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DEVELOPMENT OF A BACKHAND SKILL TEST FOR BADMINTON PLAYERS

Bhopinder Singh [1], Dr. Ekta Bhushan [2]

[1] Trained graduate Teacher (Physical Education), Directorate of Education, Government of Delhi, India
[2] Associate Professor, Indira Gandhi Institute of Physical education and sports sciences, University of Delhi, India

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ABSTRACT

This research explores the development of a comprehensive test to assess backhand shot skills in badminton. Initially inspired by a personal shift from track and field to badminton during undergraduate studies at the Indira Gandhi Institute of Physical Education and Sports Sciences, the study focuses on the influence of legendary players, particularly Taufik Hidayat's backhand technique. The research aims to design a standardized test that evaluates the key components of a well-executed backhand shot, incorporating both qualitative and quantitative measures. The test assesses technical elements such as shot placement, accuracy, and consistency, while also considering broader aspects of player performance. Grounded in research methodologies from prior studies on badminton skill assessment, this test was developed through multiple stages, including content validation by experts, field testing, and iterative revisions. The final instrument underwent thorough validation using Lawshe's Content Validity Index (CVI) method, achieving an "Excellent" rating. By increasing the number of shot attempts from 12 to 16 and refining the scoring zones on the court, the test ensures a more accurate evaluation of a player's backhand skill and precision. This tool offers valuable insights for coaches and trainers, enabling targeted improvement in player performance and contributing to the broader field of badminton training.

Keywords: Backhand Shot, Badminton

1. INTRODUCTION

The beginning of this research lies in an unexpected meet with the sport of badminton during my undergraduate studies at the Indira Gandhi institute of physical education and sports sciences, University of Delhi. While my initial athletic preference was towards track and field, particularly the 400-meter sprint, my friendship with a badminton enthusiast led me to explore this sport more closely. Attracted by the skill and accuracy of the game, I began watching international badminton matches, particularly those featuring legendary players like Taufik Hidayat, Lin Dan, Lee Chong Wei, and Peter Gade.

It was Taufik Hidayat's exceptional backhand shots that mesmerised my attention and ignited a passion for this particular technique. His masterful execution of the backhand stroke, combined with his strategic play and unwavering determination, left a profound impression on me. Inspired by his example, I embarked on a personal journey to develop my own backhand skills.

This research paper aims to explore the development of a comprehensive test for assessing backhand skill in badminton. Drawing upon my personal experiences, insights gained from studying the techniques of renowned players, and existing research in sports science, I will research into the key components of a well-executed backhand shot. By identifying the critical factors that contribute to a successful backhand, I propose to create a standardized test that can be used to evaluate and improve the backhand abilities of badminton players at various levels.

The proposed test will incorporate both qualitative and quantitative measures to assess different aspects of backhand performance. Qualitative analysis will focus on technique and shot placement. Quantitative analysis will involve measuring factors such as accuracy, and consistency. By combining these approaches, the test will provide a holistic evaluation of a player's backhand skills.

The development of this test has the potential to make a significant contribution to the field of badminton coaching and training. It can be used to identify areas for improvement in individual players, inform the development of targeted training programs, and facilitate objective comparisons of backhand performance among different players. Furthermore, the test may serve as a valuable tool for researchers studying the biomechanics and psychology of badminton.

To construct a tough backhand shot test instrument for badminton players, three foundational studies offered necessary insights. Wiyanato et al.'s (2021) "Forehand smash test model for junior badminton athletes" established a clear methodological framework for creating performance assessment tools, serving as a valuable reference point for our research. Their work provided a structured approach to instrument development, including considerations for test design, validity, and reliability.

Septian Williyanto et al.'s (2021) "Backhand serve test model for junior badminton athletes" emphasized the significance of involving multiple stakeholders in the validation process. By incorporating feedback from academics, players, and coaches, we were able to ensure that our instrument was both theoretically sound and practically relevant. This collaborative approach enhanced the instrument's trustworthiness.

