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Content validity of scenes from declarative tactical knowledge test for attack situation in beach volleyball - DTKAT-BV

Validação de conteúdo do teste de conhecimento tático declarativo para a situação de ataque no voleibol de praia – TCTDA-VP

Validación de contenido del test de conocimiento táctico declarativo para la situación de ataque en voleibol de playa – TCTDA-VP

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Abstract: The aim of the study was to establish the content validity of scenes from the Declarative Tactical Knowledge Attack Test in Beach Volleyball (DTKAT-VB). Four experts evaluated 32 attack scenes in real situations of BV game through were assessed the Content Validity Coefficient (CVC) through criteria of language clarity, practical relevance and item representativeness. The results showed that all scenes assessed obtained CVC values greater than 0.80 for all criteria[image clarity (CVC - 0.98); practical relevance (CVC - 0.97); item representativeness (CVC – 0.94)], except for one scene, which was excluded. The 31 scenes validated using the CVC enables the evaluation of the declarative tactical knowledge, assisting in the planning of the teaching-learning-training processes of beach volleyball athletes.

Keywords: Validation Studies. Sport Training. Psychometry. Beach Volleyball.

Resumo: O objetivo do estudo foi estabelecer a validade de conteúdo das cenas do Teste de Conhecimento Tático Declarativo do Ataque no Voleibol de Praia (TCTDA-VP). Quatro especialistas avaliaram 32 cenas de ataque em situações reais de jogo de VP foram avaliadas pelo Coeficiente de Validade de Conteúdo (CVC) por meio de critérios de clareza de linguagem, relevância prática e representatividade dos itens. Os resultados mostraram que as cenas avaliadas obtiveram valores de CVC maiores que 0,80 para todos os critérios [clareza da imagem (CVC - 0,98); relevância prática (CVC - 0,97); a representatividade do item (CVC - 0,94)], com exceção de uma cena, sendo assim excluída. As 31 cenas validadas por meio do CVC possibilitam a avaliação do conhecimento tático declarativo, auxiliando no planejamento dos processos de ensino-aprendizagem-treinamento de atletas do voleibol de praia.

Palavras-chave: Estudos de Validação. Treinamento Esportivo. Psicometria. Voleibol de Praia.

Resumen: El objetivo del estudio fue estabelecer la validación de contenido de las escenas del Teste de Conocimiento Táctico Declarativo del Ataque en el Voleibol de Playa – TCTDA-VP. Cuatro especialistas

evaluaron 32 escenas de ataque en situaciones reales de juego de VP através del Coeficiente de Validez de Contenido (CVC) através de criterios de claridad del idioma, relevancia práctica y representatividad del elemento. Los resultados mostraron que para todos los criterios [claridad de imagen (CVC - 0.98); relevancia práctica (CVC - 0.97); representatividad del elemento (CVC - 0,94)], obtuvieron un CVC superior a 0,80, excepto por una escena, quedando así excluida. Las 31 escenas validadas por el CVC possibilitaron la evaluación del conocimiento táctico declarativo ayudando em la planificación de los processos de enseñanza-aprendizaje-treinamiento de los deportistas de voleibol de playa.

Palabras-clave: Estudios de Validación. Entrenamiento Esporivo. Psicometría. Voleibol de Playa.

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Introduction

Unpredictability, randomness and variability are inherent characteristics of team sports, such as beach volleyball (BV). In this modality, the attack skill stands out among other skills (serve, reception, setting, defense and block), due to the multiple decision-making (DM) alternatives on how to perform the technique, compared to the other skills (MESQUITA; TEIXEIRA, 2004). The spike, dunk, and powerful attack types, among others, are possible choices that athletes can make when performing an attack. In addition, studies have shown that attackis a predictor of success in BV, since winning teams excel losers in the performance of this skill (GEORGE; PANAGIOTIS, 2008, GIATSIS; TZETZIS, 2003, PALAO; ORTEGA, 2015). Thus, attack presents itself as a fundamental skill for high performance in BV.

