Original Article

EVALUATION OF A BEACH VOLLEYBALL SKILL INSTRUMENT FOR THE LINE SHOT ATTACK

AVALIAÇÃO DE UM INSTRUMENTO DE HABILIDADE DE VOLEIBOL DE PRAIA PARA O ATAQUE DE TIRO À LINHA

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RESUMO

Este estudo teve como objetivo desenvolver um teste para mensurar o desempenho de atletas. No teste foram examinados os seguintes itens: lógica, conteúdo, construto, validade de critério, bem como confiabilidade. Três especialistas em voleibol de praia avaliaram o quão bem o teste avalia a precisão da habilidade de arremesso de acordo com seu julgamento (validade lógica). Um grupo de oito especialistas em vôlei de praia analisou o teste e o classificou em uma escala de 1 a 7 quanto à relevância do conteúdo como medida de precisão do atleta de vôlei de praia, a pontuação média foi calculada em 6,75 (DP=0,46) (validade de conteúdo). A amostra foi constituída por 60 jogadores de vôlei de praia divididos em três grupos: novatos, intermediários e experientes foram convidados a realizar o teste em dois dias separados. Uma ANOVA de uma via entre os três grupos foi realizada, o que indicou que as pontuações médias dos três grupos diferiram significativamente (p<0,001 para ambos os dias): os especialistas obtiveram melhores pontuações do que os intermediários que, por sua vez, pontuaram melhor do que os novatos (validade de construção). As pontuações dos atletas foram correlacionadas com seu nível de proficiência, usando o teste de correlação de Pearson, indicando correlação muito alta e positiva (Dia-1: r=0,956, n=60, p<0,001; Dia-2: r=0,953, n=60, p<0,001) (validade de critério). O coeficiente de correlação intraclasse foi calculado entre o Dia-1 e o Dia-2 e foi igual a 0,980 para medidas médias (p<0,001) e 0,961 para medidas isoladas (p<0,001). Em conclusão, os requisitos de lógica, conteúdo, construto, validade de critério e confiabilidade foram atendidos. Portanto, o teste de ataque de tiro de linha pode ser usado como um instrumento de medida válido e confiável para avaliar o desempenho de atletas de vôlei de praia.
Palavras-chave: FIVB, avaliação, validade, confiabilidade.

ABSTRACT

This study aimed to develop a test for measuring athletes' performance. Logical, content, construct, criterion validity, as well as reliability, were examined. Three beach volleyball experts evaluated how well the test evaluates the shot skill accuracy according to their judgment (logical validity). A group of eight beach volleyball experts analyzed the test and rated it on a scale of 1 to 7 regarding the relevance of the content as a measure of beach volleyball athlete's accuracy, the average score was calculated at 6.75 (SD=0.46) (content validity). 60 beach volleyball players divided into three equal groups of novices, intermediates, and experts were asked to undergo the test on two separate days. A one-way ANOVA between the three groups was performed, which indicated that the mean scores of the three groups differed significantly (p<0.001 for both days): experts achieved better scores than intermediates who in turn scored better than novices (construct validity). The athletes' scores were correlated with their proficiency level, using the Pearson Correlation test, which indicated very high positive (Day-1: r=0.956, n=60, p<0.001; Day-2: r=0.953, n=60, p<0.001) (criterion validity). The intraclass correlation coefficient was calculated between Day-1 and Day-2 and was found equal to 0.980 for average measures (p<0.001) and 0.961 for single measures (p<0.001). In conclusion, the requirements for logical, content, construct, criterion validity, and reliability have been met. Therefore, the line shot attack test can be used as a valid and reliable measurement instrument for evaluating the performance of beach volleyball athletes.
Keywords: FIVB, evaluation, validity, reliability

Introduction

A high level of motor skills is crucial in forming the outcome of many sports. Therefore, tests evaluating skill outcomes in sports are usually used by coaches and researchers to estimate athletes' ability level, the effectiveness of training protocols, or talent scouting[1]. Other assessments that measure a skill's technique are conducted in a laboratory setting using a manufacturing analysis and are acceptable for both beginners and advanced athletes. Other tests assess an athlete's technique while also being tailored to the needs of the game and are thus carried out on the court in the position where the athlete should stand. These examinations are

typically used for beginner athletes who have completed the first level of learning and include components of personal strategy[2]. Measurement strategies for tactical knowledge growth and skills in sport were introduced by McPherson[3]. Skill evaluation has been the major instrument for student assessment since motor skills and technique of the skills have always been used in teaching sports.