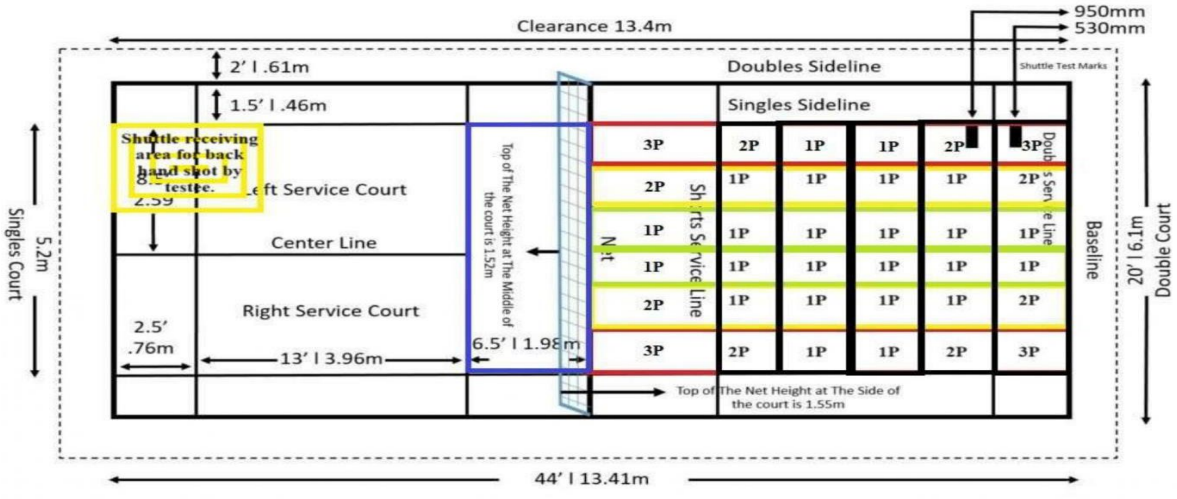
Finally, Septian Williyanto et al.'s (2023) "Development of footwork skill test instrument for junior badminton" offered a particularly influential approach. Their study demonstrated how to modify existing instruments using the Borg & Gall (1983) research model, providing a systematic framework for instrument development. By adapting this model to our specific research objectives, we were able to expedite the development process and ensure the instrument's alignment with established research practices.

In conclusion, these three studies collectively provided a solid foundation for our research. By drawing upon their insights and methodologies, we were able to develop a backhand shot test instrument that is both valid, reliable, and applicable to a wide range of badminton players

2. PROCEDURE AND METHODOLOGY

The method used in this research is the research and development method. The steps in this research refer to the development research model (W. R. Borg and M. D. Gall, Educational Research: an Introduction, 7th ed. New York: Logman Inc, 2003), which includes Research and Information Collecting, Planning, Develop Preliminary Form of Product, Preliminary Field Testing, Main Product Revision, Main Field Testing, Operational Product Revision, Operational Field Testing, Final Product Revision, Dissemination, and Implementation, as basis of the research and with some changes as per the need of the study has been made for more details, see Table 1.

Initially the idea is discussed with the guide, on a handmade badminton court on the diary page, where the court is been divided into two part by the net one side of net where the teste will execute the back hand shot from the non-racket hand side by using backhand shot only to the other side of the net from where tester was feeding the shuttle and shot will be measured, points will awarded as per the area where shuttle lands, scoring was made keeping a rational in mind that ability to execute the back hand shot away from the center required accuracy and skill, that's way center area have low value point and corners area have high value point. After discussing this part, a semi fair picture of the instrument came in front as you can see below:



Now the questionnaire is developed to validate the above instrument by using lawshe's content validation method from (Gilbert, Gregory & Prion, Susan. (2016). Making Sense of Methods and Measurement: Lawshe's Content Validity Index. Clinical Simulation in Nursing.

