in the context of Brazilian volleyball, no instruments were found that reported construction and/or adaptation and validation processes intended for high-performance athletes (Fernandes, 2019; Silva, Stefanello, & Machado, 2025).

Therefore, the instruments applied were limited to observational techniques, which compromises the standardization and reliability of the data, restricting the generalization of the results and their application in broader contexts of sports practice and academic research (Laclote-Gutierrez et al., 2025).

Thus, the standardization of a technical-tactical rating instrument, by means of a psychometrically validated instrument, becomes extremely important, since the diversity of personal interpretations by researchers and professionals in the application of an instrument, in addition to hindering the observation of an athlete's behavior, results in inconsistencies in assessing the intended subject of the rating (Collet et al., 2011, 2018). Furthermore, evaluating sports performance using techniques that lack proper validation and standardized evaluation protocols increases subjectivity in data interpretation due to limited reliability, thereby hindering the reproducibility of studies using the same instruments. (Fernandes, 2019)

Therefore, due to the absence of technical-tactical analysis instruments that have undergone a rigorous scientific validation process for measuring the technical-tactical performance of athletes, used in a game environment within the Brazilian sports context, this study aimed to determine the evidence of validity and reliability of the Instrumento de Observación de las Técnicas y la Eficacia en Voleibol – TEVOL for its use in high-performance Brazilian athletes.

Method

Participants

The study sample consisted of four distinct groups. Group 1, responsible for translating the instrument, consisted of 6 specialists in the areas of volleyball, psychometrics, and sports performance (3 of them with Physical Education doctorates), with average age of 45.3 ± 14.2 years (minimum 29 and maximum 55) and 13 ± 15.1 years of experience (minimum 9 and maximum 37). Group 2, responsible for the instrument content analysis, was composed by 10 experts in volleyball, coaches and sports performance analysts (6 PhDs and 4 Masters), with an average age of 40.6 ± 10.1 years (minimum 28 and maximum 54) and 25.0 ± 11.02 years of experience (minimum 10 and maximum 39). Group 3, intended for the pilot study, consisted of 2 volleyball experts and coaches of the sport (1 master's student and 1 PhD), with average age of 29.5 ± 2.12 years (minimum 28 and maximum 31) and 11.0 ± 2.82 years of experience (minimum 9 and maximum 13). Finally, for the purpose of intra- and inter-rater evaluation, group 4 was composed of 5 experts in volleyball, coaches of the sport and sports performance analysts (4 PhDs and 1 Master), with an average age of 45.6 ± 10.76 years (minimum 31 and maximum 57) and experience of 28.6 ± 10.95 years (minimum 13 and maximum 39).

Instrument

The *Instrumento de Observación de las Técnicas y la Eficacia en Voleibol* (TEVOL) aims to collect information on game actions from match recordings or training sessions, and was designed to analyze technical-tactical actions in volleyball (Palao & Manzanares, 2009). The instrument collects information subdivided into six subcategories: (1) Introduction (presentation of objectives); (2) Match Information Records (anamnesis of the match or training); (3) Game Status Record (information regarding the structural aspects of the situational environment of a volleyball match); (4) Technical Actions Information Record (all technical actions performed by athletes during a match or training); (5) Final Result of Actions Information Record (the final result of the combination of all variables existing in the dynamics of a game; the effectiveness of the team analyzed); and (6) Annexes (references, images, glossary of terms and additional information).

Regarding the functionality of the instrument, information is initially collected on the context and characteristics of the game or training session being analyzed. Then, data area collected on the actions performed by the players, such as: type of technique used (set, forearm pass, spike, block, high block, low block, roll, attack coverage), the position of the player executing the action (setter, outside hitter, opposite hitter, middle blocker, libero), the court zone where he action is performed (zone 1, 2, 3, 4, 5, 6, 7, 8 or 9), the timing of the actions performed (game set beginning or ending, after the team's serve or the opponent's serve, during the rally), and their effectiveness (error, continuation of the rally, or scoring). To rate effectiveness, a scale of four or five values or categories is used. The extremes of the scale indicate, at the bottom, the worst possible effectiveness (error) and at the top, the best possible effectiveness (score).

Measurement scales vary depending on the type of technical action. This way, it is possible to differentiate the nature of actions according to their objective, namely: (a) Continuity actions - behaviors that seek to neutralize actions of the opposing team and/or organize the attack of the team itself in the best possible conditions. Continuity actions are defined by: reception, setting, and defense; (b) Terminal actions - aim to score a point and/or hinder the organization of the opposing team's attack. Terminal actions are defined as: serve, attack, and block (Palao & Manzanares, 2009).

