Reliability and Validity of Badminton Special Speed Training Method toward Success Score and Time Perception Predictive Skills Performance of Badminton Players

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Abstract. The aim of this study was to examine the validity and reliability of badminton special speed training method (BSSTM) test instrument on success score and time perception predictive skills performance among elite badminton players. Thirty elite badminton players had participated for the purpose of this study. Expert’s evaluation with content validity analysis were used to determine validity. Test-retest method were used to determine the reliability of the success score and the time perception predicting skill performance of badminton players. The BSSTM scoring sheets which consisted of three parts of assessment scoring methods (Part A, B and C) were evaluated part by part by experts. Participants also performed two separated yet similar testing sessions where the BSSTM scoring methods sheets used to evaluate their performance. Results of the analysis indicated high content validity for all Part A, B and C (α = .963, α = .956, α = .956 respectively) with high reliability also recorded (r = .953, r = .986, r = .974 respectively). In conclusion, the BSSTM and its scoring instruments is valid for badminton specific speed performance tests and reliable to be used. Badminton coaches and players may utilized BSSTM as a training method and performance monitoring tools in their periodized training program.

Keywords: specificity, testing, training monitoring

1. Introduction
Research has become one of the main tasks in current physical education teaching and training system construction in China as one of the way to improve sport performance such as badminton [1]. It is a very important work to design a set of effective badminton special speed training methods. Badminton traditional speed training method mainly include the starting running reaction speed and the footwork speed. Coaches always include various running and jumping drills in order to improve their speed in the court [2-5]. The badminton special speed training method (BSSTM) refers to an effective speed training method combined with badminton special skills [6].

The main features of badminton games are uncertainty and rapid change [7] such as badminton flight speed and falling position are uncertain. Therefore, it is important that badminton special speed training method be adopted on elite badminton players. Badminton special speed training method can
improve the reaction speed, action speed and displacement speed, the athletes’ special speed quality is the important factor that affect successful score and the accurate prediction of the ball’s landing time.

A new training method was developed in this study by adopting a training method from an intervention study by Xiao [8]. This current approach of training intended to enhance speed training method with instrument for success score test method and time perception predictive skills performance test method. Therefore the reliability and validity of the intervention and instrument were needed before it can be used.

Validity is the degree to which researchers measure what they want to measure. Validity can also be interpreted as the degree to which a research instrument can truly reflect the concept it expects to study [9]. There are many kinds of validity and different classification methods. At present, the classification method proposed by [10] was widely used. They believed that the methods of calculating validity include content validity (also known as expert validity), structural validity (also known as construct validity), and calibration validity (also known as demonstration validity).

In this study, the method of content validity was used to calculate the validity of the research instrument. Content validity is a judgment based on the theoretical basis and practical experience on whether the instrument reflects the variables to be measured, including enough items with proper content distribution ratio, and so on.

Reliability of the instrument refers to the degree of the consistency and stability of measurement results. The reliability of a questionnaire scale or test instrument means that the same results can be obtained by repeated application of the same measurements under the same measuring environment [6].

This study instrument were adopted from badminton special speed training method (BSSTM) training intervention [8]. However, the research instrument was self-designed by the researcher based on the previous theory resource. Therefore, the main purpose of this study were to examined the validity and the reliability of badminton special speed training method (BSSTM) training intervention, test instrument of success score and test instrument of time perception predictive skills performance for elite badminton players through badminton experts.

2. Methodology
Experts evaluation were used to determine validity with test-retest method were used to determine the reliability of the success score test and the test method of time perception predicting the skill performance of badminton players.

2.1. Participant
Thirty elite badminton players from Xi’an Institute of Physical Education had participated in this study.

2.2. Procedure
In this study, reliability (test-retest) and validity study were conducted on badminton special speed training method (BSSTM) scoring sheet (Table 1), success score sheet (Table 2) and time perception predictive skills performance test score sheet (Table 3).

The experts evaluation of the validity of the scoring sheets instrument utilized five Likert-scale scoring with strongly agree, agree, undecided, disagree and strongly disagree for scale of 1 to 5 respectively. The scoring sheet evaluated by expert validation (part A, part B and part C) were as shown in Table 1, 2 and 3. The contents of instrument part A was badminton special speed training method (BSSTM) training intervention consisting 13 items of instrument badminton special speed training method (BSSTM) training intervention; The contents for instrument part B was the test method of success score consisting 5 items instruments of success score; The contents of instrument of part C was the test method of time perception predictive skills performance consisting 4 items instruments of time perception predictive skills performance through 5 badminton experts.
For the reliability test, participant’s performance in two different testing occasions evaluated using the scoring sheet and data were analysed using SPSS software for correlation analysis.