Table No. 1. Research Steps for the construction of the test

S. No.	Stage Framework	Researcher Steps
1	Information collecting	Preliminary study (literature) looking for path to establish the idea to create an instrument
2	Planning	Discussion group forum with badminton Experts consisting of professors, coaches, and badminton players
3	**Develop a preliminary** form of the product	The initial draft of back hand test instrument **f**or badminton players
4	Content validation anduniversal acceptance	Using the Lawshe's content for content validation
5	Preliminary field testing	Conducting initial field trials on a limited Scale by making as many as 17 badmintonPlayers as subjects
6	Main product revision	Making improvements to the initial draft of the test instrument after the initial trial
7	Main field testing	Conducted the second trial involving 54 badmintonplayers who are members of 3 badminton academies
8	Operational productanalysis	Analyzing the instrument based on the results of a wider trial.
9	Operational field texting	Validation test by Statistical data processing using the help of The SPSS application.
10	Final product revision	Final improvement of the test instrument Product developed to produce the final Product
11	Dissemination andimplementation	Disseminate back hand test instrument Products and implement them in the field

12. 530-531. 10.1016/j.ecns.2016.08.002.) And for the content index calculation (Yusoff, Muhamad Saiful Bahri. (2019). ABC of Content Validation and Content Validity Index Calculation. Education in Medicine Journal. 11. 49-54. 10.21315/eimj2019.11.2.6.) Method is used as you can see below Table: 2 and 3.

Now the content validation part of the instrument was done with help and kindness and availability a professor of the same field, two associate professors out of one was badminton player itself and a certified Nis coach cum national level badminton player and their responses can be seen below.

Table No. 2. Expert Validation Assessment Table

Item	**Rated Aspects**	**Professor**	**Associate Professor**	**Associate professor**	**NIS Coach**
Test Design:					
1	Feeding 12 shuttles to the teste on the backside of the court providesa sufficient 1 and fair assessment oftheir backhand shot execution ability.	4	4	4	4

2	The requirement for the testes to attempt all shuttles to cross the netin the first 1 place effectively measures backhand shotconsistency.	4	4	3	4
Scoring System:					
3	The division of the court into 6 rows and 6 columns accurately reflects the 1 different level of skill and control required in badminton.	4	4	4	4
4	Awarding 3 points for shuttles landing in the corners appropriately recognizes 1 the difficulty and skill required for those placements.	4	4	4	3
5	The 2-point allocation for shuttles landing in the sides of the corners is a valid 1 reflection of moderate skill and control.	2	3	4	4
6	The point allocation for shuttleslanding in the sides of the center area or at the 1 center is suitable for representing the easiest shots to execute.	3	3	4	3
Measurement Validity:					
7	The scoring system effectively differentiates between varying levels of player skill in executing backhand shots.	4	4	3	4
8	The layout of the court is clear and unambiguous, facilitating an accurate assessment of were the shuttle lands.	3	4	4	3
9	The point allocation system isappropriate for assessing the control and accuracy required forbackhand shots in badminton.	2	4	4	3
10	The overall test layout is comprehensive and covers all essential aspects of backhand shot performance.	4	4	4	3
11	Assigning 3 points to the corner areas effectively measures high skill and control in executing backhand shots.	4	4	4	3
12	Assigning 2 points to the areas adjacent to the corners appropriately reflects the level of skill and control required.	2	4	3	3
13	Assigning 1 points to the areas beside the center and to the center area effectively reflects that it is theeasiest spot to target in a backhand shot.	2	3	4	4
14	The overall scoring system (1 to 3points) is a valid measure of backhand shot proficiency	4	4	4	3

Calculation was made on the response of the experts mention in table 2 is in the table 3 below:

Table No. 3. Calculation Table

Experts	Expert-1	Expert-2	Expert-3	Expert-4	Agree	I-CVI	UA	Interpretation
Item-1	4	4	4	4	4	1.00	1	Excellent
Item-2	4	4	3	4	4	1.00	1	Excellent
Item-3	4	4	4	4	4	1.00	1	Excellent
Item-4	4	4	4	3	4	1.00	1	Excellent
Item-5	2	3	4	4	3	0.75	0	Good
Item-6	3	3	4	3	4	1.00	1	Excellent
Item-7	4	4	3	4	4	1.00	1	Excellent
Item-8	3	4	4	3	4	1.00	1	Excellent
Item-9	2	4	4	3	3	0.75	0	Good
Item-10	4	4	4	3	4	1.00	1	Excellent
Item-11	4	4	4	3	4	1.00	1	Excellent