Procedure

This study was conducted in four stages, after the Research Ethics Committee of Universidade Federal do Paraná (Health Sciences Sector – SCS) approved the methodological procedures (opinion 1.574.185). The first stage involved the translation of the instrument by group 1. In the second stage, the specialists from group 2 analyzed the content to verify the clarity of language, practical relevance, and theoretical relevance of the instrument. The third stage comprised a pilot study conducted by group 3, with the objective of testing the instrument and the feasibility of its use. In the fourth stage, intra- and inter-rater analyses were performed. Finally, a psychometric analysis of the instrument was carried out, evaluating

the validity evidence based on the content (clarity of language, practical relevance, and theoretical relevance) of the complete instrument, and a reliability analysis (intra- and inter-rater analysis), only for chapter four of the original TEVOL (Technical Actions Information Record). The remaining chapters were not included in this stage of the study as they present general team information (such as team name, jersey number, match date, among others). The research was conducted March 2017 - December 2019.

Translation and cross-cultural adaptation of the TEVOL instrument – Brazil. For the cross-cultural translation, the procedures of the back-translation technique (Cassepp-Borges et al., 2010) were followed. Initially, authorization was requested from the authors of the original instrument to carry out the translation, adaptation, and validation of the TEVOL for the Brazilian sports context. Next, the original Spanish version was translated into Portuguese by two independent, bilingual translators without prior contact with the instrument. Subsequently, a synthesis of the two translations was performed by another independent researcher, creating a Portuguese version of the instrument. This translated version was sent to two other independent translators, without knowledge of the instrument, for back-translation from Portuguese into Spanish. The two versions were analyzed, compared, and unified by another independent professional. Finally, the Portuguese version was named "Instrumento de Observação das Técnicas e da Eficácia no Voleibol" (TEVOL – Brasil). All procedures in this stage were performed by the members of group 1.

Content-based Evidence. Following the translation and cross-cultural adaptation of the instrument in stage 1, content-based evidence was provided by participants in group 2, in which the clarity of language, practical relevance, and theoretical relevance of the instrument were evaluated. The experts assessed all the instrument's variables using a Likert-type scale from 1 to 5, considering clarity of language (whether each item is structured clearly, comprehensibly, and appropriately for its intended purpose), practical relevance (analysis of the items considering their relevance to the instrument's construction), and theoretical relevance (analysis of the level of association of the items with the theory, i.e., whether the item relates to the construct) (Cassepp-Borges et al., 2010). For items that received a score lower than 3, suggestions for alteration were requested.

Pilot Study. A pilot study was conducted with participants from group 3, with the objective of testing their understanding of the analyzed game variables determining the completion time, and verifying the feasibility of the research. In this stage, the games were chosen randomly, with the sole premise being that all game actions performed from the beginning to the end of the match were included. The unit of analysis of this study was the rallies defined as a sequence of actions from the serve until the completion of the point (serve, reception, setting, attack, block, defense). The analysis included 154 rallies and 1,213 technical-tactical actions from a women's match and 106 rallies and 1,096 technical-tactical actions from a men's match, for a total of 260 rallies and 2,309 technical-tactical actions.

The pilot study was carried out by the authors of the research, immediately after the completion of the search process for Content-Based Validity Evidence, through the analysis of video footage of two complete matches from the 2018/2019 Superliga Season, in both the men's and women's categories, available on publicly accessible websites. It is important to emphasize that the Superliga is one of the most competitive Brazilian national competitions and has the highest technical level in the world, integrating national and international athletes, holders of world and Olympic titles.

It should be noted that, even during the pilot study, experts pointed out situations concerning the particularities of the game environment in terms of blocking, which were not contemplated in the criteria to be analyzed. In one of the videos analyzed, a situation occurred that was not contemplated by the instrument for rating purposes (i.e., the blocking action did not occur during the rally, as the opposing team returned the ball without attempting an attack into the analyzed team's court). Consequently, this situation could not be classified, as the instrument did not include structured categories for its rating.

