COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 ‖ Volume 18, Number 1, 2026 ‖ P.0281-0294

An Empirical Study of the Volleyball Playing Skill Profile of Student Athletes in the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta

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ABSTRACT

This study aims to describe and map the level of mastery of basic volleyball technical skills among students who are members of the Volleyball Student Activity Unit (UKM) at Universitas Muhammadiyah Surakarta using a quantitative descriptive approach with a survey-based skill test method. The study was conducted to obtain objective baseline data on students' technical abilities as a foundation for evidence-based training development in the university volleyball context. The participants consisted of 20 male students selected through purposive sampling from a population of active UKM volleyball members. Data were collected using standardized volleyball skill tests covering four fundamental techniques: overhead passing, underhand passing, overhand serving, and spiking. The collected data were analyzed using descriptive statistical techniques in the form of frequencies, percentages, and skill-level categorization with the assistance of SPSS software. The results indicate that, overall, the level of mastery of basic volleyball technical skills among UKM players falls within the moderate category. Overhead passing and underhand passing skills tend to range from moderate to good, reflecting relatively better control and consistency in ball reception and distribution. In contrast, overhand serving and spiking skills are predominantly classified as moderate, indicating that these offensive skills have not yet developed optimally. In addition, variations in technical skill mastery were observed among individual players, suggesting an uneven distribution of skills within the team. These findings emphasize the importance of implementing systematic and targeted training programs based on objective and individualized skill assessments. The technical skill profile generated in this study can serve as an evaluative reference for coaches in designing needs-based training strategies to improve basic technical proficiency and overall team performance. Furthermore, this study provides empirical evidence to support the application of data-driven coaching practices in higher education volleyball programs.

ARTICLE HISTORY
Received: 2026/01/04
Accepted: 2026/02/04
Published: 2026/02/06

KEYWORDS
Volleyball technical skills;
Skill-based performance profiling;
University student athletes;
Volleyball Student Activity Unit;
Survey-based skill assessment.

AUTHORS' CONTRIBUTION
A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

Cites this Article : Maradina, W.B.; Jariono, G.; Sistiasih, V.S. (2026). An Empirical Study of the Volleyball Playing Skill Profile of Student Athletes in the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 18 (1), p.0281-0294

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INTRODUCTION

Volleyball is one of the most popular team sports globally and has been widely developed across various educational levels due to its accessibility, cooperative nature, and positive impact on physical fitness and social development (Sistiasih et al., 2019; FIVB, 2023). The game requires a combination of physical capacity, tactical awareness, and mastery of fundamental technical skills such as serving, passing, spiking, and blocking, which together determine overall performance effectiveness (Keswando & Septi Sistiasih, 2022; Palao et al., 2015). Among these components, basic technical skills are widely acknowledged as the foundation of successful volleyball performance, particularly in developing athletes and student players (Ramara et al., 2025; Afonso et al., 2022).

In the higher education context, volleyball is commonly developed through Student Activity Units (UKM), which function not only as platforms for competitive achievement but also as learning environments for character building, leadership, teamwork, and discipline (Jariono et al., 2021; Nugroho et al., 2020). University volleyball programs are expected to implement structured training systems that are measurable, evidence-based, and responsive to athletes' actual skill levels. However, in practice, volleyball training at the university level is often conducted based on coaches' subjective observations rather than systematic skill assessments, leading to potential mismatches between training content and athletes' needs (Setiawan et al., 2019; García-de-Alcaraz et al., 2020).

Preliminary observations conducted on the men's team of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta reveal persistent technical issues, particularly in overhand serving accuracy, consistency of overhead and underhand passing, and effectiveness of spiking execution. These deficiencies frequently result in unforced errors during matches, reduced rally continuity, and limited tactical options during competitive play. Such conditions are increasingly problematic given the rising intensity and competitiveness of inter-university volleyball tournaments at regional and national levels (Sukadiyanto et al., 2021). Despite these challenges, there is currently no systematically documented empirical data that objectively describes the level of basic technical skill mastery among Volleyball UKM players at Universitas Muhammadiyah Surakarta. This absence of baseline data limits the effectiveness of training evaluation and long-term athlete development planning.