Item-12	2	4	3	3	3	0.75	0	Good
Item-13	2	3	4	4	3	0.75	0	Good
Item-14	4	4	4	3	4	1.00	1	Excellent
Proportion Relevance	0.71	1.00	1.00	1.00	0.71	**0.9285 S-CVI/Ave**	**0.7142 S-CVI /UA**	

To understand the above numeric digits written under the Expert 1,2,3,4. Is as followed

Code	Label
1	Not Relevant
2	Somewhat Relevant
3	Quite Relevant
4	Highly Relevant

I-CVI (item-level content validity index) The proportion of content experts giving item a relevance rating of 3 or 4 I-CVI = (agreed item)/ (number of expert) which is one for all the items accept items 5,9,12,13. Which is 0.75.

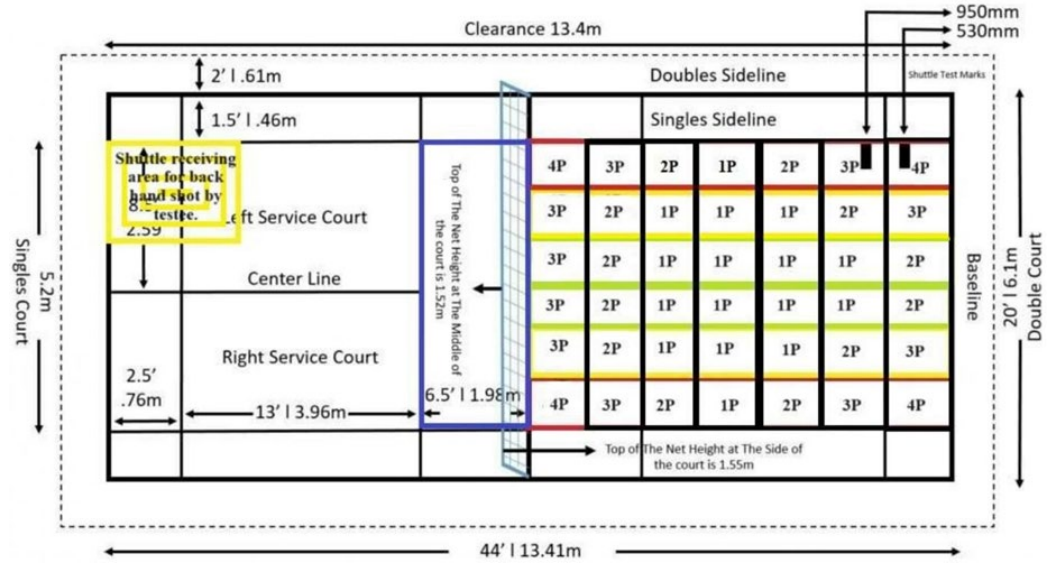
S-CVI/Ave (scale-level content validity index based on the average method) The average of the I-CVI scores for all items on the scale or the average of proportion relevance judged by all experts. The proportion relevant is the average of relevance rating by individual expert. Which is 0.92857 of the present study. And consider as "Excellent" value as per the recommendation of ((Yusoff, Muhamad Saiful Bahri. (2019). ABC of Content Validation and Content Validity Index Calculation. Education in Medicine Journal. 11. 49-54. 10.21315/eimj2019.11.2.6.)) and ((Gilbert, Gregory & Prion, Susan. (2016). Making Sense of Methods and Measurement: Lawshe's Content Validity Index. Clinical Simulation in Nursing. 12. 530-531. 10.1016/j.ecns.2016.08.002.))

S-CVI/UA (scale-level content validity index based on the universal agreement method) the proportion of items on the scale that achieve a relevance scale of 3 or 4 by all experts. Universal agreement (UA) score is given as 1 when the item achieved 100% experts in agreement, otherwise the UA score is given as 0. S-CVI/UA = (sum of UA scores)/ (number of item) which is 0.7142 of the present study, and at the last Lawshe CVR (Content Validity Ratio) of the present study is 1. The number of experts and its implication on the acceptable cut-off score of CVI

From	To	Interpretation
-1	0	Remove
0	0.4	Poor
0.4	0.59	Fair
0.6	0.74	Good
0.75	1	Excellent

Note: all the above definition and interpretation are the referred from the (Yusoff, Muhamad Saiful Bahri. (2019). ABC of Content Validation and Content Validity Index Calculation. Education in Medicine Journal. 11. 49-54. 10.21315/eimj2019.11.2.6.)