Although the pilot study confirmed the relevance of the structured outlines of technical volleyball actions—facilitating rating alignment and improving rally visualization—it also revealed limitations in the operationalization of the TEVOL-Brazil framework when analyzing the situational environment of the match. The visualization of the tables and observation guidelines during the analysis proved to be challenging, as the instrument's tables and quantitative references were separate from the data collection

spreadsheet. This separation slowed the data collection process, requiring the simultaneous consultation of two documents to verify scores and determine the value assigned to each action. Therefore, a spreadsheet was developed in Microsoft Excel 2013, with frozen rows and columns labeled according to the variables contained in the instrument, in addition to tables with the corresponding variables for analysis. Based on the scores assigned to the observed variables during the viewing of the rallies (provided separately in video format), all data were entered and aggregated in a more streamlined manner. Subsequently, the completed spreadsheets were forwarded to the specialists for instrument rating in the next phase, which comprised intra- and inter-rater reliability analyses.

Intra- and inter-rater analyses. Reliability tests were conducted to verify the stability of the TEVOL-Brazil through intra- and inter-rater analysis. To this end, the experts comprising group 4 participated in this stage. Five experts analyzed the instrument in 6 game actions, encompassing all situational actions of a volleyball game complete rallies defined as the sequence of actions that characterize the dynamics of a volleyball game, beginning with the serve and ending when the ball contacts the ground, for a total of 6 rallies and 46 technical-tactical actions from high-performance volleyball teams, 3 in the women's division and 3 in the men's division. This analysis was conducted using videos of matches from the qualifying phase of the 2018/2019 Superliga season, provided by the teams' coaching staff. The videos have a standard structure, being recorded using a camera positioned at the back of the court. Each expert evaluated the same video at two different times, within a one-week interval.

Data analysis

Data were analyzed using SPSS® (version 22) and Jamovi® (2024). Content validity was assessed using the ratified content validity coefficient (CVCc) (Cassepp-Borges et al., 2010)

Intra-rater reliability was evaluated using Spearman's correlation coefficient, following Mitra & Lankford (1998), with correlations interpreted as weak (.20–.40), moderate (.40–.60), or strong (> .60). Inter-rater reliability was assessed using Spearman's correlation and the Intraclass Correlation Coefficient (ICC), Model 3, Average Measures with Absolute Agreement (Two-Way Mixed Effects), considering fixed raters (Shrout & Fleiss, 1979).

Additionally, inter-rater agreement was complemented with the Bland-Altman test, supported by a t-test comparing the mean difference between raters to zero for selected action blocks. Statistical significance was set at $p < 0.05$ for all analyses.

Results

Transcultural Adaptation

The translation and cross-cultural adaptation procedure showed that the versions translated into Portuguese presented minimal modifications in relation to the original instrument. Regarding the technical volleyball terms contained in the instrument, the translations presented some false cognates, that is, words that are semantically similar to Portuguese but have different meanings, which were altered in order to give coherence to the text; for example, the term colocación was translated as "levantamento" (setting) and the word términos was changed to "termos" (terms). The backtranslation procedure of the TEVOL maintained the instrument similar to the original, without alterations. Finally, the final Brazilian version of the TEVOL was structured based on the union of two translated versions and two back-translated versions, concluding the cross-cultural translation procedure, and was named "Instrumento de Observação das Técnicas e da Eficácia do Voleibol" (Instrument for Observing Volleyball Techniques and Effectiveness) – TEVOL-Brazil.

Content-Based Evidence

Table 1 presents the ratified content validity coefficients (CVCc) related to the experts' evaluation of the components of the TEVOL-Brazil, segmented by the chapters of the original version of the instrument, which are: (1) Introduction; (2) Match Information Record; (3) Game situation record; (4) Technical Actions Information Record; (5) Final Result of Actions Information Record; and (6) Annexes.

Table 1. Ratified Content Validity Coefficients of the TEVOL Chapters

	Clarity of Language	Practical Relevance	Theoretical Relevance	Total
Chapter 1	94 %	98 %	98 %	96.7 %
Chapter 2	93.1 %	94.4 %	95.5 %	94.3 %
Chapter 3	94.3 %	96.7 %	97.3 %	96.1 %
Chapter 4	91.7 %	95.9 %	97.1 %	94.9 %
Chapter 5	92.5 %	95 %	93 %	93.5 %
Chapter 6	88.7%	89.7 %	88.7 %	89 %
General	92 %	95 %	95.6 %	94.2 %

The three components of Content-Based Evidence — Clarity of Language, Practical Relevance, and Theoretical Relevance — all exceeded the 80.0 cutoff, with an overall instrument index of 94.2, indicating that the adapted instrument is valid and applicable.