Recent studies in volleyball science emphasize the importance of objective skill assessment as a foundation for performance enhancement and training optimization. Research has demonstrated that systematic evaluation of technical skills enables coaches to identify strengths and weaknesses, monitor athlete development, and design targeted training interventions (Palao & Ortega, 2015; Afonso et al., 2022). In educational and developmental contexts, technical skill profiling has been widely applied to junior athletes and school-based physical education programs (Gabbett et al., 2018; Sgrò et al., 2017).

Several studies have examined the technical characteristics of volleyball players using standardized skill tests. For instance, García-de-Alcaraz et al. (2020) analyzed serve and reception performance as predictors of match success, while Laporta et al. (2021) highlighted passing accuracy as a critical determinant of offensive effectiveness.

Windi Bagus Maradina[1A-E*], Gatot Jariono[2A-C], Vera Septi Sistiasih[3A-C]
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Other research has focused on spiking biomechanics and its relationship with power, coordination, and injury risk (Sheppard et al., 2019; Fuchs et al., 2020). These studies consistently confirm that mastery of fundamental techniques strongly correlates with overall team performance.

In Indonesia, research on volleyball technical skills has predominantly focused on school athletes, youth clubs, or regional training centers (PPLP), often emphasizing the effectiveness of specific training methods or learning models (Apriyanto et al., 2021; Pratama et al., 2022). While these studies contribute valuable insights, investigations within higher education volleyball settings particularly those employing comprehensive technical skill profiling remain limited. Existing university-level studies tend to emphasize physical fitness, motivation, or psychological aspects rather than detailed technical performance mapping (Jariono et al., 2021; Wibowo et al., 2023).

Internationally, baseline technical profiling has been increasingly used as a strategic tool in talent development systems, enabling data-driven coaching decisions and longitudinal athlete monitoring (Till et al., 2020; Woods et al., 2021). However, such approaches have not been widely adopted in Indonesian university volleyball programs, indicating a disparity between current scientific advances and practical implementation in higher education sports development.

Based on the review of relevant literature, several research gaps can be identified. First, although numerous studies have confirmed the importance of basic technical skills in volleyball performance, most empirical investigations focus on elite athletes, youth development programs, or school-based settings, with limited attention to university-level student athletes, particularly within Student Activity Units (Palao et al., 2015; Nugroho et al., 2020).

Second, existing studies in the Indonesian context generally examine the effects of training interventions without first establishing a comprehensive baseline profile of athletes' technical skill mastery. This condition limits the interpretability of training outcomes and reduces the potential for individualized training design (Setiawan et al., 2019; Sukadiyanto et al., 2021).

Third, there is a lack of empirical research that simultaneously assesses multiple fundamental volleyball techniques such as overhand serve, overhead passing, underhand passing, and spiking using standardized and objective measurement instruments within higher education volleyball programs. Consequently, coaches and institutions lack reliable reference data to support evidence-based coaching and sustainable athlete development.

Therefore, a clear gap exists in the form of the absence of comprehensive, data-driven technical skill profiling of university volleyball players, particularly within the context of Student Activity Units in Indonesia. Addressing this gap is crucial to bridging the disconnect between scientific knowledge and practical coaching implementation at the higher education level.

Based on the identified problems and research gaps, this study aims to objectively identify and map the profile of basic volleyball technical skills among players of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta. Specifically, this research focuses on assessing four fundamental techniques: overhand serving,

Windi Bagus Maradina[1A-E*], Gatot Jariono[2A-C], Vera Septi Sistiasih[3A-C]
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overhead passing, underhand passing, and spiking, using standardized skill tests to obtain measurable and reliable data.

The novelty of this research lies in its comprehensive and integrative approach to technical skill profiling within a higher education volleyball setting. Unlike previous studies that focus on isolated skills or intervention outcomes, this study presents a holistic baseline profile of multiple fundamental techniques among university student athletes. This approach provides new empirical evidence that has rarely been reported in the context of sports development in Indonesian higher education.

Furthermore, the findings of this study are expected to contribute both theoretically and practically. From a scientific perspective, the results will enrich the existing body of literature on volleyball performance analysis by providing empirical data specific to university level athletes. From a practical standpoint, the skill profiles generated can serve as a foundation for designing more effective, individualized, and data-driven training programs. Ultimately, this research supports the sustainable improvement of volleyball coaching quality and athlete development within higher education institutions.