Thereafter on the discussion and recommendation of the experts there were few changes were made in the instrument maximum points were increased from 3 to 4, size of the area of yellow box was resize to length 4.70 feet by breadth 4.91 feet and one more zone was added to net side to increase the accuracy and assessment level of the instrument, more over assessment point of center back was increased by 1 point can easily observe in picture below:

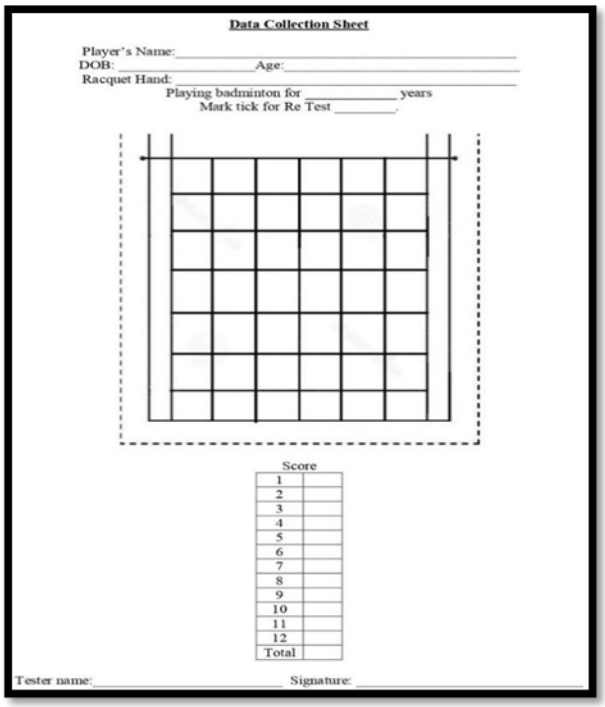


3. PRELIMINARY FIELD TESTING

To develop the test instrument, a preliminary field test was conducted with 17 badminton players from a badminton academy. Each player stood on a marked line located 11 feet from the baseline of the badminton court. The tester also stood at the same distance on the opposite side of the court.

Each player received 12 shuttlecocks (BWF-approved Victor Ace Master shuttles were used, as shown in the image below) to perform the backhand shot. The shuttles were delivered within a designated area measuring 6.28 feet in length and 5.66 feet in width (yellow box). Points were awarded based on the zone where the shuttle landed, each zone measured 3.14 feet by 2.83 feet, with higher points awarded for landing in zones of maximum value.

The players' ability to score maximum points was evaluated based on the placement of the shuttle in the highest point zones. The data was recorded on a score sheet, designed to track both the score and the specific location where the shuttle landed, all recorded simultaneously by a single person along with detailed instructions are provided below in screen shot.



Data Collection Sheet

Player's Name:_____
DOB: _____ Age:_____
Racquet Hand: _____
Playing badminton for _____ years
Mark tick for Re Test _____.

Score

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total	

Tester name:_____ Signature: _____

Instruction to the Recorder/Tester

Objective: To accurately record the landing position and corresponding score of each shuttle during the backhand smash test.

1. Marking the Shuttle Position:
- As each shuttle is hit, observe where it lands on the court.
- Use the provided layout sheet to mark the exact position where the shuttle lands.
- Each shuttle is numbered (1 to 12). Mark the position on the layout corresponding to the shuttle number.

2. Recording the Score:
- Assign a score based on the shuttle's landing position:
- 4 points: Shuttle lands in the highest-scoring area.
- 3 points: Shuttle lands in the second highest-scoring area.
- 2 points: Shuttle lands in the third highest-scoring area.
- 1 point: Shuttle lands in the lowest-scoring area.
- If the shuttle does not cross the net, mark 0 points.
- If the shuttle lands out of bounds, mark 0 points.
- If the testee fails to execute the shot (misses the shuttle), mark -1 point.
- Write the corresponding score in front of the shuttle number on the score sheet.

