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of Paper ID/Title

147

Developing design and construction of backspin serving skill tests to assess the learning outcomes of Table Tennis Serving

at
The 6th International Congress on
Interdisciplinary Behavior & Social Science 2017
(ICIBSoS 2017)

which were held at
The Patra Bali Resort & Villas, Indonesia
22 - 23 July 2017

For and on behalf of
The 6th International Congress on
Interdisciplinary Behavior & Social Science 2017
(ICIBSoS 2017)

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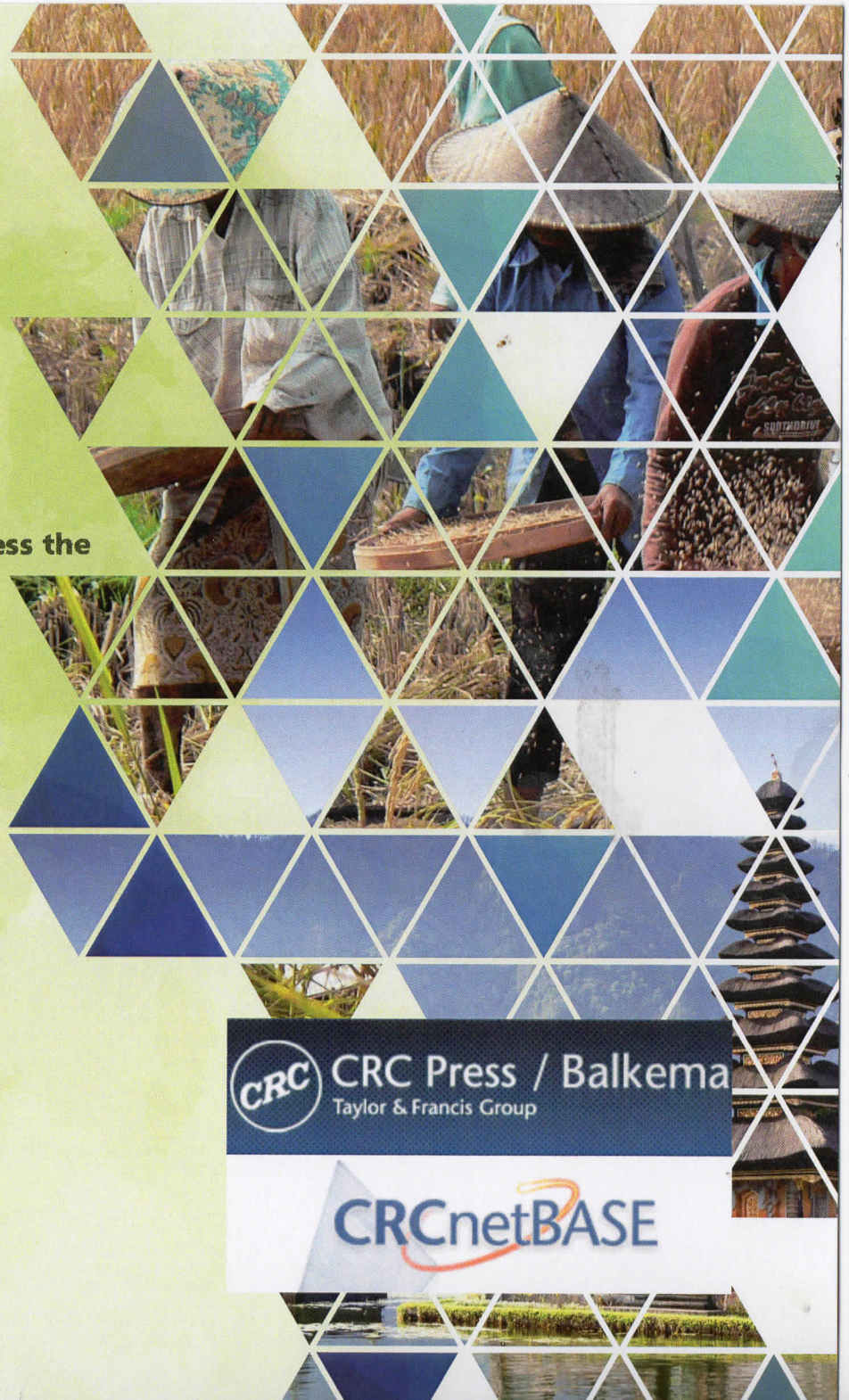