Reliability-Based Evidence (Intra-rater and Inter-rater)

Intra-rater reliability was determined using Spearman's correlation. Table 2 presents the correlation between the two moments of analysis by the experts. Strong correlations were observed, with coefficients ranging between r = .89 and r = 1.00, indicating high intra-rater agreement.

Table 2. Spearman's Correlation Coefficients (SCCs) between the two expert ratings.

Raters:	SCC
Rater 1	.93
Rater 2	.99
Rater 3	.89
Rater 4	1.00
Rater 5	.98

Regarding inter-rater reliability (Table 3), the highest correlation coefficient was found between experts four and two (.96), showing greater approximation in the applications of the instrument. The other data showed indexes between .63 and .96, also considered strong.

Table 3. Spearman's Correlation Coefficients (SCCs) between raters.

Raters:	1	2	3	4	5
Rater 1					
Rater 2	.66				
Rater 3	.76	.71			
Rater 4	.70	.96	.73		
Rater 5	.91	.63	.85	.67	

Intraclass Correlation (ICC) indexes were measured according to the blocks of technical actions subdivided in Chapter 4 of TEVOL – Brazil (Information Record on technical actions). The present ICC results showed values classified as strong (above .60). The ICC results are presented in Table 4.

Table 4. Intraclass Correlation Indexes (ICC), subdivided by Action Block

Raters:	ICC
Serve / Blocking	.89
Reception /Defense	.96
Setting	.90
Atack	.79
General	.84

The Bland-Altman test showed good agreement among raters, with overall mean differences below 0.5 points for most pairs. The largest difference was observed between raters 2 and 5 in the "Setting" block (-1.17, p=0.10), while the smallest differences occurred in the "Reception/Defense" block (0.00–0.60), indicating the highest agreement in this block. The results of the Bland–Altman analysis are presented in Tables 5a and 5b.

Table 5a. Pairwise, Action and General Block Agreement, as per the Bland-Altman Test

Serve/Blocking					
	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Rater 1	-	Δ= -0.60 t= -1.3; p=0.20	Δ= -0.80 t= -1.3; p=0.20	Δ= 0.00 t=**; p**	Δ= -0.90 t= -1.3; p=0.20
Rater 2	-	-	Δ= -0.20 t= -0.61; p=0.60	Δ= 0.60 t= 1.3; p=0.20	Δ= -0.30 t= -0.76; p=0.50
Rater 3	-	-	-	Δ= 0.80 t= 1.3; p=0.20	Δ= -0.10 t= -1; p=0.30
Rater 4	-	-	-	-	Δ= -0.90 t= -1.3; p=0.20
Rater 5	-	-	-	-	-
Reception /Defense					
	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Rater 1	-	Δ= 0.40 t= 1; p=0.40	Δ= 0.00 t=**; p**	Δ= 0.00 t=**; p**	Δ= -0.20 t= -1; p=0.40
Rater 2	-	-	Δ= -0.40 t= -1; p=0.40	Δ= -0.40 t= -1; p=0.40	Δ= -0.60 t= -1; p=0.40
Rater 3	-	-	-	Δ= 0.00 t=**; p**	Δ= -0.20 t= -1; p=0.40
Rater 4	-	-	-	-	Δ= -0.20 t= -1; p=0.40
Rater 5	-	-	-	-	-
Setting					
	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Rater 1	-	Δ= 0.83 t= 1.4; p=0.20	Δ= 0.16 t=0.42; p=0.70	Δ= 0.00 t=**; p**	Δ= -0.33 t= -1.6; p=0.20
Rater 2	-	-	Δ= -0.66 t= -1.3; p=0.20	Δ= -0.83 t= -1.4; p=0.20	Δ= -1.17 t= -1.8; p=0.10
Rater 3	-	-	-	Δ= -0.16 t= -0.4; p=0.70	Δ= -0.50 t= -1.5; p=0.20
Rater 4	-	-	-	-	Δ= -0.33 t= -1.6; p=0.20
Rater 5	-	-	-	-	-

Δ = mean difference between the raters; t = t-test of the mean difference between raters versus zero; p = significance level; * = the mean difference between the raters was statistically significantly different from zero; ** = no variability was observed between raters (mean difference = 0), indicating perfect agreement and precluding the Bland–Altman t-test due to zero variance.