3. Final Review:
- After all 12 shuttles have been recorded, review the marked layout to ensure accuracy.
- Double-check that each shuttle number has a corresponding to the score recorded.

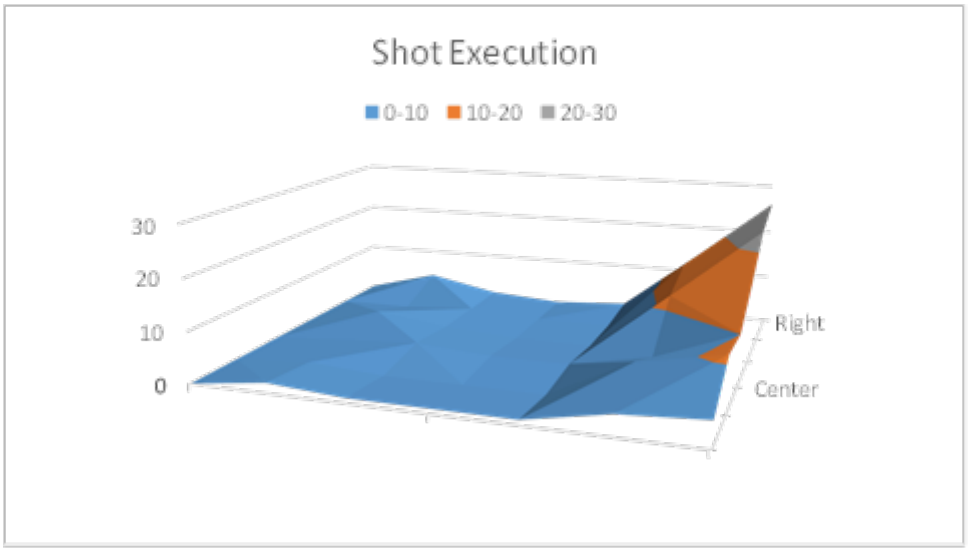
Important Notes:
- Ensure that the markings on the layout are clear and precise and equivalent to the score recorded.
- Scores must accurately reflect the shuttle's position and any penalties incurred.
- Consistency in scoring is crucial throughout the test.

4. RESULT AND DISCUSSION ON PRELIMINARY FIELD TESTING

The analysis of the backhand shot executed with the placement of the execution of the preliminary field test of 17 badminton players is as followed.

	Left		Center		Right	
Net area	0	0	0	0	0	0
	2	1	1	3	0	4
	1	0	2	1	1	1
Mid Court	1	0	1	0	0	0
	1	0	1	0	0	1
	4	8	4	12	15	13
Back court	5	11	10	16	23	26
	Deep left					Deep Right

In the Net Area (Front Court), the numbers are relatively low, ranging from 0 to 4, which suggests that fewer shots are being placed near the net. The highest value, 4, appears in the last column, indicating more activity on the far-right side of the court near the net. Moving to the Mid Court, the values are also quite low, with most columns showing 0 and only a few instances of 1. This implies that the mid-court area is not being heavily utilized. In contrast, the Back Court shows a significant increase in numbers, particularly in the last two columns, where values reach as high as 26, indicating a large number of shots landing in the far back- right corner. The back-left corner also shows considerable activity, with values of 11 and 5, though it is less targeted than the right side. Graphically represented below.



Main product revision

After the analysis from both above tables, it can be said that maximum point which is 4 can be easily obtain from the execution of backhand straight clear shot, which leads to overshadow the other 3 corners, to assess the exact skill and accuracy of backhand shot of badminton player, the area needs to be delimited were no shots were executed. After the group discussion with coach and players every corner is been delimited to 4 shots, which leads to increase in total no of shuttle from 12 to 16.

Main Field testing

The analysis of backhand shots was conducted using data from 54 badminton players under 17 years old from three different academies. These players executed a total of 1,728 backhand shots (864 in each test). Out of these, 333 shots went out of bounds, resulting in 1,395 valid backhand shots being recorded. This data recorded while establishing validity by test- retest method more for further calculation SPSS software was used to evaluate.