Researchers can use performance protocols to imitate sporting performance or components of it in a controlled scientific setting. This allows researchers to experiment with different variables to see how they affect athletic performance. Performance is frequently tested in a controlled scientific environment in order to examine the impact of pharmacological, dietary, or training interventions on performance, to measure variations in performance over a season, or to detect overreaching[4]. Gabbett and Georgieff[5], developed a skill assessment for junior volleyball players and evaluated the reliability, validity, and sensitivity of the test for detecting training-induced improvements in skill. Downs and Wood[6] examined the validity and reliability of a Volleyball Skills Assessment Test (VSAT) as a measure of volleyball skill and as a predictor of team success in Special Olympics International (SOI) volleyball competition. Bartlett, Smith, Davis, and Peel[7] developed the NCSU volleyball skills test battery. When determining the performance protocol to utilize, two variables should be taken into account: A) Validity: the protocol as nearly as feasible resembles the performance that is being emulated[8], and B) Reliability: when no intervention is utilized, the routine produces identical results from day to day[9].

In the present study, four types of construct validity have been examined: A) Logical validity, B) Content validity, C) Construct validity, and D) Criterion validity establishing these types of validity provides sufficient evidence to declare the test procedure as valid[1,10,11,12]: A) Logical validity of a measure can be declared when the instrument in question obviously involves the type of performance that it aims to measure. The present test aims at measuring the accuracy of performance of beach volleyball athletes, B) Content validity of a measurement test can be claimed if the procedure is declared to represent all important areas of the measurement objective by judges that hold significant knowledge in the field C) Construct validity is using by the researchers utilizing known groups' different methods in order to measure the test's construct validity. The known group difference method assumes that a measuring construct's validity can be supported if the measure produces reliably different results for groups that are a priori different from one another in the measured variable, be it performance or trait, D) Criterion validity refers to the degree that the scores on a test related to some recognized standard or criterion. The most suitable method to calculate reliability in situations when raters are not involved, such as is the case in the present study, is test-retest reliability which reflects the variation in measurements taken by an instrument on the same subject(s) under the same conditions[10,11,12,13].

Beach volleyball is a two-against-two game that is played on an 8x16 m court and is known for its demanding physical, technical, and tactical skills. A player tries to score with an attack[14] against a blocker and a defender[15]. A team must win two sets of 21 points to win a match (if necessary, the third set of 15 points is played). The attacker player can score a point using a hard-driving spike and a soft shot, which is preferably played over the blocker to the open part of the court[16,17]. Blockers remain in the net performing a block almost 85%[18] and the line blocking where blockers covered the line attack and the defender the cross-court spike is the most frequent defending system[14]. The high line shot is the most frequent shot when the blocker covered the line as the attackers can see the open area of the court[19]. For this reason, the most frequent attacking zones are the corners of the court[20], and the exact placement of the attacking ball is essential for winning a point[21].

The ability of BV coaches to evaluate their athletes' performance in every situation they face during a game is an issue. The evaluation procedure is critical because it allows the coach

to determine whether his or her teaching and training method was proper or whether he or she needs to change one or more components of his or her procedure. Because BV is such a new professional activity, there is a dearth of BV research and appropriate testing devices for BV skill evaluation. As a result, specific measures for assessing basic BV skills have been developed. That study aimed to develop a skill test for beach volleyball and to examine its degree of validity and reliability using the line shot attack skill. Four types of validity: A) logical, B) content, C) construct, D) criterion validity, and also reliability: internal consistency (intraclass) were examined in this study.

Methods

Ethics committee approval statement

The Ethics and Research Integrity Committee of the Aristotle University of Thessaloniki approved the design of the study (Approval number 191585/2019) because it fulfilled the provisions of the Aristotle University Code of Ethics Code. Each participant voluntarily provided written informed consent before participating in the study which was conducted according to the 2000 revision of the Declaration of Helsinki for the use of human subjects.