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The 6th International Congress on Interdisciplinary Behavior and Social Sciences 2017 (ICIBSoS 2017)

The Patra Bali Resort & Villas
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Jl. Ir. H. Juanda, South Kuta Beach, Kuta 80361 Bali - Indonesia Phone: +62 361 935 1161 | Fax: +62 361 935 2030

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Developing design and construction of backspin serving skill tests to assess the learning outcomes of Table Tennis Serving

Tomoliyus[1], Bandi Utama[2], Sujarwo[3], Sumaryanti[4], Herka Maya Jatmika[5]

Faculty of Sports Science, Yogyakarta State University, Indonesia[1,2,3,4,5]

ABSTRACT: The purpose of this research was to develop design and construction of backspin serving skill tests to assess the learning outcomes of table tennis serving skills. The research employed research and development method with the following procedures: (1) Developing the design and construction of backspin serving skill tests and searching the content validity of the design and construction of the backspin serving skills of table tennis game, (2) Searching for empirical validity and reliability of the backspin serving skill tests. The subjects of the research were students studying table tennis. The data analysis involved content validity ratio, product moment formula and Cronbach's Alpha formula. The results show that (1) the content validity of the test is high (content validity ratio= 0.90) with the design and construct of three target marks on the table; the first area (152.5 cm x 35 cm) was scored 5, the second one (152.5 cm x 35 cm) was scored 3, the third area (152.5cm x 67 cm) was scored 1 with a string set across the table 20 cm above the net, and attached with procedures of the test and scoring guide, (2) the empirical validity is 0.893 and reliablity = 0.938 for students studying table tennis serving. The design and construction of this backhand serving test can be used to assess the learning outcomes of table tennis serving skills.

1. INTRODUCTION

Serving is one technique that is important and must be controlled by a table tennis player (Liu, 2010); (Flores, Bercades, & Florendo, 2010); (Kasai & Mori, 1992); (Hirst, 1999). A good serving skill will produce precision targeting areas which is difficult to be accepted or returned by the opponent (Tomoliyus, 2011). Learning backspin service skills to keep in mind the way the ball backspin slightly above the net, bounce on the server's side must be near the net and 2nd bounce on receiver's side must be close to the base line (Tepper, 2005); (Aaron & Derek, nd). Richard (2009) stated that the target ball that hard to accept or returned by the opponent is the area near the net as well as the results of the low ball bounce on the opponent's table. In other words, the results of serving targets that is difficult to accept or returned by the recipient is the target that away from the opponent, either at forward, at sideways, or right side of the serving recipient.

Based on the ball spins, the serving consists of three kinds, namely round to the back (backspin), round to the front (topspin) and round to the side (sidespin). The technique of forehand and backhand serving includes: The left foot is positioned at the front and the body slightly leans toward the table (for right-handed players), the arms position form a small corner with body arm pointing downwards, the position of bet is open up when serving (Richard, 2009), turning side to the target, keep the eyes on the ball and hit the ball into the table at a 45 degree angle (Harrison & McCurdy, nd.). Open up bet means when hitting the ball, the front bet position is facing forward, the movement of serving with an open bet position is done from top to bottom, resulting in backspin ball. Meanwhile, the serving motion with an open bet position from right to left or from left to right will produce sidespin ball (Iizuka, Ushiyama, Yoshida, Fei, Yu, & Kamijima, 2010) . Serving movement with bet open position from the rear to the front is to create a slight backspin ball. Serving Movement with a closed position bet from the rear to the front produces topspin ball. Low arm ends the movement before the forehead. So for making a stroke, low arms form a smaller angle.