METHODS

Type of Research

This study employs a quantitative descriptive research design using a survey-based skill test approach. In this context, the term survey does not refer to questionnaire-based perception or opinion data, but rather to a systematic data collection process conducted across all research subjects using standardized volleyball skill tests. The quantitative approach emphasizes the use of numerical data obtained from objective measurements, which are subsequently analyzed using statistical techniques to describe the distribution and characteristics of the observed variables (Sugiyono, 2019).

A survey-based skill test is defined as a research method that aims to map, describe, and profile the level of mastery of specific skills within a defined population by administering identical test instruments to all selected participants at a single point in time (Sutama, 2022). In sports science research, this method is commonly used to obtain baseline data on athletes' technical abilities, physical capacities, or performance characteristics without applying experimental treatments or interventions. Therefore, this study focuses on describing the current condition of basic volleyball technical skills among members of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta in an objective and measurable manner.

Time and Place of Research

The study was conducted at the Sports Hall of Campus 2, Universitas Muhammadiyah Surakarta, specifically within the Volleyball Student Activity Unit, located at Jl. Garuda Mas No. 6, Mendungan, Pabelan, Kartasura District, Sukoharjo Regency, Central Java, Indonesia. Data collection was carried out on November 25, 2025, under standardized testing conditions to ensure consistency and reliability of the measurement results.

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Population and Sample

The population of this study comprised all male students who were active members of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta in 2025, totaling 30 individuals. The research sample was determined using a purposive sampling technique, which allows the selection of participants based on specific characteristics relevant to the objectives of the study (Sutama, 2022).

The inclusion criteria applied in this study were as follows: male students who actively participated in regular training and competitive activities of the Volleyball Student Activity Unit, and students who were willing and physically able to participate in all stages of the testing process.

Based on these criteria, 20 students were selected as the research sample. This sampling approach was considered appropriate to ensure that the collected data accurately represented the technical skill profile of actively training university volleyball players.

Operational Definition of Variables

The dependent variable in this study was the level of basic volleyball technical skills of students who are members of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta. Basic technical skills are operationally defined as the students' ability to correctly and effectively perform fundamental volleyball techniques according to standardized performance criteria and scoring guidelines.

The independent variables consisted of four fundamental volleyball techniques: forearm passing, overhead passing, overhand serving, and spiking.

Each technical skill was measured using standardized volleyball skill test instruments. The scores obtained from these tests quantitatively represent the students' level of mastery of each basic technique and serve as objective indicators of technical performance.

Research Procedure

This study employed test and measurement methods within a survey-based framework to collect data on students' basic volleyball technical skills. The research instrument referred to a standardized volleyball skills test developed by Jariono et al. (2023), which has demonstrated strong psychometric properties, with a reported reliability coefficient of $r = 0.872$.

The test battery consisted of four components: overhead passing test, forearm passing test, overhand serving test, and spiking test.

Each test was administered following standardized procedures to ensure objectivity and consistency. During data collection, two officials were involved in each testing station: one official was responsible for observing and verifying the validity of ball placement or execution according to test criteria, while the other official recorded the scores achieved by each participant. The scores from all tests were then compiled and processed as quantitative data to describe the overall profile of basic volleyball technical skills among the research subjects.

Windi Bagus Maradina[1A-E*], Gatot Jariono[2A-C], Vera Septi Sistiasih[3A-C]
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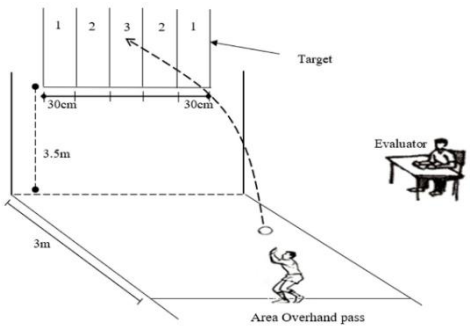

Figure 1.
Overhand Passing Test
Source : (Jariono et al., 2023)

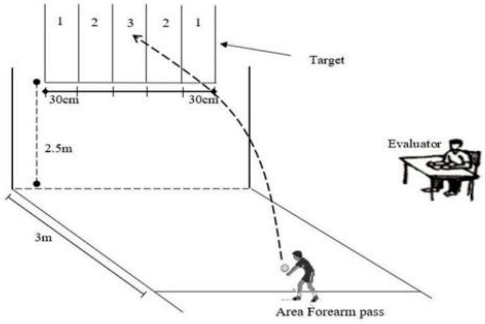

Figure 2.
Underhand Passing Test
Source : (Jariono et al., 2023)

The overhead passing and forearm passing tests were conducted for one minute at a distance of three meters from the target wall. The assessment was based on the accuracy of the ball in hitting the designated target area, with the cumulative score serving as the final result.