Table 5b. Pairwise, Action and General Block Agreement, as per the Bland-Altman Test

Atack					
	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Rater 1	-	Δ= 0.50 t= 0.54; p=0.60	Δ= 0.37 t=1; p=0.40	Δ= 0.00 t=**; p**	Δ= 0.25 t= -0.61; p=0.60
Rater 2	-	-	Δ= -0.12 t= -0.15; p=0.90	Δ= -0.50 t= -0.54; p=0.60	Δ= -0.25 t= -0.32; p=0.80
Rater 3	-	-	-	Δ= -0.37 t= -1; p=0.40	Δ= -0.12 t= -1; p=0.40
Rater 4	-	-	-	-	Δ= 0.25 t= 0.61; p=0.60
Rater 5	-	-	-	-	-
General					
	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Rater 1	-	Δ= 0.17 t= 0.52; p=0.60	Δ= -0.13 t=-.54; p=0.60	Δ= 0.00 t=**; p**	Δ= -0.34 t= -1.2; p=0.20
Rater 2	-	-	Δ= -0.31 t= -1.1; p=0.30	Δ= -0.17 t= -0.52; p=0.60	Δ= -0.51 t= -1.7; p=0.90
Rater 3	-	-	-	Δ= 0.13 t= 0.54; p=0.60	Δ= -0.20 t= -2.3; p=0.03*
Rater 4	-	-	-	-	Δ= -0.34 t= -1.2; p=0.20
Rater 5	-	-	-	-	-

Δ = mean difference between the raters; t = t-test of the mean difference between raters versus zero; p = significance level; * = the mean difference between the raters was statistically significantly different from zero; ** = no variability was observed between raters (mean difference = 0), indicating perfect agreement and precluding the Bland–Altman t-test due to zero variance.

Discussion

The purpose of this study is to determine the preliminary validity evidence of the Instrumento de Observación de las Técnicas y La Eficácia en Voleibol – TEVOL in high-performance Brazilian volleyball athletes. After translation and cross-cultural adaptation procedures, the version in current Brazilian Portuguese was named "Instrumento de Observação das Técnicas e da Eficácia no Voleibol" (TEVOL – Brasil). Expert analysis in a cross-cultural translation procedure is relevant to ensure semantic, idiomatic, cultural, and conceptual equivalences (Amaral & Bastos, 2018), establishing the beginning of the instrument validation process (Collet et al., 2018). For the TEVOL-Brazil, the fact that the synthesis of the versions translated into Portuguese did not present significant changes in relation to the original instrument, and that its back-translation into Spanish maintained a very similar instrument to the original version, demonstrates that the initial validation procedures of the TEVOL for the Brazilian context were successful, allowing the analysis of validity evidence for the Brazilian version to proceed.

Regarding Content-Based Validity Evidence, all items of the TEVOL-Brazil demonstrated CVCc values above the recommended threshold (≥ .80), indicating that the instrument is valid and applicable (Cassepp-Borges et al., 2010; Hernández-Nieto, 2002). These findings are consistent with Palao et al. (2015), who validated the instrument with high-performance indoor volleyball athletes, and Palao, Manzanares et al. (2015), who applied a similar methodology with beach volleyball athletes, confirming that the items are clear, relevant, and supported by robust content-based evidence.

The ratings of the TEVOL chapters presented values considered adequate (Cassepp-Borges et al., 2010). This evidence can be explained by the scarcity of some information in the original document used for validation in the Brazilian context (illustrative images, spreadsheets with the codes used in the instrument), which made the experts' rating difficult. Another factor that elucidates these values is that, in certain subcategories of the instrument, the specific technical actions of the sport are presented in detail, accumulating a range of information on serve, reception, setting, attack, defense, counter-attack, block, and other volleyball features. During this stage, experts also identified some structural issues, and included suggestions to refine the wording to enhance the scientific rigor of the text, and proposals to restructure the game visualizations based on the images provided by the instrument (e.g., blocking zones and attack zones). While the wording refinements were accepted, the proposed changes to the visualization structures were not implemented. This decision was made because any modification to the technical variables would have altered the entire detailed system of the instrument, thereby changing the analytical framework originally established for the TEVOL. By maintaining the original structure, the instrument preserves its integrity and consistency, ensuring that the analysis remains comparable to the framework used in the original validation. The CVCc indexes also presented values above those recommended by the literature regarding Clarity of Language, Practical Relevance, and Theoretical Relevance, indicating that the instrument presents robust overall Content Evidence, reinforcing its theoretical and practical quality.