In order to be able to handle table tennis serving, students requirea good learning. Good learning and teaching process will generate good ratings, as well as good judgment will encourage students' learning outcomes. Good assessment of learning outcomes can be achieved by employing ra good testto determine if the test is valid and reliable.

Assessment of learning outcomes of backspin serving skills of table tennis games required valid and reliable tests. There is a test to assess the game of table tennis backspin serving, but the design and construction of the test still needs to be improved. Thus, the authors wanted to investigate and develop the design and construction of the test aimed at (1) developing the design and construction of the test in accordance with the skill competencies of backspin serving of table tennis game (content validity), (2) testing the emperic validity and the reliability of the backspin serving skill test of table tennis game.

Based on the theory and objectives of the research, the research hypotheses are: (1) The design and construction of table tennis backspin serving test is developed to have high content validity, (2) The design and construction of table tennis backspin serving skill test developed has high empirical validity and relibility.

Validity and reliability are the basic requirements for measuring devices or tests to be developed or designed (Arifin, 2012); (Sukardi, 2009). Validity is the precision of a test to measure those aspects that should be measured. Test which is valid for a specific purpose may not be valid for any other purpose. Therefore, validity is always associated with a specific purpose. The validity of the measurement has score from low to high. The higher the level of validity, then the better the measurement is.

Baumgartner et al. (2007) generally divides validity into two, namely the rational validity and the empirical validity. Rational validity or content validity is referred to as internal validity because it shows a suitability test has to measure the contents of which will be measured. Content validity relates to the ability of an instrument to measure the content (concept) should be measured. This means that a measuring instrument should be able to reveal the content of a concept or variable to be measured. Content Validity is calculated by testing the validity of the content using a measuring instrument with rational analysis of an expert.

Meanwhile, the empirical validity or external validity or also called the criterion-related validity is the validation of an instrument by comparing it with other measurement instruments that are valid and reliable through correlations. When the correlation is significant, the instrument is considered to have the criteria validity. Criteria Validity- based approach requires the availability of external criteria that can be used as a basic test for measurement instrument score. A criterion is a variable behavior to be predicted by a measuring instrument score. To see the criteria- based validity, we can use a computation of correlations between the measurement instruments scoreswith the criteria scores. This coefficient constitutes validity coefficient for the measuring instrument designed, namely r_{xy}, where x symbolizes measuring instruments score, and y symbolizing criteria scores (Arifin, 2012).

According to Sugiono (2007), reliability is a series of measurements or series of gauges that have consistency if the conducted measurement using that instrument is done repeatedly. Reliability of the test is the degree of regularity or consistency of a test, namely the extent to which a test can be trusted to produce a score that is steady, and relatively unchanged although it is tested in different situations. Reliability can be obtained through the test-retest. This is done by experimenting the instruments twice on same respondents. In this case, the instrument and respondents should be the same, but the timing is different. Reliability was obtained by differentiating the first test second test fund is calculated by the formula Cronbach's Alpha. If the alpha value is between 0.80 to 1.00 then the reliability is very high.

2. METHOD

This study employed research and development, with the first two stages to test the content validity of the design and construction of backspin serving skills tests of table tennis game, the second phase to test the validity and reliability of the design and construction of empirical backspin serving skills tests of table tennis game. The research subjects were beginner table tennis athletes. Techniques to search for content validity is to use seven experts with Focus Group Discussion (FGD) and the Delphi technique. Empirical validity is gained through correlating the serving skill tests with the rating score from the seven experts due to the serving techniques used, looking for reliability by means of correlating the first test and the second test of the serving skill. The researchers analyzed data for content validity by using the Content Validity Ratio (Wilson, Pan, & Schumsky, 2012). While the empirical validity are using product moment formula and reliability are using Cronbach's Alpha formula.