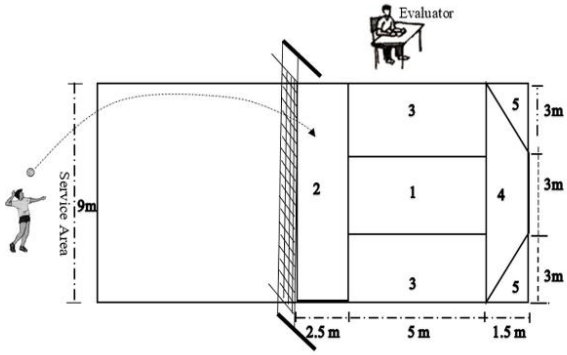

Figure 3.
Serve Test Instrument
Source: (Jariono et al., 2023)

The overhand service test was performed in ten attempts from the service area toward designated target zones in the opponent's court, and the score was determined based on service accuracy.

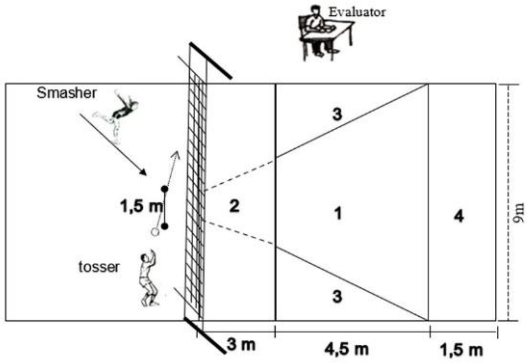

Figure 4.
Smash Test Instrument
Source: (Jariono et al., 2023)

Windi Bagus Maradina[1A-E*], Gatot Jariono[2A-C], Vera Septi Sistiasih[3A-C]
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The spiking test was conducted in ten attempts, with the ball set into the attacking area, and scores were awarded based on the accuracy of the ball landing in the designated target area.

The collected data were analyzed using quantitative descriptive statistics in the form of percentages. The stages of analysis included data reduction, data presentation in the form of tables and graphs, and data verification. The classification of skill levels was determined based on assessment norms referring to the mean and standard deviation values. All data analyses were conducted using SPSS software.

RESULTS AND DISCUSSION

Result

In this study, data were collected through a series of skill tests and direct observations of players during training sessions at the Volleyball Student Activity Unit of Universitas Muhammadiyah Surakarta. The observation process aimed to gain an in-depth understanding of players' performance in applying basic volleyball techniques in real training situations. Meanwhile, the test instruments used to measure basic volleyball technical skills covered several key aspects, namely overhead passing, underhand passing, serving, and spiking. Each test was designed to evaluate the players' level of mastery of these techniques in terms of accuracy, power, and consistency of movement. To obtain a more comprehensive overview of the test results, the following section presents a more detailed description of players' performance based on each skill assessed:

Based on the results of the overhead passing skill test involving 20 students who are members of the Volleyball Student Activity Unit of Universitas Muhammadiyah Surakarta, the data indicate differences in score attainment among participants. The maximum score achieved in this test was 248, while the minimum score recorded was 41. Descriptive analysis revealed a mean score of 168.2 with a standard deviation of 52.56, indicating a considerable variation in participants' abilities relative to the mean. The measurement of overhead passing skills employed a test instrument adapted from the method developed by Jariono et al (2023), ensuring that the resulting data possess adequate validity to represent the players' technical abilities. To further clarify the distribution of test results, the following table presents each player's achievement in overhead passing skills.

Table 1.
Upper Passing Test Results

Class Interval	Frequency	Percentage	Description
≥247	1	5%	Verry Good
195-246	6	30%	Good
143-194	8	40%	Currently
90-142	4	20%	Low
≤89	1	5%	Very Low
Total	**20**	**100%**	

Based on the results of the underhand passing skill assessment of 20 students who are members of the Volleyball Student Activity Unit of Universitas Muhammadiyah

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Surakarta, the data indicate variations in score attainment among participants. The highest score achieved in this test was 149, while the lowest score was 12. Descriptive statistical analysis revealed a mean score of 84.60 with a standard deviation of 40.17, reflecting the degree of dispersion of participants' abilities around the mean. The measurement of underhand passing skills was conducted using a test instrument based on the method developed by Jariono et al (2023), thereby ensuring that the data obtained are valid in representing the players' level of mastery of basic techniques. To provide a clearer overview of the distribution of test results, the following table presents each player's underhand passing skill performance.

