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Analysis of Badminton Game Performance: Prediction of Subjective Skill Results and Accuracy of Playing Performance

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ABSTRACT

This study aimed to test and analyze the variability of subjective rating test and accuracy-based test types of badminton skills tests on athlete game performance. The study was conducted using quantitative descriptive methods carried out on 50 badminton school athletes in the West Java PBSI Provincial Government with inclusive criteria for students or beginner athletes. There were three instruments used in the study, including Badminton skill learning outcome test for measuring the movement process (subjective rating test), Badminton skill learning outcome test form measuring the accuracy of the strokes (accuracy-based test), and Badminton performance test. All data generated in this study were analyzed using percentage analysis to determine the success of athletes in carrying out the test and linear regression analysis to test the variability or prediction of subjective rating test and accuracy-based test results on athlete game performance. The results of the analysis showed that 1) the results of the subjective badminton skills test were positively and significantly correlated with the results of the accuracy test and 2) the results of both subjective and accuracy skills tests had a significant effect on athlete performance when playing. It shows that good subjective and accuracy skills are predicted to have an impact on the results of the athlete game performance.

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INTRODUCTION

Badminton is a popular racket sport and is loved by many people worldwide (Ghosh et al., 2018). The coaching process is systematically implemented, starting from early childhood, beginners, teenagers, cadets, up to adults. Therefore, a fundamental skill base in badminton is one of the skills that students or athletes must master as a result of the learning process, which is an objective measure of success in education and training programs, particularly at the level of clubs, training centers, and badminton schools.

The success of an education or training program can be achieved in accordance with the objectives that have been set, one of which is by measuring learning outcomes, especially measurements in the context of sports skills and motor skills (Sari & Indahwati, 2016). Therefore, in the learning and training process, tests and measurements are an inseparable part of evaluation or assessment activities. Evaluation, basically a very important activity in the learning and training process (Kumar & Kalidasan, 2013), aims to determine the extent to which students or athletes have developed their skills after completing a learning or training program. This assumption underlines the importance of skill testing in badminton, especially in playing skills, as a key indicator of learning outcomes (Duncan et al., 2017; Hidayat et al., 2022; Kumar & Kalidasan, 2013) .

The performance of badminton athletes during competitions—both in singles and doubles—is influenced by multiple factors, including physical, technical, tactical, and psychological aspects (Duncan et al., 2017; Fuchs et al., 2014; M. Á. Gómez et al., 2020; Seth, 2016; Subarjah et al., 2019) . These are critical components that coaches must consider throughout the coaching process. One of the important factors that must be considered for students or beginner athletes is the technical skills (Duncan et al., 2017; Hidayat et al., 2022). These technical skills significantly affect the playing performance of athletes and students (Duncan et al., 2017; Leong & Krasilshchikov, 2016) .

Field observations show that many coaches have not yet conducted learning outcome assessments, especially in the area of basic badminton skills such as service, defensive lob, dropshot, and smash (Hambali et al., 2023). However, in practice, these skills play a vital role in determining an athlete's performance during competition. Therefore, this problem is one of the researcher's GAPs and is one of the focuses of the problems that must be solved. This research seeks to address this gap by highlighting the theoretical and empirical importance of mastering basic hitting techniques for student and athlete performance.

Two types of skill tests, Accuracy-Based Test and Subjective Rating Test, were tested and analyzed as predictor variables for athletes' performance during competitions. So this research design examined: 1) the description of the badminton playing skills learning test results that students or athletes already possess, 2) the extent of variability in basic skills possessed by athletes that influences their performance when competing, and 3) whether there is a relationship between the results of the accuracy-based test type and the subjective rating test possessed by athletes.