Table 1. An Example of Scoring Sheet for Badminton Special Speed Training Method (Bsstm)

| No. | Items of Badminton Specialized Speed Training Methods                                                                 |
|-----|-----------------------------------------------------------------------------------------------------------------------|
| 1   | Training of fast serve to target position (the forehand and backhand low serve, the high serve, the flick serve, the drive serve). |
| 2   | Train backward footwork with visual or auditory signals: 1. Run backward. 2. Skip backward. 3. Slide footwork backward.   |
| 3   | Footwork training to move to one side of the racket and to the side of the non-racket.                                  |
| 4   | Training of the fast lunge and recovery. A deep lunge into the forecourt and recovery, lunge into the right forecourt and recover, lunge into the left forecourt and recovery. |
| 5   | Move to 6 positions and place the shuttlecock. Success 2 to 1 times = 1 point.                                          |
| 6   | Fast Net Kills (Shuttle Above top of net) and the overhead forehand Fast kill in the two corners of rear court in 30 seconds. |
| 7   | The forehand overhead Fast Drop Shot to target position and Smash to target position                                    |
| 8   | The overhead backhand fast drop shot and Underhand backhand drop shot.                                                |
| 9   | Cross-court drop shot at net and tumble drop shot at net.                                                             |
| 10  | Movement Forewards and Backwards, The Forehand Overhead Clear and Underarm Net Shots.                                 |
| 11  | Fast Movement Push or the Forehand and Backhand Drive.                                                                |
| 12  | Rally for 2 minutes: Movement forwards and backwards, the forehand overhead slow drop shots, forehand and backhand underarm net of the return of stroke training. |
| 13  | Rally for 2 minutes: Movement forwards and backwards, the forehand overhead fast drop shot and smash, return of smash, forehand and backhand underarm the return of clear ball. |

Note: Score item of badminton specialized speed training methods was 1=Strongly Disagree (SD), 2=Disagree (D), 3=Undecided (UD), 4=Agree (A), 5=Strongly Agree (SA).

Table 2. An Example of Scoring Sheet for Success Score Test Method for Badminton Players (Part B)

| No. | Items of Test Method of Success Score For Badminton Players |
|-----|-----------------------------------------------------------|
| 1   | Forehand serve to target position in rearcourt in 1 minute. Success Score Check: Success 15 to 13 times = 5 points; Success 12 to 10 times = 4 points; Success 9 to 6 times = 3 points; Success 5 to 3 times = 2 points; Success 2 to 1 times = 1 point. |
| 2   | Using 1.5 frequency of the serve machine, serve to the midcourt. Record the successful times of drop shots to target position in 1 minute. Success Score Check: Success 15 to 13 times = 5 points; Success 12 to 10 times = 4 points; Success 9 to 6 times = 3 points; |
Using the 1.5 frequency of serve machine to serve to the two corners of the badminton rearcourt in 1 minute. Record successful times of return kill. Success Score Check: Success 15 to 13 times = 5 points; Success 12 to 10 times = 4 points; Success 9 to 6 times = 3 points; Success 5 to 3 times = 2 points; Success 2 to 1 times = 1 point.

Place the shuttlecock in the four corners of the left court, each corner with 4 shuttlecocks as touching target. After listening to the signal, start to touch target of four corners from starting position, finish to touch all targets, and then go back to the starting position. Record time of touching all target. Check your Score:
27.51 to 28.50 seconds = 5 points; 28.51 to 29.50 seconds = 4 points; 29.51 to 30.50 seconds = 3 points; 30.51 to 31.50 seconds = 2 points; 31.51 to 32.50 seconds = 1 point.

Using 2.0 frequency of the serve machine, serve to the midcourt. Record the successful times of Smash to target position in 1 Minute. Success Score Check: Success 10 to 9 times = 5 points; Success 8 to 7 times = 4 points; Success 6 to 5 times = 3 points; Success 4 to 3 times = 2 points; Success 2 to 1 times = 1 point.