Development and Description of the Test Instrument: validity

A) Logical Validity. The logical validity of a measure can be declared when the instrument in question obviously involves the type of performance that it aims to measure. The present test aims at measuring the accuracy of the performance of beach volleyball athletes. Three beach volleyball experts (two experienced beach volleyball coaches & one expert-level player) cooperated with the researchers in order to be developed a test that according to their knowledge and judgment can measure the accuracy of beach volleyball players, furthermore, they set the scoring procedures in a way that better scores reflect better accuracy[10,11].

B) Content Validity. In the present study, in order to examine content relevance and content representativeness, a group of 8 beach volleyball experts that did not share common members with the group that developed the test (four experienced beach volleyball coaches and four expert-level players) analyzed the test and rated it on a scale of 1 to 7 regarding its validity as a measure of beach volleyball athlete's accuracy where one was no validity and 7 was absolute validity.

C) Construct Validity (through known group difference method). For the needs of the present study, a sample consisting of three separate groups of 20 beach volleyball players was utilized. The first group consisted of expert players, the second one of intermediate players, and the third one of novice players. The players were assigned to each group via the following criteria: Experience in beach volleyball, participation in the finals of the major tournament in the Hellenic Championship:

i) Expert players: Professional players with more than five years of experience and at least one participant in a final of the Masters Hellenic beach volleyball championship.

ii) Intermediate players: Beach volleyball players with more than five years of experience and never participated in the main draw of the Masters Hellenic beach volleyball championship.

iii) Novice players: Novice players with 1.5 - 2 years of experience in beach volleyball training.

By definition, these three groups of beach volleyball athletes must differ in their accuracy performance, therefore a valid test that measures accuracy should procure distinctly different results for each group that also agree with their performance level. Each athlete performed the test 20 total times. The first 10 were performed on the first day of the test (Day-1) while the other 10 were on the second day (Day-2). A composite score consisting of the

summed scores of each set of 10 tests was calculated separately for Day-1 and Day-2.

D) Criterion Validity. In the present study, according to the criterion validity, the test scores were compared with the athletes' beach volleyball proficiency where novice proficiency was coded as 1, intermediate proficiency was coded as 2 and expert proficiency was coded as 3. To calculate the coefficient of validity, the researchers had to correlate the test scores with the athlete's proficiency level, the Pearson Correlation test was selected since the Shapiro-Wilk tests indicated that both the Day-1 and Day-2 distributions conformed to the normal distribution standards.

Definition of the Ideal Set and Shot-Attacking Skill

The ideal set was 0.5-1 m off the net and the height of the ball should be 2-2.5 m (medium height sets) above the net with a mean distance of 2 m between the setter and the attacker[22,2]. This kind of set is ideal in beach volleyball due to the lesser approach path of attacking players, the lesser path of the ball, and better communication between the attacker and the setter.

The shot is a softly attacked ball that is used to place the ball into an undefended area of the court. The Shot's trajectory is not directly downwards but, horizontally or in the beginning even upwards.

Development and Description of Line Shot Attack Test Instrument

A) Purpose. The evaluation of the accuracy of line shot attacks from the left side of the court.

B) Apparatus. Official FIVB (Fédération Internationale de Volleyball) beach volleyball balls, tape for the lineation of the player's starting position. For the lineation of the target scoring areas, cloth-colored tapes were used, in order for the target area to be distinct. Also, cloth-colored tapes were used for the lineation of the player's starting position and the setter area. The sand fulfilled the FIVB requirements for the conduction of official BV tournaments. This was established after checking the physical properties and grain size distribution of the sand as determined from a series of laboratory tests according to the American Society for Testing and Materials (ASTM) and which are described in detail by Author et al. (2018). All tests were performed in an indoor beach volleyball court that fulfilled the FIVB requirements (official BV rules) with 26x16 m dimensions and 40 cm sand depth. The net had eight meters long, and one meter wide, and the top was set at a height of 2.43 m. The playing court was defined by two side-lines and two end lines. There was no dividing center line. Both side and end lines were placed inside the dimensions of the playing court. The lines were colored bands, five cm wide and 16–8 m long. The indoor BV court was chosen so that the line shot attacks and the sets were not affected by the wind (0 m/s).

C) Procedure. The players performed the test (Figure 1) and stood in their starting position 6.5 m from the net and 1.5 m from the left line of the court. The setter stood in an area with 1.5x2 m dimensions. One side of the setter area was in the same line as the net and the other side was three meters from the left side of the court.