Regarding the reliability analyses of the TEVOL-Brazil, the two ratings from all experts were strongly correlated, suggesting evidence of high intra-rater reliability (Mitra & Lankford, 1998). The results of this study are consistent with the results of the original version of the TEVOL, which presented intra-rater correlation values higher than recommended in the literature for all its variables (Palao et al., 2015). The same was observed in a study that evaluated the validity evidence of the Observational Instrument for Analyzing Technical and Tactical Actions in Beach Volleyball; the reliability values also showed strong correlation indexes, corroborating the findings of the present investigation (Palao, Manzanares et al., 2015). These findings reinforce the idea that raters are interpreting and applying the rating criteria in the same way, reducing subjectivity and creating a rating standard. In the practical sports field, this is one of the major problems: the lack of standardization among experts who carry out performance analyses. This makes the reproducibility of studies difficult, as each analyst interprets them differently. Thus, the use of game analysis tools to develop and improve the performance of athletes in sports using instruments that have undergone psychometric analysis reduces rating bias and allows others to use the same instrument under the same conditions of analytical standard.

Regarding the strong correlations found in the inter-rater analysis, they indicate the reliability of the instrument for this investigation. This finding is consistent with the original study on the construction

of the TEVOL, which showed a strong correlation for all chapters (Palao et al., 2015). Also, in the validation study of the Observational Instrument for Analyzing Technical and Tactical Actions in Beach Volleyball, the inter-rater correlation indexes showed strong values, which denotes the reliability of the instruments (Palao, Manzanares et al., 2015).

The Intraclass Correlation (ICC) results showed values classified as strong in the literature (Mitra & Lankford, 1998). However, it was not possible to compare these findings with the original TEVOL and with the validation study of the Observational Instrument for Analyzing Technical and Tactical Actions in Beach Volleyball, as they did not conduct the same analysis. In a study of the construction and validation of a technical-tactical analysis instrument for youth volleyball, the overall ICC index presented (.78) was also considered strong (Collet et al., 2011).

In terms of practical applicability, the TEVOL-B represents a strategic advancement by reducing observational bias among professionals in volleyball performance analyses, as it standardizes the observation of the variables assessed and enables more consistent identification of technical-tactical indicators. In the literature, such indicators have been associated with differences in performance between winning and losing teams in competitive volleyball contexts (Silva Lima et al., 2025).

The instrument dissemination facilitates more accurate evaluations. This initiative also enhances the instrument's accessibility, allowing its use by professionals and researchers with varying levels of methodological familiarity, while simultaneously increasing the scalability of its application in studies with larger samples and diverse settings.

Conclusions

The translation and cross-cultural adaptation process, and the search for content evidence validity and reliability of the TEVOL-Brazil for the current Portuguese language in Brazil pointed to a suitable and reliable instrument for the analysis of technical-tactical notation for high-performance Brazilian volleyball athletes, as well as for application in academic and sports contexts. The validity evidence based on the ratings of experts in the sport, obtained through intra-rater and inter-rater agreement, was considered strong. This result is important insofar as it seeks to address one of the major gaps in scientific knowledge concerning game analysis: rater subjectivity during assessment.

Regarding the fundamental aspect of blocking, although the pilot study highlighted the situation of "block dropping" (when an athlete refrains from performing the blocking action, for example, due to a situation involving a free-ball pass), the researchers implemented a tab in the final evaluation document so that experts could report this situation, since it is a situation that can occur at different times during the game.

Among the limitations of the study, it can be considered that the images of the chosen games may not have encompassed all possible game actions, since, in certain game situations, a complete rally is not constructed with all the variables of analysis of the instrument (e.g., a chain of actions with serve, reception, set, attack, block, and defense), leaving the data collection reduced. It should also be noted that Chapters 2, 3, and 5 were not included in the instrument adaptation process. These chapters contained anamnesis information from the analyzed teams, as well as texts and images labeled as 'annexes,' which did not require more comprehensive validation procedures. This exclusion may have limited certain aspects of the instrument related to the conception of the original version. Therefore, further research is recommended to establish additional validity evidence for the remaining components of the TEVOL that were not addressed in this study.

Finally, the TEVOL–Brazil proved to be a viable instrument, with practical applicability for sports teams that do not have many resources to acquire software or, especially, that seek scientific evidence for practical game analysis to improve and enhance the performance of their athletes.

In this regard, as future directions, the development of a specific analysis platform, software, or application with open access could significantly contribute to the standardization of performance analysis, minimizing operational biases. Moreover, technological solutions of this nature enable greater efficiency in data collection, storage, and processing.

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