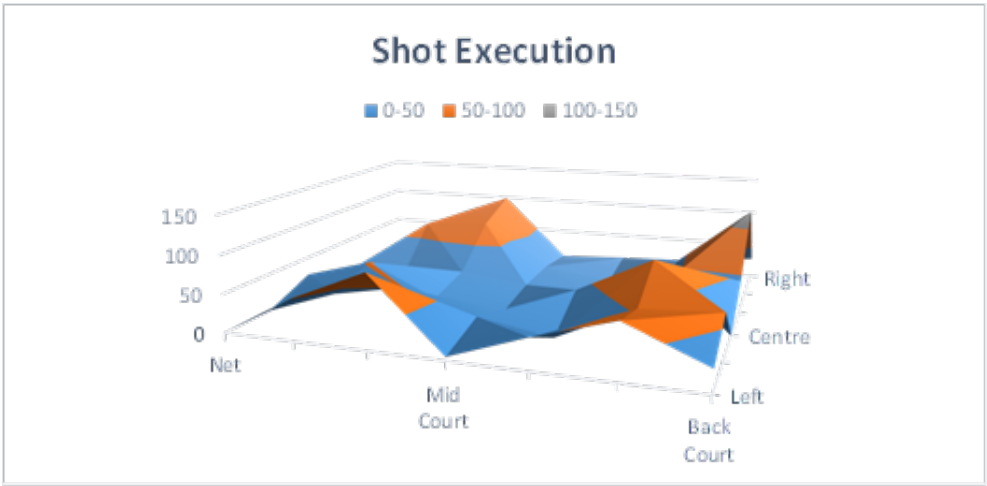
Name of badminton academy	Sample
Infinity S Badminton Academy Palam Vihar	15
Sai Shuttlers Badminton Academy	21
Love India Badminton Academy	18

In net area, in general, saw relatively low performance across all left, center, and right sections. The left side near the net showed slightly better results compared to the center and right sections, with a value of 96, indicating slightly more successful actions or plays in that area.

	Left		Center			Right
Net	1	0	1	0	2	0
	55	33	25	0	68	62
	96	51	52	22	75	99
Mid Court	5	23	9	11	14	8
	40	7	0	0	0	13
	70	54	40	33	39	17
Back Court	29	60	89	44	120	28
	Deep Left					Deep Right

The mid-court zone exhibited moderate performance levels. The left and right sections performed better than the center, with higher values suggesting more effective plays or actions in those areas. The center section, particularly in the middle of the court, showed lower performance, with a value of 0 in one zone, indicating less success in that specific area.

The back court demonstrated significantly stronger performance compared to the net and mid-court areas. The deep right section, in particular, exhibited the highest value of 120, indicating a high success rate in that area. The deep left and center zones also showed strong performance, with values of 89 and 60, respectively. Overall, the back court area proved to be the most successful zone on the court, is graphically represented below.



5. OPERATIONAL PRODUCT ANALYSIS

The analysis of the table and previous test results indicates that this test is more effective for evaluating overall backhand shot performance. It offers a comprehensive breakdown of shot placement across various court zones, enabling detailed assessments of accuracy and consistency. This approach helps identify specific strengths and weaknesses in a player's backhand, which is essential for development and improvement. In summary, the table's capacity to assess backhand shots in all four corners of the court makes it a valuable tool for evaluating overall performance and pinpointing areas for enhancement.

6. OPERATIONAL FIELD TEXTING

Statistical analysis for The Development of a Valid and Reliable Backhand Skill Test for Badminton Players is conducted on two different trials by using SPSS statistical software in table 4.

