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

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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. Data were analyse involved both formula content validity ratio and product moment formula. The results show that (1) the content validity of the test was 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 coefficient reliablity = 0.898 for students studying table tennis serving. The design and construction of this serving backhand 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); (Mark, 2010); (Kasai & Mori, 1992); (Peter, accessed on july 30th 2017). 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, accessed on july 30th 2017). 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 serving forehand and backhand includes: The position of the left foot is in front and the body slightly leaning 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), turn your side to the target, keep your eyes on the ball and hit the ball into the table at a 45 degree angle (Harrison James & Noah McCurdy, accessed july 30th 2017). 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. 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 service skills of table tennis games required valid and reliable tests. There is a test to assess the game of table tennis backspin serve, but still need to be improved the design and construction of a test. Based on this, the authors wanted to investigate and develop the design and construction of a test aimed at (1) to develop the design and construction of the test in accordance with the skill competencies serve backspin game of table tennis (content validity), (2) To test the emperic validity and the reliability of the backspin service test skills of the table tennis game.

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

Validity and reliability are the basic requirements for measuring devices or tests to be developed or designed (Ariffin, 2012); (Sukardi, 2013). 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, namelyrxy,where x symbolizes measuring instruments score, and y symbolizing criteria scores

(Ariffin Z, 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 way of experimenting the instruments two times on same respondents. In this case, the instrument should be the same, the same respondents, but the timing is different. Reliability is measured by the correlation coefficient between the first trial with the next ones. Reliability is stated as a number, usually referred to as the coefficient. If the coefficient is high, then the reliability is high, too.

2. METHODES

This study uses research and development, with the first two stages to test the validity of the contents of the design and construction servicing skills tests backspin game of table tennis, the second phase of testing the validity and reliability of the design and construction emperik servicing skills tests backspin game of table tennis. 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 & Schumsky, 2012). While the empirical validity and reliability are using product moment.

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. Hi accepted and Ho rejected. The design and construction of the table tennis backspin service 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.



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)



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 hitung = 0893. Based on the 0.01 significance level r hitung = 0.893> r table = 0.505. Hi accepted and Ho rejected. The design and construction of the table tennis backspin skill test skills developed has high empirical validity.

Reliability test-retest results obtained by correlating 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 correlation results of the first and second test shown in Table 2.

Table 2. The correlation results of the first and second test



Table 2 shows the correlation between test1 and test2 score is 0.898. Based on the level of 0.01 significance of r arithmetic = 0.898> r table = 0.505. Hi accepted and Ho rejected. The design and construction of the table tennis backspin skill test skills 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 (Ariffin, 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 correlating the first test trial with the second test with the same respondents, but the timing is different. The results show that the value of the correlation coefficient score between the first with the second trial was 0.898. 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 Guilford & Benjamin (1977) who states that the value of the correlation coefficient between 0.80 until 1.00 means a very high level of reliability. Therefore, the design and construction of backspin serving skills test in table tennis has very high reliability.

Desain dan kontruksi tes servis backspin yang dikebangkan ini lebih kompetensinya dari pada desain dan kontruksi tes yang sudah ada, karena desain dan kontruksi tes ini ada pembatas jalanya bola dari tinggi net 20 centimeter. Hal ini sesuai dengan pernyataan Tepper (2005) and Aaron & Derek, (accessed 30 july 2017) yang mengatakan bahwa 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.

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 coefficient value of 0.898. 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 backspin serve to measure skills at table tennis game.

A comparison of the design and construction of this developed table tennis backspin skills test with an existing table tennis skill backspin test. The design and construction of this developed table tennis backspin service 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 net is invalid. Servis difficult to accept when bouncing on the server side must be near the net and bounces on the 2nd side of the receiver must be close to the baseline. This developed test is more appropriate than an existing test to measure the competence of backspin service skills on a table tennis game.

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REFERENCES

Arifin & Zainal. 2012. *Evaluasi Pembelajaran*. Bandung: PT. Remaja Rosdakarya.

Aaron H & Derek D. “*Table Tennis*”. 30 july 2017. web.uvic.ca/~thopper/Pe352/2002/Table Tennis8DerekAaron.pdf

Baumgartner, T.A., Jackson, A.S., Mahar, M.T., & Rowe, D.A. 2007. *Measurement for Evaluation in Physical Education and Exercise Science*, New York: Mc Graw Hill.

Guilford & Benjamin Fruchter.1977. *Fundamental Statistics in Psychology and Education*, New York: McGraw-Hill Book Co.

Harrison James & Noah McCurdy. “*Table Tennis*”. Accessed 30 july 2017. http://www.pelinks4u.org/naspeforum/discus/messages/1239/Table\_Tennis\_Harrison\_McCurdy-2784.pdf

Kasai, J. & Mori, T. 1992.  **Studies of various strokes in table tennis.** *International Journal of Table Tennis Sciences*, no.1: 39.

Liu, K. 2010. Reasons for the defeat of Wang Hao in table tennis men's singles final of Beijing Olympic Games from the technical and tactical point of view*. Journal of Shandong Institute of Physical Education and Sports*, 5: 73-76.

Mark Andrew Flores, Prof. Dave Bercades& Fernando Florendo. 2010. Effectiveness of Shadow Practice in Learning the Standard Table Tennis Backhand Drive. *International Journal of Table Tennis Sciences*, no.6: 46.

Peter A. Hirst. ETTA. “*Table Tennis*”. 30 july 2017. [www.teachpe.com/gcse/Table%20Tennis.pdf](http://www.teachpe.com/gcse/Table%20Tennis.pdf).

Richard Mc Afee. 2009. *Table Tennis Step to Success*. United States*:* Human Kinetics.

Sukardi. 2009. *Metodologi penelitian pendidikan: kompetensi dan praktiknya* Jakarta: Bumi Aksara.

Sugiyono. 2007. *Metode Penelitian Pendidikan. Pendekatan kuantitatif, kualitatif dan R & D.* Bandung: Alfabeta.

Shinji Iizuka, Yukihiko Ushiyama, Kazuto Yoshida, Yang Fei, Zhang Huan yu, & Kei kamijima. 2010. The Measuring Ball Spin at the Service in Table Tennis by Junior player. *International Journal of Table Tennis Sciences*, no.6: 122.

Tomoliyus, Sumaryanti & Herka Maya Jadmika. 2016. Development of Validity and Reliability of Net Game Performance-Based Assessment on Elementary Students’ Achievement in Physical Education. International *Journal of Assessment and Evaluation in Education,* vol. 6, no.1: 41 - 49.

Tepper, G. 2005. ITTF Coaching Manual Level 1.As cited in USA. *Table Tennis Magazine,* vol.76: 3.

Wilson, F., Pan, W., & Schumsky, D. 2012. Recalculation of the critical values for Lawshe’s content validity ratio.*Measurement and Evaluation in Counseling and Development*, 45(3), 197-210 <http://dx.doi.org/> 10.1177/ 07481756 12440286.