Analysis of research results on the development of variability or the influence of basic badminton technical skills on the performance of badminton athletes is an interesting issue. Several research results provide an overview related to factors that can contribute to the performance of athletes when competing. Duncan et al.'s research, (2017) provides an

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overview of the influence of short service skills on athletes' performance when competing (Duncan et al., 2017). Later, the results of Özgür & Hotaman's research (2020) provide an overview related to athlete motor factors on playing skills and athlete performance when competing (Özgür & Hotaman, 2020). Mahulkar (2016) provides an overview related to the variability of badminton athletes' strength and flexibility on athletes' performance when playing. Furthermore, Kosack et al., (2020) provides an overview of mental factors in supporting athletes' performance when playing. Subarjah et al., (2019) provide an overview of research results related to the influence of motivation and emotional intelligence of athletes on athlete performance when competing. As well as several other studies that aim to see the impact of physical, technical, and tactical factors on athlete performance in competition (MA Gómez et al., 2021; Liao et al., 2017; özmen & aydoğmuş, 2017; Taha et al., 2016; Yuksel et al., 2015)

METHODS

The research method used in this study was a quantitative descriptive type of explanatory survey that aimed to explain the causal relationship between variables (Sari et al., 2022). The use of explanatory surveys was appropriate because this study examined the variability or influence of badminton playing skill variables tested by two types of tests—accuracy-based tests and subjective rating tests—on athlete performance when competing. There were two independent variables that were measured: basic badminton playing skills assessed based on the quality or process of movement, and basic badminton playing skills assessed based on the accuracy of the results of the strokes. The dependent variable was the athlete's performance when competing. The following figure illustrates the design of the relationship between variables in the study:

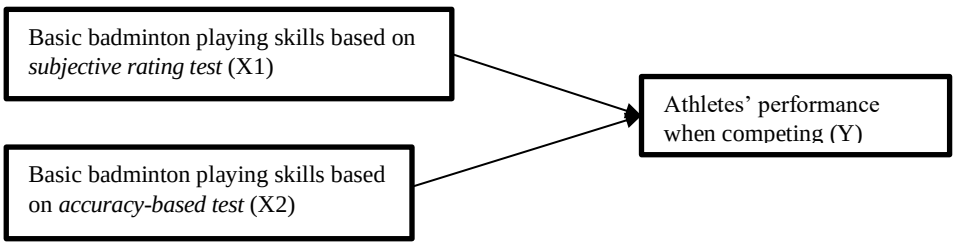

Figure 1. Research Flow

The study participants were 50 badminton athletes (25 males and 25 females) from schools and clubs affiliated with the West Java PBSI. Participants were selected using purposive sampling (Campbell et al., 2020; Etikan, 2016; Singh & Masuku, 2014) with inclusion criteria: 1) male and female students or novice students, 2) aged between 10-12 years, 3) registered and actively participating in training at registered badminton clubs or schools in the West Java PBSI Information System (SI), and 4) having 1-2 years of training experience.

Three test instruments were used in this study: is 1) a badminton playing skills test based on subjective rating t - test , 2) accuracy - based test (Hambali et al., 2021; Hambali, Hidayat, et al., 2020; Hambali, Ma'mun, et al., 2020; Hidayat et al., 2022), and 3) Test of performance results in the match measured by the Game Performance Instrument Additionally, success and victories in matches or in a tournament using a half-competition system, also known as round robin, were also considered (Corain et al., 2019; Larson & Johansson, 2014) . All data

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generated in this study were analyzed using percentage analysis and linear regression to examine the relationship between skill test results and playing performance (Boateng & Abaye, 2019; Yao & Li, 2014) .

RESULTS

The analysis results in this study focus on descriptive statistics and linear regression testing to determine the influence or contribution of test results based on the process of movement and stroke accuracy on the performance of beginner athletes in competition. The following analysis results are presented:

Table 1. Descriptive Statistics of Test Results

Test	N	Mean	Std. Deviation
Subjective Test Score	50	38.10	5.15
Accuracy Test Score	50	3.52	0.50
Combined Test Score	50	41.54	5.44
Playing Performance Score	50	69.12	19.39

Based on the descriptive statistics analysis, the average score for the subjective test results was (M=38.10; SD=5.15), the average score for the accuracy test results was (M=3.52; SD=0.50), the average combined test score for subjective and accuracy was (M=41.54; SD=5.44), and the average playing performance score was (M=69.12; SD=19.39). The results of the descriptive statistical analysis provide an overview of the test results for each type of test, and the analysis is continued with linear regression analysis and the examination of the relationships between variables.