From the starting position, they under-head the ball with both hands in the setter area where an expert setter performed an ideal setting to the attacking area. The expert setter used only an overhand set. The attacking area had 2.5x1.5 m dimensions. One side of the attacking area was in the same line with the net and the other side was in the same line with the left side of the court. In case a set was not ideal, was cancelled by the setter or the expert author (GG) and performed again. After the set, the attacker tries to score points using only line shot attacks in the target area which consists of four graded sections. The four graded points sections had the following dimensions: 4=0.5x0.5 m; 3=1x1 m; 2=1.5x1.5 m and 1=2x2 m (Figure 1). The inner lines of every scoring area score for the highest number of points.

D) Scoring. The excellent score was 40 points. The method of scoring evaluates a player's ability to execute a line shot attack in a certain location of the opponent's court in the left corner. The total score of ten trials was the final score.

E) Remarks. After each successful trial, the sand in the target area was formatted again with a small tool to make clear the footprint of the ball in the next attempt. Also, a customized tool was utilized to equally distribute the sand within the approach and attacking areas after each trial to avoid sand particle compaction.
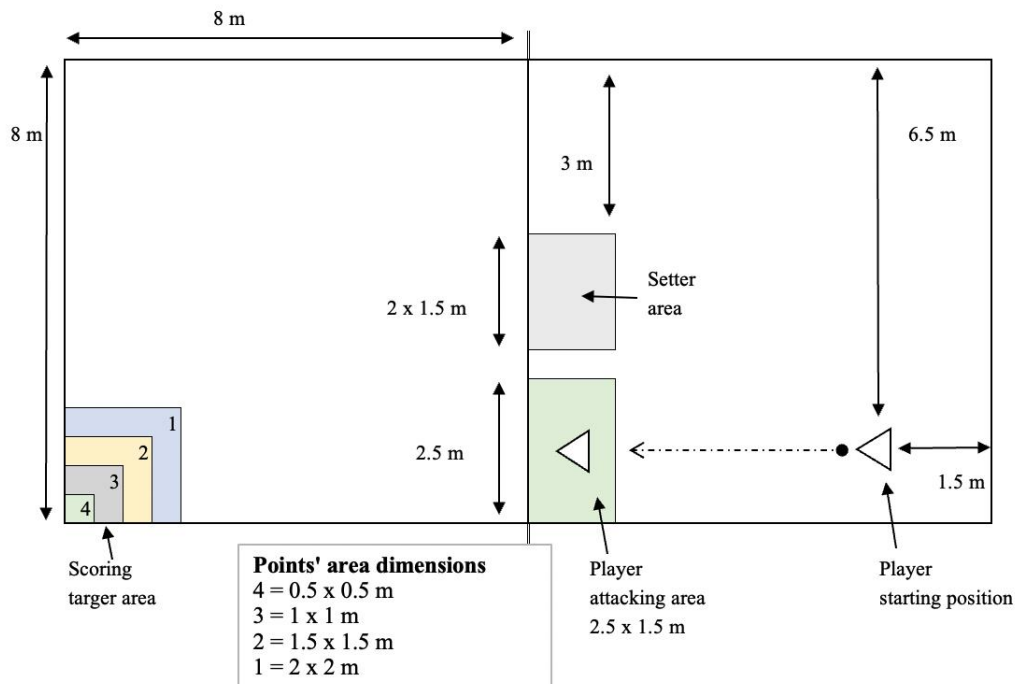

Figure 1. The test instrument
Source: authors

Development and Description of the Test Instrument: reliability

For the needs of the present study, test-retest reliability was calculated between Day-1 and Day-2 results by utilizing intra-class reliability analysis with the absolute agreement method (Intraclass correlation coefficient). Usually, researchers use interclass correlation coefficient in addition to intraclass correlation coefficient in order to measure agreement between different evaluators/judges. However, measuring the score of this test is performed via the analysis of multiple angles slow-motion camera footage, which allows an evaluator to identify with absolute and objective certainty the point on the demarcated field that the ball landed (and therefore the score of each shot). This procedure does not allow for disagreement between ratters, therefore, rendering any inter-class correlation measurement unnecessary.