In order to execute good attack, the athlete needs more than good technique, since DM processes that relies on tactical knowledge are necessary to perform the skill successfully and to achieve high game effectiveness (COSTA *et al.,* 2002). DM reflects the ability of an individual to choose the best alternative at the right time, given the many possibilities of choice (RAAB, 2003, 2007, 2015; RAAB; GIGERENZER, 2005; WILLIAMS *et al.*, 2012), based on several cognitive processes, such as tactical knowledge, attention, anticipation, memory and visual perception (MURGIA *et al*., 2014; TENENBAUM; FILHO, 2017). Accordingly, team sports" coaches are concerned with developing athletes" DM during training sessions .

The ability to make decisions in team sports relates to the processes of declarative tactical knowledge (DTK) (ANDERSON, 1982), which are declared facts "of what to do" in certain game situations. These statements are thought to provide the possibility to assess DM (GRECO, 2006). DTK indentifies with "knowing", "knowing what to do", and refers to knowledge that athletes have of skills and strategies of the game (ANDERSON, 1982; FRENCH; THOMAS, 1987; GAMEIRO et al., 2021; WILLIAMS; DAVIDS, 1995).

Indeed, studies have shown moderate or high correlations between DTK and DM, showing improvements in ability to perform actions in the game (BLOMSQVIST *et al*., 2005; CASTRO *et al.*, 2016; McPHERSON; THOMAS, 1989). In this context, the application of instruments to measure DTK becomes necessary to assess the athletes tactical capacity (GAMEIRO *et al*., 2021). Considering the direct nature of this relation, DTK tests are used to evaluate the DM of volleyball athletes (CASTRO *et al*., 2016, 2017, 2019, 2020; GRISI *et a*l., 2021) and coaches (COSTA *et al*., 2018 ab).

In indoor volleyball, Costa et al. (2016) used the Content Validity Coefficient (CVC) for the validation of scenes containing extremity attacks, central attacks, settings and blocks in a DTK test. However, although indoor volleyball shows many similarities with BV, the game dynamics between the two modalities are very different, which indicates the need for a specific DTK test for BV (TILP; WAGNER; MÜLLER, 2008).

Thereby a specific DTK test must be created and validated for BV with the purpose of assisting professionals in training and assessing cognitive processes such as DM in this sport modality. However, to the best of the authors' knowledge, no work have validated BV attack scenes with the intent of creating a DTK test. Thus, the aim of the study was to establish the content validity of scenes from the Declarative Tactical Knowledge Attack Test in Beach Volleyball (DTKAT-VB).

Materials and Methods

Sample

The sample consisted of four experts in beach volleyball, following the recommendation suggested by Hernández-Nieto (2002).The following inclusion criteria were used: (1) Having at least 10 years of experience in beach volleyball; (2) be a beach volleyball

coach at the time of the data collection; and (3) not participating in any stage of the study other than the validation of scenes. With regard to time of experience, the mean and standard deviation of the participants was 13.5±3.4. According Ericsson *et al*. (2006), experts coaches in the modality must have experience of at least 10 years. Table 1 shows the profile of specialists participating in this study.

Table 1. Representativeness panel of BV experts.

Description	Training / performance in beach volleyball	Experience
Expert 1	PhD. Minas Gerais state champion in U-17, U-19 and U-21 categories. Level II BV Coach.	18 years
Expert 2	World U-19 champion and World U-21 two-times champion, Brazilian U-19 and U-21 champion. Level II BV Coach.	14 years
Expert 3	World U-21 and U-19 champion, Brazilian U-23 champion and South American champion in senior category. Level II BV Coach.	10 years
Expert 4	Master's degree. Brazilian U-19 champion; 3rd place in the South American championship; 9th place in the world U-19 championship; Level II BV Coach.	12 years

BV = beach volleyball

The present study was approved by the Ethics Research Committee of the Health Sciences Center of Federal University of Paraíba (protocol No. 2.614.432), meeting all the requirements of the National Health Council - Resolution 466/12. It is important to highlight that the present study is part of a macro project and only part of the data from this project was used.

Procedures

The research consisted of three stages: in the first, attack scenes were prepared and selected; after that, the ecological

validity of the scenes was assessed by experts; and, finally, scenes were validated using the CVC values calculated. Thirty-two attack scenes were selected, with the video starting with the opponent's serve and then following to receiving, setting and attack, lasting from 4 to 7 seconds. All scenes had the presence of the opposing team's block and there was no freezing of the images. These scenes were taken from the Men's World Circuit Games held in 2018. In all scenes, the camera was positioned in a way that all dimensions of the court were captured.