Table 2.
Underhand Passing Test Results

Class Interval	Frequency	Percentage	Description
≥145	2	10%	Verry Good
106-144	4	20%	Good
66-105	9	45%	Currently
25-65	3	15%	Low
≤24	2	10%	Very Low
Total	**20**	**100%**	

The results of the serving skill test conducted on 20 students who are members of the Volleyball Student Activity Unit of Universitas Muhammadiyah Surakarta indicate differences in score attainment among participants. The maximum score achieved in this test was 39, while the minimum score recorded was 10. Descriptive statistical analysis produced a mean score of 28.73 with a standard deviation of 6.86, indicating the level of variation in participants' abilities around the mean. The measurement of serving skills was carried out using a test instrument based on the method developed by Jariono et al (2023), ensuring that the resulting data have adequate validity in representing players' mastery of serving techniques. To clarify the distribution of test results, the following table presents each participant's serving skill performance

Table 3.
Servis Test Results

Class Interval	Frequency	Percentage	Description
≥38	1	5%	Verry Good
32-37	5	25%	Good
24-31	9	45%	Currently
16-23	4	20%	Low
≤15	1	5%	Very Low
Total	**20**	**100%**	

The results of the spiking skill test conducted on 20 students who are members of the Volleyball Student Activity Unit of Universitas Muhammadiyah Surakarta indicate differences in score attainment among participants. The maximum score achieved in this test was 33, while the minimum score recorded was 3. Descriptive statistical analysis produced a mean score of 22.33 with a standard deviation of 8.93, indicating the level of variation in participants' abilities around the mean. The measurement of spiking skills

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was carried out using a test instrument based on the method developed by Jariono et al (2023), ensuring that the resulting data have adequate validity in representing players' mastery of spiking techniques. To clarify the distribution of test results, the following table presents each participant's spiking skill performance.

Table 4.
Smash Test Results

Class Interval	Frequency	Percentage	Description
≥34	0	0%	Verry Good
27-34	7	35%	Good
19-26	8	40%	Currently
11-18	3	15%	Low
≤10	2	10%	Very Low
Total	**20**	**100%**	

Overall, the results of this study indicate that the level of mastery of basic volleyball technical skills among students who are members of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta falls within the moderate category. These findings suggest a fairly noticeable variation in abilities among players across each technical aspect assessed, namely overhead passing, underhand passing, serving, and spiking. The variation in results shows that some students already possess adequate technical skills, while others still experience limitations in applying basic techniques consistently and optimally. This condition highlights the importance of designing training programs that are more systematic, targeted, and tailored to the individual needs and characteristics of participants. Therefore, the results of this study can be used as an evaluative basis for coaches to refine training programs, enabling training implementation to become more effective and measurable, and to contribute to improving the quality of basic techniques as well as overall team performance.

Discussion

Overall, the results of this study show that the level of mastery of basic volleyball technical skills among students who are members of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta falls within the moderate category. These findings indicate that the training and coaching processes implemented so far have been able to equip most players with adequate basic skills; however, they have not yet fully resulted in an optimal and evenly distributed level of technical mastery across all team members. The considerable variation in skill achievement among players reflects a heterogeneity of abilities, which is likely influenced by differences in training intensity and frequency, competitive experience, as well as individual physical conditions and coordinative abilities. This condition is consistent with the view of Bompa et al (2019), who state that differences in athletes' training backgrounds and physical capacities strongly affect the development of technical skills in team sports.

In overhead passing skills, most players fall within the moderate to good categories, although there are still players with very low as well as very high achievement levels. This indicates that overhead passing, as a fundamental technique in building attacking

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patterns, has been fairly well understood by the majority of players but has not yet been mastered consistently. The high variability in scores suggests differences in players' ability to control the ball, eye-hand coordination, and body position stability when performing passes. These findings are in line with the study by Fanani (2020), which emphasizes that the effectiveness of overhead passing is strongly influenced by the quality of movement coordination and the accuracy of body positioning, as even small technical errors can have a significant impact on a team's attacking flow.