Results

Validity

A) Logical Validity. The logical validity of a measure can be declared when the instrument in question obviously involves the type of performance that it aims to measure. The present test aims at measuring the accuracy of the performance of beach volleyball athletes. Three beach volleyball experts (two experienced beach volleyball coaches & one expert-level player) cooperated with the researchers in order to be developed a test that according to their

knowledge and judgment can measure the accuracy of beach volleyball players, furthermore, they set the scoring procedures in a way that better scores reflect better accuracy[10,11].

B) Content Validity. In the present study, a group of eight beach volleyball experts that did not share common members with the group that developed the test (four experienced beach volleyball coaches & four expert-level players) analyzed the test and rated it on a scale of 1 to 7 regarding its validity as a measure of beach volleyball athlete's accuracy where one was no validity and 7 was absolute validity. The average score of the eight judges was 6.75 (SD=0.46) indicating almost absolute content validity.

C) Construct Validity. For the needs of the present study, a sample consisting of three separate groups of 20 beach volleyball players was utilized. The first group consisted of novice players, the second one of intermediate players, and the third one of expert players. The players were assigned to each group via a series of criteria that have been described in the methodology chapter. By definition, these three groups of beach volleyball athletes must differ in their accuracy performance, therefore a valid test that measures accuracy should procure distinctly different results for each group that also agree with their performance level. Each athlete performed the test 20 total times. The first 10 were performed on the first day of the test (Day-1) while the other 10 were on the second day (Day-2). A composite score consisting of the summed scores of each set of 10 tests was calculated separately for Day-1 and Day-2.

In order to select between the most suitable tests for identifying group differences the normality of each group's distribution as well as the homogeneity of variances between groups had to be assessed. The Shapiro-Wilk tests that were utilized for this purpose indicated that all groups' distributions on both days could be considered to conform to the normal distribution standards (Table 1). The results of Levene's tests of equality of variances among groups for both Day-1 and Day-2 were not statistically significant (Day-1: $F_{(2,57)}=1.127$, p=0.331; Day-2: $F_{(2,57)}=1.487$, p=0.235), therefore group variances should be considered equal, both for Day-1 and Day-2 (Table 2.). As a result, Fisher's one-way analysis of variance (ANOVA) with Tuckey post hoc tests was selected as the optimal test to identify differences between group means on each separate day. An a priori power analysis utilizing Gpower v3.1for a one-way ANOVA with an effect size of 0.5, an error probability of 0.05, a b-error probability of 0.2, and three groups indicated that a sample of 42 would be sufficient with an actual power of 0.803.

Table 1. Tests of Normality

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Expert Level			
Day-1	0.946	20	0.304
Day-2	0.945	20	0.295
Intermediate Level			
Day-1	0.926	20	0.128
Day-2	0.928	20	0.140
Novice Level			
Day-1	0.950	20	0.367
Day-2	0.946	20	0.306

Source: authors

Table 2. Test of Homogeneity of Variances

	Levene Statistic	**df1**	**df2**	**Sig.**
Day-1	1.127	2	57	0.331
Day-2	1.487	2	57	0.235

Source: authors

The one-way ANOVA results for Day-1 indicated statistically significant differences between the three groups $F_{(2,57)}=406.726$, $p<0.001$, Eta Squared=0.935. More specifically the Expert group (M=26.35; SD=2.28) had the best scores followed by the Intermediate group (M=15.15; SD=1.66) with the Novice group (M=8.50; SD=2.01) getting the worst scores of the three, Tukey HSD post hoc analyses indicated that all differences among groups were statistically significant. The one-way ANOVA results for Day-2 indicated statistically significant differences between the three groups $F_{(2,57)}=348.334$, $p<0.001$, Eta Squared=0.924 (Table 3). More specifically the Expert group (M=27.35; SD=2.925) had the best scores followed by the Intermediate group (M=15.90; SD=1.86) with the Novice group (M=8.75; SD=1.77) getting the poorest scores of the three, Tukey HSD post hoc analyses indicated that all differences among groups were statistically significant (Table 4).

Therefore, the proposed test succeeded to provide statistically significant differences for our known groups with large effect sizes for both initial and retest measurements while the group means followed the expected group order. These results greatly support the Construct validity of the proposed measuring test.