The ecological validity analysis of the scenes was verified through the experts' choices, which should reflect the same actions as the ones performed by the athletes in the scenes (PASQUALI, 2007). 32 scenes presented ecological validaty, representing the choice of experts in agreement with the action performed by athletes in scenes that culminated in score. After these analysis, as a criterion used by authors, for the CVC evaluation, the 32 scenes with ecological validity were used to calculate CVC.

Within the theoretical procedures proposed by Pasquali (2007) for the elaboration of psychometric instruments, the semantic analysis of items and the analysis of experts aim to verify the representativeness of the construct through the items. In this sense, the specialized literature recommends the use of CVC (COSTA *et al,* 2016; GRECO *et al*, 2014), in order to investigate the representativeness level of the construct using validation of concepts of image clarity, practical relevance and item representativeness. That is, it is verified if the instrument measures exactly what it proposes, in terms of its content (ROBERTS *et al*., 2006). Thus, in order to verify reproducibility, experts evaluated scenes according to procedures presented by Hernández-Nieto (2002) regarding the criteria of image clarity, practical relevance and item representativeness for each of the scenes. Table 2 presents the evaluation criteria for scenes selection.

Table 2. Descriptions and questions of test items.

Item	Image clarity	Practical relevance	Item representativeness
Description	The quality of images from the scenes will be evaluated considering the population of BV athletes and experts who will later answer it.	The relevance of the scene will be evaluated in terms of representing decision-making situations in the BV game.	The level of representation of the cognitive processes that were of interest in the scenes will be evaluated.
Question	Are the images clear? Is it possible to see the ball, the players, the net and the court lines clearly in the scene?	Do you believe that this scene represent appropriate situations to assess player's decision-making in a BV game?	Do you believe that this scene allows the analysis of a player's decision-making and the relevant signals that lead to it?

BV = beach volleyball

Experts assessed scenes in each of the criteria using a 5-point Likert scale (1 = very low, 2 = low, 3 = average, 4 = high, and 5 = very high), following the questions from Table 2. The responses were used to calculate the CVC for each item, indicating the experts' degree of agreement for each item in the scenes analyzed. After this process, the scenes that obtained agreement values lower than 0.80 were excluded and the scenes that obtained higher values than 0.80 were maintained.

Statistical analysis

The experts' responses regarding scenes were tabulated and analyzed in the Microsoft Office Excel 2010 software using the CVC formula and its descriptions. CVC was calculated for each scene (CVC_c), total (CVC_t) and corrected (CVC_{tc}), based on scores from the four experts. The average of scores for each item was calculated as follows:

1) The experts' scores were calculated as proposed by Hernández-Nieto (2002, p.128) (M):

$$Mx = \frac{\sum_{i=1}^{j} xi}{J}$$

Where M_x is the average scores for each item, Σx_i represents the sum of experts' scores and J represents the number of experts who evaluated the item.

2) Based on the average, CVC was calculated for each item (HERNÁNDEZ-NIETO, 2002, p.128) (CVC_i):

$$CVC_i = \frac{Mx}{Vmax}$$

Where V_{max} represents the maximum value that i could receive.

3) Error (P_e) was also calculated to account for possible evaluation bias for each item (HERNÁNDEZ-NIETO, 2002, p.131):

$$Pe_i = \left(\frac{1}{J}\right)^J$$

4) Then, the final CVC of each item (CVC_{ei}) was calculated (HERNÁNDEZ-NIETO, 2002, p.133):

$$CVC_{ec} = CVC_i - Pe_i$$

5) In the calculation of the CVC_t and corrected CVC (CVC_{tc}), for each of the items (image clarity, practical relevance, and item representativeness), (p 143) the following equation was used:

$$CVC_t = MCVC_i - MPe_i$$

Where $MCVC_i$ represents the mean CVCs values of the test items and Mpe_i represents the mean error of the test items.