The results of the underhand passing skill assessment also show a predominance of the moderate category with a relatively wide range of scores. Underhand passing plays a crucial role in the serve-receive phase and early defense, thus requiring stable ball control and quick movement responses. Players with lower achievement are presumed to still experience difficulties in adjusting arm angles, maintaining body balance, and determining the timing of ball contact, especially when dealing with balls of varying speeds and trajectories. These findings are consistent with the study by Faozi et al (2019), which states that imperfections in underhand passing technique are often caused by a lack of mastery of basic biomechanical principles and insufficient training repetitions in game like situations.

In the serving skill aspect, the majority of players fall within the moderate category, with a relatively limited proportion classified as good. Serving is an initial technique that plays a strategic role in creating pressure on opponents and generating direct scoring opportunities. The less-than-optimal achievement in serving skills indicates that players still face difficulties in maintaining directional consistency, hitting power, and ball control. In addition to technical factors, psychological aspects such as self-confidence and concentration also influence serving success, particularly in match situations. This is consistent with the findings of Setiawan (2022), which state that serving effectiveness is influenced by a combination of technical factors, physical condition, and athletes' mental readiness.

The results of the spiking skill assessment indicate that the abilities of students in the Volleyball Student Activity Unit of Universitas Muhammadiyah Surakarta are distributed across the moderate to good categories, with considerable variation in achievement and no players reaching the very good category. These findings suggest that players' attacking abilities have not yet developed optimally, given that spiking is a complex technique that requires the integration of various components, such as rapid movement coordination, lower and upper limb muscle strength, explosive power, and precise timing of jumps and hits. The less than maximal achievement in spiking skills is presumed to be influenced by factors such as lower limb muscle strength, explosive power, and the quality of sets received by players prior to executing attacks. These results are consistent with the study by Yoga et al (2025), which emphasizes that spiking performance is strongly influenced by explosive physical abilities and overall movement coordination quality. Compared with the study by Miftahudin and Nurhidayat (2022), which focused solely on variations of open and semi spikes among UKM students, the present study has a broader scope because it evaluates spiking skills comprehensively without limiting the analysis to specific types.

This research approach demonstrates a significant difference compared with the study by Fauzi and Jariono (2022), which focused solely on spiking skills without

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considering the interrelationships among other basic technical skills in relation to overall team performance. By adopting a more comprehensive evaluation approach, the present study is able to provide a more complete depiction of players' technical conditions, thereby contributing more substantially to the design of integrated training programs that are not partial in nature. In addition, the use of direct observation methods in this study constitutes a distinct advantage compared with the research by Arista et al (2024), which analyzed quick and open spiking skills through video recordings. Although visual analysis has strengths in examining detailed movement mechanics, such an approach has limitations in capturing situational context and real-time game dynamics. In contrast, direct observation allows researchers to record players' responses, decision making processes, and technical consistency under actual match conditions, resulting in evaluation outcomes that are more realistic, contextual, and relevant as a basis for decision making in volleyball coaching and performance development processes.

Overall, the findings of this study confirm that although students of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta already possess an adequate foundation of technical skills, efforts to improve the quality of basic techniques are still greatly needed. The practical implication of these findings is the necessity for coaches to design training programs that are more systematic, measurable, and based on the results of individual skill evaluations. Training approaches that emphasize differentiated practice, repeated execution of basic techniques, and the integration of technical training with physical conditioning are believed to be capable of enhancing the mastery of basic skills more evenly. In line with Jariono et al (2023), coaching that is grounded in objective skill evaluation is expected to have a positive impact on improving both individual and overall team performance.

CONCLUSION

The results of the study indicate that, overall, the mastery of basic volleyball technical skills among students of the Volleyball Student Activity Unit at Universitas Muhammadiyah Surakarta falls within the moderate category, with fairly noticeable differences in ability across the aspects of overhead passing, underhand passing, serving, and spiking. These findings suggest that although some players already possess adequate technical skills, the mastery of basic techniques has not yet developed evenly and consistently. Therefore, more systematic, targeted training programs based on individual skill evaluations are required so that improvements in the quality of basic techniques can be achieved optimally and contribute to overall team performance.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to Universitas Muhammadiyah Surakarta, particularly the management of the Volleyball Student Activity Unit, for their support and facilitation throughout the implementation of this

research. Appreciation is also extended to the students who actively participated, making the successful completion of this study possible.

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