Table 3. ANOVA results

		Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Day-1	Between Groups	3255.233	2	1627.617	406.726	0.000	.935
	Within Groups	228.100	57	4.002			
	Total	3483.333	59				
Day-2	Between Groups	3521.233	2	1760.617	348.334	0.000	.924
	Within Groups	288.100	57	5.054			
	Total	3809.333	59				

Source: authors

Table 4. Multiple Comparisons

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.
Day-1	Tukey HSD	Expert	Intermediate	11.200*	0.633	0.000
			Novice	17.850*	0.633	0.000
		Intermediate	Expert	-11.200*	0.633	0.000
			Novice	6.650*	0.633	0.000
		Novice	Expert	-17.850*	0.633	0.000
			Intermediate	-6.650*	0.633	0.000
Day-2	Tukey HSD	Expert	Intermediate	11.450*	0.711	0.000
			Novice	18.600*	0.711	0.000
		Intermediate	Expert	-11.450*	0.711	0.000
			Novice	7.150*	0.711	0.000
		Novice	Expert	-18.600*	0.711	0.000
			Intermediate	-7.150*	0.711	0.000

Note: *The mean difference is significant at the 0.05 level
Source: authors

D) Criterion Validity. In the present study, according to the criterion validity, the test scores were compared with the athletes' beach volleyball proficiency where novice proficiency was coded as 1, intermediate proficiency was coded as 2 and expert proficiency was coded as 3. To calculate the coefficient of validity, the researchers had to correlate the test scores with the athlete's proficiency level, the Pearson Correlation test was selected since the Shapiro-Wilk tests indicated that both the Day-1 and Day-2 distributions conformed to the normal distribution standards. An a priori power analysis with the help of Gpower 3.1 (effect size: 0.5; a-error probability 0.05; b-error probability 0.2; correlation p H0: 0) indicated that a sample of 29 would be sufficient for a Pearson correlation analysis with an actual power of 0.806. For both days, Pearson correlations' results indicated a very high level of association and were statistically significant (Day-1: $r=0.956$, $n=60$, $p<0.001$; Day-2: $r=0.953$, $n=60$, $p<0.001$), therefore it is safe to assume that Criterion Validity has been established for the proposed measurement test.

Reliability

For the needs of the present study, test-retest reliability was calculated between Day-1 and Day-2 results by utilizing intra-class reliability analysis with the absolute agreement method. The intraclass correlation coefficient for single measures was calculated at 0.961 with a 95% confidence interval ranging from 0.932 to 0.977 ($F(59,59)=54.387$, $p<0.001$), while the intraclass correlation coefficient for average measures was calculated at 0.980 with a 95% confidence interval ranging from 0.965 to 0.988 ($F(59,59)=54.387$, $p<0.001$) (Table 5). These results indicate excellent reliability for both single and average measures of ICC, which holds true for the full spectrum of the confidence interval.

Table 5. Intraclass Correlation Coefficient

	Intraclass Correlation[b]	**95% Confidence Interval**		**F Test with True Value 0**			
		Lower Bound	**Upper Bound**	**Value**	**df1**	**df2**	**Sig**
Single Measures	.961[a]	.932	.977	54.387	59	59	.000
Average Measures	.980[c]	.965	.988	54.387	59	59	.000

Source: authors

Two-way mixed effects model where people effects are random and measures effects are fixed. a. The estimator is the same, whether the interaction effect is present or not; b. Type A intraclass correlation coefficients using an absolute agreement definition; c. This estimate is computed assuming the interaction effect is absent because it is not estimable otherwise.

Discussion

In recent years, there has been a rise in the number of studies that use simulations of extremely complex sports like open sports where sports performance in a high-information environment necessitates decoding the data provided by the visual setting, which requires the development of strategies for selective attention, continuous interaction with memory, the ability to convert the decision into a motor response, and finally the ability to modify the initial decision in real-time if necessary[23]. Protocols have tended to give consistent and valid models of simply physiological responses such as heart rate and blood lactate[24] or of skill performance; however, protocols mimicking both physical and skill components of performance are few[25].

In this study, an attempt was made to develop a skill test for beach volleyball and to examine its degree of validity and reliability using the line shot attack skill. In this study, to ensure the purity of results, no performance feedback was given either during or after the test until all tests were completed, there was no distraction of participants during the performance tests, no encouragement was given to participants, and measurements were taken on the court but not during a match, no feedback was given to participants on their performance on the test, the height of the net and clothing was the same for all. The requirements for logical, content, construct, and criterion validity were achieved in all tests. In terms of reliability, internal consistency was acceptable for all the participants. Therefore, the results of this study have shown that the test instrument of the shot test was valid and reliable and can be used by coaches and teachers in evaluating the performance of their athletes.