Results

The 32 attack scenes presented initial CVC_t scores of 0.95 for criteria of image clarity and practical pertinence. Ultimately, CVC_{tc} values of 0.98 and 0.97, were shown for image clarity and practical pertinence criteria respectively, as shown in Table 3. Regarding item representativeness, a CVC_{tc} value of 0.94 was found. Nevertheless, one item (scene 1) presented a CVC_t value of 0.79 which, is below those considerable acceptable by literature (< 0.8). Therefore, this scene was excluded.

Table 3. Content Validity Coefficient Values (CVC) obtained from experts' evaluation of the attack scenes.

Criterion evaluated	Items without CVC_t (> 0.80)	CVC_{tc}	CVC_{tc} excluded
Image clarity	32	0.98	0
Practical pertinence	32	0.97	0
Item representativeness	31	0.94	Scene 1 (CVC_t = 0.79)

CVCt = Total Content Validity Coefficient for item; CVCtc = Total Content Validity Coefficient for item adjusted

Discussion

The aim of the study was to establish the content validity of scenes from the Declarative Tactical Knowledge Attack Test in

Beach Volleyball (DTKAT-VB). The results showed that 31 of the 32 proposed attack scenes obtained satisfactory CVC values using the image clarity, practical relevance and item representativeness criteria. Therefore, after CVC calculation, content validity was confirmed in 31 scenes that will be used in the DTKAT-BV to assess DM and DTK in BV.

Based on the assumption of Costa *et al*. (2002), which proposes that six to 13 scenes would be an ideal number of scenes to elaborate a DTK test, 32 attack scenes were selected in the present study. Overall, 31 attack scenes were considered valid, which is in accordance with Pasquali's (1999) recommendations, which suggested that the test should have at least 20 items so that the semantic representation of the construct is stable and well represented.

Other studies have proposed to investigate this type of validation in collective sports. To illustrate, Aburachid and Greco (2011) validated scenes in tennis and Costa et al. (2016) validated volleyball scenes that comprised extremity attacks, center attacks, settings and block actions. Our findings are in line with findings from these studies, since all studies showed validated scenes with CVC values above 0.80 for image clarity, practical relevance and item representativeness. Additionally, the number of scenes validated for constructing the declarative tactical tests was above 20 scenes in all cases.

Similarly, other studies have used the CVC methodology to validate specific actions in handball, futsal and basketball (GRECO et al., 2014), in soccer and futsal (CASTRO *et al*., 2015) and in basketball (MORALES *et al*., 2012). In short, the results of these studies also reported satisfactory CVC results (> 0.80).

In the present study, only attack scenes were validated. This is justified by the fact that attack is one of the main skills related to DM in BV, due to the many motor possibilities that can be performed. Moreover, the success rate in executing this action during the game is positively associated with the match outcome

(GIATSIS; TZETZIS, 2003), which makes this skill the most decisive to win the matches. The other abilities are expected to rely less on decision-making processes to be performed. For example, in the serve skill, the athlete has time to think where to direct the ball, and depending on the opponent, game strategies can be elaborated in advance. At reception, setting, defending, and blocking DM options are limited and somehow predetermined.

The validated scenes in the present study could be used in a declarative tactical knowledge test to evaluate DM in BV athletes. Considering the fact thata tactical knowledge test must contain 6 to 13 validated scenes (COSTA *et al*., 2002), the scenes validated in this study may allow the elaboration of more than one declarative tactical knowledge test.

The study was limited to the content validity of oficial high-performance beach volleyball game scenes in the adult male category, which in a way restricts the use of these scenes with female volleyball players. Tus, further studies should develop and validate specifc tests for female volleyball athletes with similar situational constraints. In addition, the stratifcation of the level of difculty of each scene presented by the test becomes interesting, allowing creating tests according to the level of athletes analyzed.

Conclusion

This study indicates that the attack scenes of the DTKAT-BV are validated to CVC, and thus, can be used to create an instrument to evaluate the declarative tactical knowledge of beach volleyball. Among other possibilities, this instrument may be used to investigate differences in declarative tactical knowledge regarding age, practice time, skills proficiency, and other aspects related to performance in the modality.

Thus, the validation of attack scenes from the DTKAT-BV may contribute to the improvement of pedagogical processes and

to performance in this sport modelity. The application of attack scenes is an effective way to assess and monitor the development of DTK, thus improving the teaching-learning-training process in BV.

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