3. RESULT

The design and construction of backspin serving skill tests of table tennis is assessed by seven table tennis experts by means of Focus Group Discussion (FGD) and dephi techniques. Then the results of the assessment of seven experts were calculated by a formula of content validity ratio (CVR). The design and construction of table tennis backspin serving

skill tests generate CVR value = 0.90. The design and construction of the table tennis backspin serving skill test is developed to have high content validity. This means that the developed test instrument was contended, and the construction tests showed a linear or accuracy skill relevant to the ability of serving in table tennis. Therefore, the design and construction of table tennis backspin serving skill tests in this research is eligible to test its empirical validity. The details for the test design and construction of table tennis backspin serving skill tests are as follows: The purpose of the test: to measure the ability of serving backspin; Equipment: table tennis ball, bat, rope, and a scoreboard; Signs table: Signs for the three targets, namely score 1 with the size of 152.5 cm x 35cm, score 2 with the size of 152.5 cm x 35 cm, and the score 3 with the size of 152.5 cm x 67 cm. Distance from rope to the net is 20 cm; the table marked with the targets is seen in figure 1; Test Instruction: The subject was asked to warm up and practice sufficiently. The subject makes backspin serve towards the targets, in which the ball passes under the rope. Then the subject serves 10 times toward the target at the right and 10 times toward the target at the left side in turns; Scoring Direction: scoring carried out by two people. The first person acting as the registrar and the second person watching the ball which was served passing under the rope and get the target. Scores obtained by adding the target points of the serving as much as 20 times.

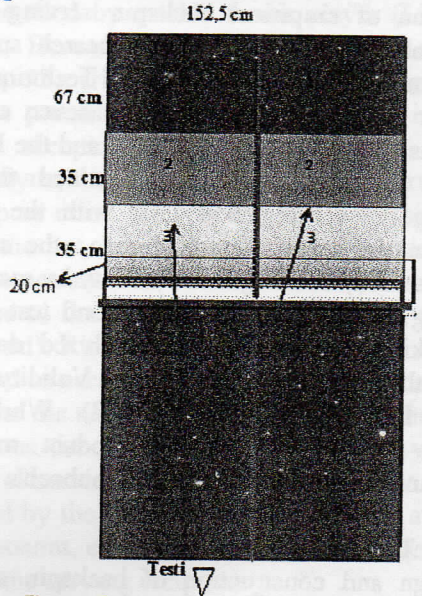

Figure 1: Target signs on the table with the score on it.

The empirical validity results were gained by means of correlating thescore results of the backspin serving skill tests (BS2T) and assessment score from the serving techniques experts (STE) which will be used as the criteria. The results correlation results are as shown in Table 1.

Table 1.The score results of the backspin serving skill tests (BS2T) and assessment score from the serving techniques experts (STE)

		BS2T	STE
BS2T	Pearson Correlation	1	0,893
	Sig. (2-tailed)		0,000
	N	25	25
STE	Pearson Correlation	0,893	1
	Sig. (2-tailed)	0,000	
	N	25	25

Table 1 shows the results of correlation between the backspin servingskill tests (BS2T) and of assessment score from the serving techniques experts (STE). The coefficient of correlation between serving skill test and assessment score from the experts amounted to r_{xy} = 0893. Based on the 0.01 significance level r_{xy} = 0.893> r table = 0.505. H_1 is accepted and H_0 is rejected. The design and construction of the table tennis backspin serving skill test developed has high empirical validity.

The reliability test results were obtained by differentiating the first test scores and second test score of the backspin serving skill tests, with the same respondents, but the timing is different, and the reliability test results are shown in Table 2.

Table 2. The results of reliability test.

Cronbach's Alpha	N of Items
0,938	2

Table 2 shows the results of the reliability test between test1 and test2 score is Cronbach's Alpha 0.938. The design and construction of the table tennis backspin serving skill test developed has high relibility. In other words, it shows the degree of stability measurements made over time (stability over time).