The advantages of this skill test are the convenience and speed with which they may be used, as well as the ability to test large groups on the same day. In addition, that instrument can be used to assess both novice and experienced athletes. Because all measurements are indirect, evaluating the game's comprehension is a challenging undertaking. When an athlete's performance is evaluated under BV simulated conditions, some aspects of his/her tactical or technical knowledge may be revealed, but his or her ability to apply that knowledge to game-like situations remains unknown. However, a skill test score's key disadvantage is that it does not reflect the player's ability to perform the skills when and when they are needed.

Accurate placement of the ball by the players and avoidance of errors is important to increase the percentage of kill attack which is the most important parameter for a team to win a match[26,17,18]. For this reason, line shot attacks should be trained from players at all levels and under different conditions (wind, near or off the net, and with or without block).

Future research should concentrate on incorporating skill characteristics into protocols, and any new protocols generated should be tested for reliability and validity before being used in intervention studies. It may also be advantageous to combine this type of instrument with other types of game performance evaluation instruments, such as "Game 's Performance Assessment Instrument – GPAI"[27]. This would give us more insight into how the cognitive process is transferred to game performance and, at the same time, what kind of understanding is still processed only on the cognitive level (decision-making-tactic), which is critical in team games like BV. Furthermore, more research should be done to enable the use of valid and reliable skill test instruments in game-like scenarios for the other BV skills (attack, block, or defense). Finally, while validity and reliability are important aspects of performance assessments that have been studied to some extent, the concepts of sensitivity and transfer have not been studied enough. Researchers should try to study the protocol's sensitivity and determine how much of the benefit noticed by a specific intervention 'equates' to real performance while developing new performance procedures.

Conclusion

In this study, an attempt was made to develop a skill test for beach volleyball and to examine its degree of validity and reliability using the line shot attack skill. In this study, to ensure the purity of results, no performance feedback was given either during or after the test until all tests were completed, there was no distraction of participants during the performance tests, no encouragement was given to participants, and measurements were taken on the court but not during a match, no feedback was given to participants on their performance on the test, the height of the net and clothing was the same for all. The requirements for logical, content, construct, and criterion validity were corrected and achieved in all tests. In terms of reliability, internal consistency was acceptable for all the participants. Therefore, the results of this study

have shown that the test instrument of the shot test was valid and reliable and can be used by coaches and teachers in evaluating the performance of their athletes.

References

1. Robertson SJ, Burnett AF, Cochrane J. Tests examining skill outcomes in sport: a systematic review of measurement properties and feasibility. Sports Med. 2014;44(4):501-518. DOI: https://doi.org/10.1007/s40279-013-0131-0

2. Zetou E, Giatsis G, Tzetzis G. Validation and reliability of beach volleyball skill test instruments. Hum Mov. 2005;49(3):215-230.

3. McPherson SL. The development of sport expertise: Mapping the tactical domain. Quest. 1994;46(2):223-240. DOI: https://doi.org/10.1080/00336297.1994.10484123

4. Halson SL, Bridge MW, Meeusen R, Busschaert B, Gleeson M, Jones DA, Jeukendrup A. Time course of performance changes and fatigue markers during intensified training in trained cyclists. J Appl Physiol. 2002;93(3):947-956. DOI: https://doi.org/10.1152/japplphysiol.01164.2001

5. Gabbett TJ, Georgieff B. The development of a standardized skill assessment for junior volleyball players. Int J Sports Physiol Perform. 2006;1(2):95-107. DOI: https://doi.org/10.1123/ijspp.1.2.95

6. Downs SB, Wood TM. Validating a Special Olympics volleyball skills assessment test. Adapt Phys Activ Q. 1996;13(2):166-179. DOI: https://doi.org/10.1123/apaq.13.2.166

7. Bartlett J, Smith L, Davis K, Peel J. Development of a valid volleyball skills test battery. J Phys Educ Recreat. 1991;62(2):19-21. DOI: https://doi.org/10.1080/07303084.1991.10606554

8. Hopkins WG. Measures of reliability in sports medicine and science. Sports Med. 2000;30(1):1-15. DOI: https://doi.org/10.2165/00007256-200030010-00001

9. Atkinson G, Nevill AM. Statistical methods for assessing measurement error (reliability) in variables relevant to sports medicine. Sports Med. 1998;26(4):217-238. DOI: https://doi.org/10.2165/00007256-199826040-00002

10. Safrit MJ. Measurement concepts in physical education and exercise science (pp. 119-36). Wood TM, editor. Champaign: Human Kinetics Books; 1989.