Table 2. Correlation Coefficients

Test Type	Performance Score
Subjective Test	r = 0.69; *prob* = 0.00
Accuracy Test	r = 0.85; *prob* = 0.00

Table 3. Model Summary

Model	R	R Square	Adj. R Square	Std. Error
1	.90	.89	.81	8.45

a. Predictors: (Constant), Accuracy Test Result Score, Subjective Test Result Score
b. Dependent Variable: Playing Performance Score

The results of the analysis in Tables 2 and 3 show that the correlation coefficient between the subjective test results score and the playing performance score is r = 0.69 with a probability of 0.00. The correlation coefficient between the accuracy test results score and the playing performance score is r = 0.85 with a probability of 0.00. The correlation between both subjective and accuracy tests combined with playing performance is 0.89. These results demonstrate that both types of tests conducted have a significant influence on playing performance. Subjective tests account for 69% of the variability in beginner badminton athletes' playing performance, while accuracy tests account for 85% of the variability in

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athletes' playing performance. The structural model of the relationship between variables is presented in the following figure.

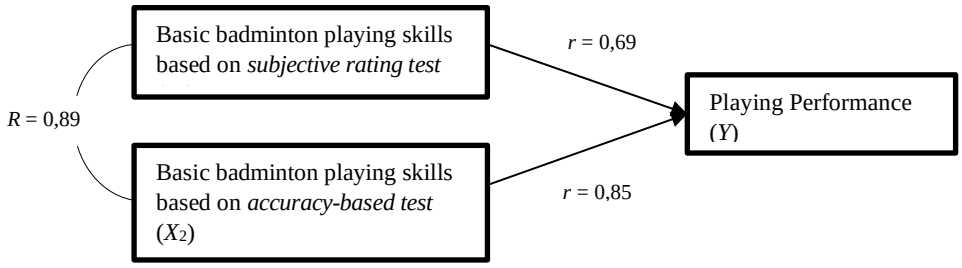

Figure 2. Structure of the Relationship Model between Variables

Table 4. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-73.06	10.11		-7.23	0.00
	Subjective Test Score	1.36	0.27	0.36	5.01	0.00
	Accuracy Test Score	25.71	2.76	0.67	9.32	0.00

Based on the analysis results presented in Table 4, the regression model Y = -73.06 + 1.36 X_1 + 25.71 X_2 was obtained with a probability value of the regression coefficient of 0.00. These results prove that movement process skills and determination skills in the results of badminton playing tests provide a significant contribution to the success of athletes in the competition. The histogram image of the standardized residual regression is presented in the following diagram.