4. DISCUSSION

The main requirement measuring devices or test development is the validity and reliability (Arifin, 2012); (Sukardi, 2013). In general, the validity consists of two levels, namely the rational validity or content validity and empirical validity (Baumgartner et al., 2007). Validity of the content is obtained by doing FGD with some experts and or using the Delphi technique. Meanwhile the empirical validity is gotten by way of correlating between the scores of measurement instruments with the score of criteria.

Meanwhile, the reliability can be gained by correlating the first test and the second test with the same respondents, but the different timing (Sugiono, 2007). Based on the test development requirements above, the development conditions of construction test of backspin serving skill in table tennis must be valid and reliable. The results of the research here showed that the content validity of construction test development of backspin serving skill or content validity ratio (CVR) was 0.90. Thus, this tool of measuring serve accuracy developed in this research is scientifically proven to disclose the target area close to the net, and produces low ball-bounce that is difficult to accept or returned by the opponent. This is in accordance with the opinion of Tomoliyus (2016) and Richard (2009), which states that the goals or targets that are difficult to be received or returned by the opponent is in the area near the net, and the low bouncing ball on the opponent area. Therefore, this test can be continued to test its empirical validity.

Empirical validity was sought by looking for correlations between the construction test scores of backspin servings kills with the serving technique assessment as the criteria. The result is the correlation coefficient scores between the first test scores and second test score was 0.898. This indicated that the level of accuracy or appropriateness of the instruments used to measure the skills of serving in this research was very high. According to Guilford & Benjamin (1977), the value of the correlation coefficient between 0.80 until 1.00 has a very high validity. So we can say that this construction test of the backspin servingskill has a very high empirical validity. In other words, this test deserves the feasibility and accuracy to measure the skills of table tennis backspin serve.

Furthermore, the reliability was obtained by checking the first test with the second test with the same respondent, but the timing is different. The results of the variability test show that the value of Cronbach's Alpha 0.938. It shows the level of reliability, constancy, consistency, and stability of measurements made over time wis very high.

This is in accordance with the opinion of Hair et al. (2010: 125) which states that the value Cronbach's Alpha between 0.80 until 1.00 is very reliable. Therefore, the design and construction of backspin serving skills test in table tennis has very high reliability.The design and construction of backspin serving test developed has more accurate competency than the design and construction that has been previously available, because the design and construction in this test provides limit line 20 cm above the net in order to let the ball passes between the net and the string. This is in line with Tepper (2005) and Aaron & Derek, (nd.) who state that learning backspin serving skills needs to keep in mind that the ball should have backspin slightly above the net, bounce on the server's side must be near the net, and bounce twice on the receiver's side and it must be close to the base line.

5. CONCLUSION

Based on the results and the discussion above, it can be concluded as follows.

The design and construction of table tennis backspin serving skill tests has high content validity. Then the test instruments are in accordance with competency linear or appropriate with the backspin serving skill in table tennis.

The design and construction of the table tennis backspin serving skill test has very high empirical validity with coefficient value of 0.893 and very high reliability with the value of 0.938. Thus, the test is feasible to use because it has a measurement accuracy and consistency or regularity that must be applied repeatedly by the same respondents, but in a different time in doing the backspin serving to measure skills at table tennis game.

A comparison has been made between the design and construction of this developed table tennis backspin skills test with the existing table tennis skill backspin test. The design and construction of this developed table tennis backspin serving test has a limit on the path of the ball from the net height to the 20 cm rope, then the testi is forced to carry out a service whose ball passes over the net slightly (maximum 20 centimeters) above the net. When the ball passes over the rope is considered to be invalid. The difficulty in serving is found when the ball bouncing on the server side must be near the net and bounce twice on the side of the receiver and the ball must be close to the baseline. This developed test is more appropriate than the existing test to measure the competence of backspin serving skills on a table tennis game.

5. ACKNOWLEDGEMENT

This work has been supported by Faculty of Sport Science Yogyakarta State University and Indonesian table tennis association.

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