Table No.4: Descriptive analysis of backhand shot test on two different trials

	Mean	Std. Deviation	N
Trial A	26.91	3.939	54
Trial B	28.81	2.795	54

The table no. 4 clearly depicts the descriptive analysis for the test at two different trials, which shows that the Trial A has a mean score of 26.91 with a standard deviation of 3.939, while Trial B has a higher mean score of 28.81 and a lower standard deviation of 2.795, both based on a sample size of 54 participants

Table No.5: Pearson's Product moment correlation between the two trials of back hand shot test

		Trail A	Trial B
Trial A	Pearson Correlation	1	0.651**
	Sig. (2-tailed)		0.000
	N	54	54
Trial B	Pearson Correlation	0.651**	1
	Sig. (2-tailed)	0.000	
	N	54	54

**. Correlation is significant at the 0.01 level (2-tailed).

Table No.5 clearly indicates the values of Pearson's Product moment correlation between the two trails of backhand shot test, which shows that a significant positive relationship between the scores of two different trials, with a Pearson correlation coefficient of 0.651, indicating a moderate to strong association. This correlation is statistically significant at the 0.01 level (2-tailed), suggesting that as the scores in trials A increase, the scores in trials B tend to increase as well. Overall, these findings highlight a meaningful connection between the performance metrics of the two trials.

Table No. 6: Grading Norms

Age	Level	Below Average	Average	Above Average
12- 17year	State	≤ 26	26-28	≥ 28

7. RESULTS AND DISCUSSIONS

The descriptive statistics for Trial A and Trial B, shown in Table 4, provide valuable insight into the performance of participants across both trials. Trial A yielded a mean score of 26.91 with a standard deviation of 3.939, while Trial B exhibited a higher mean score of 28.81 with a lower standard deviation of 2.795. Both trials involved 54 participants. The lower standard deviation in Trial B indicates less variability in performance, suggesting that players may have become more consistent in their backhand shots over time or under slightly altered conditions.

Table 5 presents the Pearson's product-moment correlation analysis. A statistically significant positive correlation ($r = 0.651$, $p < 0.01$) was found between the scores of Trial A and Trial B. This moderate to strong correlation suggests a meaningful relationship between the performances in the two trials. As performance improved in one trial, a corresponding improvement was observed in the other, indicating consistency in the measurement of backhand shot performance across trials.

The analysis of the descriptive statistics and correlation coefficients underscores the effectiveness of the test for evaluating backhand shot performance in badminton. The higher mean score in Trial B, coupled with a lower standard deviation, suggests that players demonstrated increased accuracy and consistency in their backhand shots. This improvement could be attributed to better familiarity with the test setup, enhanced focus, or skill development between trials.

The significant positive correlation between Trial A and Trial B further reinforces the reliability of the test. The moderate to strong correlation demonstrates that the test yields consistent results across multiple trials, which is critical for evaluating player performance over time. The test's ability to distinguish between various levels of player proficiency while maintaining reliable measurements makes it a valuable tool for coaches and trainers to assess player strengths and weaknesses, particularly in terms of accuracy and shot placement in different court zones.

In summary, this backhand skill test offers a comprehensive evaluation of shot placement across the court, making it effective for identifying specific areas of a player's backhand that may require improvement. The test's reliability, demonstrated through consistent results across trials, supports its use as a valuable instrument for tracking performance progress and tailoring training programs for badminton players.

8. RECOMMENDATIONS

Based on the findings of this research on the development of a valid and reliable backhand skill test for badminton players, the following recommendations are proposed:

- Adoption of the Backhand Skill Test in Training Programs: The validated backhand skill test should be incorporated into training programs at various levels of competitive badminton. Coaches and trainers can use this tool to assess players' backhand performance, identify areas for improvement, and create targeted training interventions.
- Continuous Assessment for Skill Progression: The test should be administered periodically to monitor the progression of players' backhand skills. Regular assessments will help track improvements, identify weaknesses, and adjust training programs accordingly.
- Customization for Different Skill Levels: The backhand skill test can be adapted for players at different stages of development, such as beginner, intermediate, and advanced levels. Modifying the test parameters (e.g., number of shuttle feeds or court zones) can accommodate varying skill levels while maintaining the test's validity and reliability.
- Wider Dissemination of the Test: The backhand skill test should be disseminated to a broader audience, including badminton academies, schools, and sports organizations. Workshops and training for coaches and trainers on how to effectively implement and interpret the test can further increase its usage.

By implementing these recommendations, the backhand skill test can become an integral tool in badminton training and development, providing measurable benchmarks for skill enhancement and contributing to the overall improvement of players' performance.

CONFLICT OF INTERESTS

None .

ACKNOWLEDGMENTS

None.

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