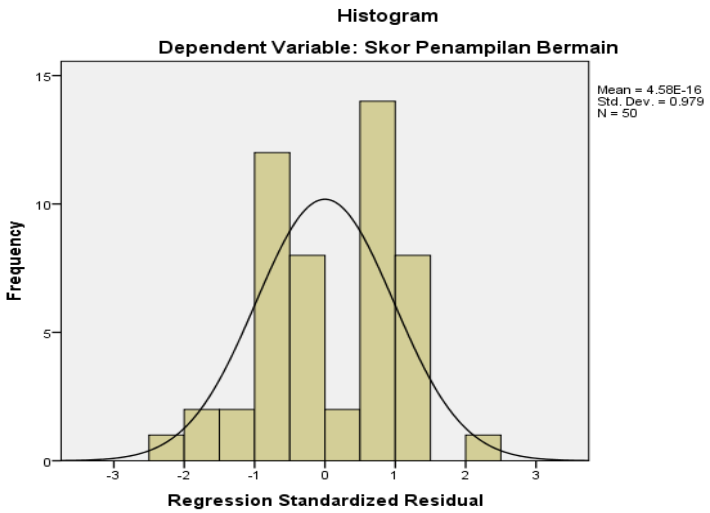

Figure 3. Histogram pf Regression Standardized Residuals

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DISCUSSION

This study aimed to test and analyze the variability of badminton playing skills tests of the subjective rating test and accuracy-based test types on athlete playing performance. The findings of the analysis prove that the correlation coefficient between the subjective test score and the playing performance score is r = 0.69 with a probability of 0.00. The correlation coefficient between the accuracy test score and the playing performance score is r = 0.85 with a probability of 0.00. The correlation between both subjective and accuracy tests combined with playing performance is 0.89. These results demonstrate that both types of tests conducted have a significant influence on playing performance. Subjective tests account for 69% of the variability in beginner badminton athletes' playing performance, while accuracy tests account for 85% of the variability in athletes' playing performance. The findings of this analysis prove that technical movement skills and stroke precision are significant factors influencing the performance of athletes in playing badminton. Furthermore, the results of further analysis using regression model analysis yielded a regression model Y = -73.06 + 1.36 X_1 + 25.71 X_2 with a probability value of the regression coefficient of 0.00. These results prove that movement process skills and determination skills in the results of badminton playing tests provide a significant contribution to the success of athletes in competing.

These findings support theoretical studies indicating that the success of badminton athletes' performance in competition, whether in singles or doubles, is influenced by various factors, including physical, technical, tactical, and psychological aspects (Duncan et al., 2017; Fuchs et al., 2014; M. Á. Gómez et al., 2020; Seth, 2016; Subarjah et al., 2019) . Therefore, these factors are part of what coaches must consider in the coaching process. Notably, technique is a crucial factor for badminton students or beginner athletes (Duncan et al., 2017; Hidayat et al., 2022). These fundamental skills are aspects that can significantly affect the playing performance of athletes or students (Duncan et al., 2017; Leong & Krasilshchikov, 2016)

Duncan et al., (2017) provides an overview of the influence of short service skills on athletes' performance when competing (Duncan et al., 2017). Similarly, Özgür & Hotaman (2020) provides an overview of the relationship between athlete motor skills and playing ability, as well as competitive performance. Mahulkar (2016) highlights the impact of badminton athletes' strength and flexibility on their playing performance. Furthermore, Kosack et al., (2020) examine the role of mental factors in supporting athlete performance. Subarjah et al., (2019) present research on the influence of athlete motivation and emotional intelligence on competitive performance. Numerous other studies also investigate the impact of physical, technical, and tactical factors on athletes' performance in competitions (MA Gómez et al., 2021; Liao et al., 2017; özmen & aydoğmuş, 2017; Taha et al., 2016; Yuksel et al., 2015) .

The findings of this study suggest that athletes with strong badminton playing skills are likely to perform well. This underscores that for beginners, fundamental skills are paramount for effective badminton play. Athletes possessing good basic grip, stance, footwork, and stroke techniques will achieve improved and more effective hitting and overall playing performance. Consequently, this study provides valuable information indicating that basic badminton playing skills must be a primary focus and serve as a foundational element in coaching beginner athletes.

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CONCLUSION

Based on the analysis of the study results, the following conclusions can be drawn: 1) Subjective badminton playing skills have a significant influence on the athlete's playing performance, accounting for 69% of the variability. 2) Accuracy in badminton playing skills has a significant influence on the athlete's playing performance, accounting for 85% of the variability. 3) Subjective and accuracy in badminton playing skills, when considered together, have a significant influence on the athlete's playing performance, accounting for 89% of the variability. This illustrates that athletes with good process skills or movement techniques and shot accuracy will experience a positive impact on their playing performance.

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AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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