11. Sullivan GM. A primer on the validity of assessment instruments. J Grad Med Educ. 2011;3(2):119–120. DOI: https://doi.org/10.4300/JGME-D-11-00075.1

12. Thomas JR, Nelson JK. Research Methods in Physical Activity. Champaign, IL: Human Kinetics; 1990.

13. Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. J Chiropr Med. 2016;15(2):155–163. DOI: https://doi.org/10.1016/j.jcm.2016.02.012

14. Koch C, Tilp M. Beach volleyball techniques and tactics: a comparison of male and female playing characteristics. Kinesiology. 2009;41(1):52-9. [Cited on 10 May 2022] Available from: https://hrcak.srce.hr/file/60567

15. Tili M, Giatsis G. The height of the men's winners FIVB Beach Volleyball in relation to specialization and court dimensions. J Hum Sport and Exerc. 2011;6(3):504-510. DOI: http://dx.doi.org/10.4100/jhse.2011.63.04

16. Mesquita I, Teixeira J. The Spike, Attack zones and the opposing block in elite male Beach Volleyball. Int J Voll Res. 2004;7(1):57-62. [Cited on 5 May 2022] Available from: https://hdl.handle.net/10216/95702

17. Papadopoulou SD, Giatsis G, Billis E, Giannakos A, Bakirtzoglou P. Comparative analysis of the technical-tactical skills of elite male beach volleyball teams. Sport Sci. 2020;13(1):59-66.

18. Giatsis G, Lopez Martinez AB, Gea Garcia GM. The efficacy of the attack and block in game phases on male FIVB and CEV beach volleyball. J Hum Sport and Exerc. 2015;10(2):537-549. DOI: https://doi.org/10.14198/jhse.2015.102.01

19. Schläppi-Lienhard O, Hossner EJ. Decision making in beach volleyball defense: Crucial factors derived from interviews with top-level experts. Psychol Sport and Exerc. 2015;16(P1):60–73. DOI: https://doi.org/10.1016/j.psychsport.2014.07.005

20. Chinchilla-Mira JJ, Pérez-Turpin JA, Martínez-Carbonell JA, Jove-Tossi MA. Offensive zones in beach volleyball: differences by gender. J Hum Sport and Exerc. 2012;7(3):727-32. DOI: https://doi.org/10.4100/jhse.2012.73.12

21. Medeiros AIA, Palao JM, Marcelino R, Mesquita I. Systematic review on sports performance in beach volleyball from match analysis. Rev Bras Cineantropom Desmpehno Hum. 2014;16(6):698-708. DOI: http://dx.doi.org/10.5007/1980-0037.2014v16n6p698

22. Hömberg S, Papageorgiou A. Handbook for beach volleyball. Meyer & Meyer Verlag; 1995.

23. Tenenbaum G. Expert athletes: an integrated approach to decision making. In JL Starkes & KA Ericsson, editors. Expert Performance in Sports: Advances in Research on Sport Expertise. United States of America: Human Kinetics; 2003, p.191-218.
24. Nicholas CW, Nuttall FE, Williams C. The Loughborough Intermittent Shuttle Test: a field test that simulates the activity pattern of soccer. J Sports Sci. 2000;18(2):97-104. DOI: https://doi.org/10.1080/026404100365162
25. Currell K, Jeukendrup AE. Validity, reliability and sensitivity of measures of sporting performance. Sports Med. 2008;38(4):297-316. DOI: https://doi.org/10.2165/00007256-200838040-00003
26. Giatsis G, Zaxariadis P. Statistical analysis of men's FIVB beach volleyball team performance. Int J Perform Anal Sport. 2008;8(1):31-43. DOI: https://doi.org/10.1080/24748668.2008.118 68420
27. Oslin JL, Mitchell SA, Griffin LL. The game performance assessment instrument (GPAI): Development and preliminary validation. J Teach Phys Educ. 1998;17(2):231-243. DOI: https://doi.org/10.1123/jtpe.17.2.231

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