Note: Score Items of Test Method of Success Score For badminton players was 1=Strongly Disagree (SD), 2=Disagree (D), 3=Undecided (UD), 4=Agree (A), 5=Strongly Agree (SA).

Table 3. An Example of Scoring Sheet for Time Perception Predictive Skills Performance (Tppsp) Test Method for Badminton Players (Part C)

| No. | Items of Test Method of Time Perception Predictive Skills Performance | Score |
|-----|---------------------------------------------------------------------|-------|
| 1   | The 1.5 serve frequency of the serve machine is used to serve the high serve to the target in the rear-court, so that the object can predict the landing time of the high serve. Record your Predict Time: | 1 2 3 4 5 |
| 2   | The 1.5 serve frequency of the serve machine is used to serve to the target of the rear-court, the forehand Smash in badminton rearcourt. Predict landing time of forehand smash. Record your Predict Time: | |
| 3   | The 1.5 serve frequency of the serve machine is used to serve to the target of the rear-court, the forehand drop shot in badminton rearcourt. Predict the landing time of badminton forehand drop shot. Record your Predict Time: | |

Note: Score Items of Test Method of Time Perception Predictive Skills Performance was 1=Strongly Disagree (SD), 2=Disagree (D), 3=Undecided (UD), 4=Agree (A), 5=Strongly Agree (SA).

2.3. Statistical Analysis
Data were analyzed using Statistical Package of the Social Sciences (SPSS). Consistency of Cronbach'a coefficient analysis method were used for contents validity of test method of Success score and test method of time perception predictive skills performance. While, retest reliability analysis method by pretesting experiment were used for reliability what it should be doing as presented before the test method of Success score and test method of time perception predictive skills performance

3. Result

3.1. Experts Evaluation Results for The Contents of The Instruments
Table 4 showed that all experts had given 100% usable rate of the instruments, indicating the high validity of the instrument in measuring
Table 4. Evaluation Results of Research Instrument Validity

| Description | Instruments | SE | UR % |
|-------------|-------------|----|------|
| Distributed | Part A: BSSTM Training Intervention | 5 | 100 |
|             | Part B: Test Method of Success score | 5 | 100 |
|             | Part C: Test Method of Tim Perception Predictive Skills Performance | 5 | 100 |
| Received    | Part A: BSSTM Training Intervention | 5 | 100 |
|             | Part B: Test Method of Success score | 5 | 100 |
|             | Part C: Test Method of Tim Perception Predictive Skills Performance | 5 | 100 |

Note: SE = Sample expert, UR = Usable rate %

3.2. Evaluation Results of Research Instrument Validity

Table 5 showed that for all three part of the instruments, alpha level recorded were very high. Indicating highly acceptable content validity.

Table 5. Evaluation Results of Research Instrument Validity

| Sub-variables | Content Validity | No. of Items |
|---------------|-----------------|--------------|
| Part A of Instrument: Badminton special speed training method (BSSTM) | $\alpha = .963$ | 13 |
| Part B of Instrument: Test method of success score | $\alpha = .956$ | 5 |
| Part C of Instrument: Time perception predictive skills performance | $\alpha = .956$ | 4 |

3.3. Reliability Analysis on Badminton Special Speed Training Method

Table 6 showed that for all three tests represented by all three part of the instrument, the reliability level was high. This indicated that the instruments is highly reliable to be used as a testing instrument.

Table 6. Reliability Analysis on Badminton Special Speed Training Method

| Sub-variables | Retest Reliability | No. of Items |
|---------------|-------------------|--------------|
| Part A of Instrument | $r = .953$ | 13 |
| Reliability Statistics on Success Score Test Method of Badminton players | Retest Reliability | No. of Items |
| Part B of Instrument | $r = .986$ | 5 |
| Reliability Statistics on Test Method of Time Perception Predictive Skills performance | Retest Reliability | No. of Items |
| Part C of Instrument | $r = .974$ | 4 |
4. Discussion
The objective of this study was to test the reliability and validity badminton special speed training method (BSSTM) of training intervention and the research instrument of success score test and time perception predictive skills performance test method. From the data that has been obtained, based on the results of the study it can be concluded that the BSSTM, instrument of success score test and instrument of perception predictive skills performance test method have high validity and reliability.

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