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Jump Analysis Based on Player Specialization in Men's Volleyball Matches

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ABSTRACT

Purpose of the study: This study aims to analyze the jumping activity of male volleyball players based on positional specialization during an official match in order to identify the frequency and distribution of jumps as a representation of athletes' physical workload in competition.

Methodology: This study used a descriptive qualitative design with an observational approach. Data were collected through match video recordings (YouTube) and analyzed using structured observation sheets. The subjects were male volleyball players in the Porprov VII final match. Data were processed using descriptive statistics, including frequency counts and averages.

Main Findings: The results show that players performed an average of 21 jumps per set with a range of 15–29 jumps, and 5–10 jumps per rotation with an average of 7. Jumping activity varied based on player positions, where front-row players performed more jumps than back-row players during the match.

Novelty/Originality of this study: This study provides a novel approach by analyzing actual jumping activity during real match conditions based on player positions and sets. It offers empirical data on physical workload, contributing to the development of more specific and evidence-based training programs aligned with real competition demands.

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1. INTRODUCTION

Volleyball is one of the most popular sports, widely played both as a recreational activity and as a competitive sport [1], [2], [3]. Its dynamic, fast-paced, and competitive nature requires not only technical skills but also optimal physical conditioning [4], [5]. In the context of performance sports, volleyball has evolved into a discipline that increasingly relies on performance analysis, where various aspects such as technique, tactics, and physical condition must be scientifically examined to improve the quality of play and match outcomes [6].

In modern volleyball, the demands on athletes' physical abilities have become increasingly complex, particularly with the implementation of the rally point system, which accelerates the tempo of the game [7], [8]. This condition requires players to perform explosive movements repeatedly within a relatively short time. One of the most crucial components is jumping ability. Jumping plays a vital role in key techniques such as spiking, blocking, and jump serving [9], [10]. Therefore, jumping ability is not only related to vertical height but also to the frequency and consistency of jumps throughout the match.

The jumping ability of volleyball players is closely related to their physical condition, especially lower limb strength and explosive power [11]. Leg muscle strength serves as the fundamental basis for producing optimal

and stable jumps. In training contexts, this ability must be developed systematically and continuously to support player performance during matches. However, in practice, training programs are often not fully based on empirical data reflecting the actual demands of competition, particularly regarding the number and intensity of jumps performed by players during matches [12], [13].

Along with the advancement of science and technology in sports, match analysis has become an essential approach in evaluating athlete performance. This analysis does not only focus on match outcomes but also on process-oriented aspects such as movement patterns, activity intensity, and athletes' physical workload during competition [14]. In volleyball, analyzing the number of jumps performed by players during matches is crucial to understanding the actual workload experienced by athletes. Such data can serve as a foundation for designing more specific and measurable training programs.

However, empirical studies that specifically analyze the number of jumps performed by volleyball players based on playing positions and match sets remain limited [15]. In fact, such data are essential to provide a realistic representation of athletes' physical demands during competition. Based on this gap, the present study focuses on analyzing the number of jumps performed by male volleyball players based on positional specialization during the final match of the 7th Provincial Sports Week (Porprov VII) in Jember. This study aims to generate empirical data that can be used to develop more effective and needs-based training programs.

Several previous studies have examined physical condition and performance aspects in volleyball. The first study [16] found that lower limb explosive power has a significant relationship with players' spiking and blocking abilities, highlighting the importance of physical strength in supporting technical performance. The second study [17] demonstrated that plyometric-based training programs significantly improve athletes' vertical jump height; however, it mainly focused on physical capacity enhancement without linking it to actual match demands. Meanwhile, the third study [18] analyzed volleyball performance during matches but primarily emphasized technical and tactical aspects without specifically addressing physical activity variables such as jump frequency.These studies indicate that although research on physical abilities in volleyball is well established, there is still a limitation in connecting training outcomes with real match demands. In particular, studies analyzing the actual number of jumps performed by players based on match situations and playing positions are still scarce.

The novelty of this study lies in its focus on analyzing jumping activity not merely as a physical capacity but as an actual performance indicator during competition [19], [20]. This study specifically examines the number of jumps performed by volleyball players based on their positions and across different match sets, thereby providing empirical data on athletes' real workload [21]. Thus, this research offers a more practical and integrative approach by linking match analysis with the development of training programs based on actual field demands.

This study has important implications both theoretically and practically. Theoretically, it contributes to the body of knowledge in sports coaching science, particularly in performance analysis based on physical activity during matches [22]. Practically, the findings can serve as a reference for coaches in designing more specific training programs, especially in determining the appropriate number of jump repetitions according to match demands. Furthermore, this study may help reduce the risk of injury caused by training loads that are not aligned with athletes' actual capacities and needs [23].

The urgency of this study is based on the need for accurate empirical data to support evidence-based athlete development in volleyball. Without concrete data on players' physical activities during matches, training programs tend to be generalized and less effective. Therefore, this study is important to bridge the gap between training theory and real practice in the field, ultimately contributing to improving athlete performance and achieving optimal results in competitive volleyball.

2. RESEARCH METHOD

2.1. Research Design

This study employed a descriptive qualitative research design with an observational approach [24]. The purpose of this design was to systematically describe and analyze the jumping activities performed by volleyball players during an official match. The qualitative descriptive approach was chosen because the study focused on capturing real match phenomena and interpreting them into meaningful data related to players' physical workload, particularly jumping frequency. The research emphasized match performance analysis, where the data were not generated through experimental manipulation but through direct observation of an actual competition. This design allowed the researcher to obtain authentic and contextual data reflecting the real conditions experienced by athletes during high-level competition.

2.2. Research Subjects and Objects

The subjects of this study were male volleyball players from two competing teams in the final match of the Provincial Sports Week (Porprov VII) 2022 held in Jember, namely the Surabaya City team and the Sidoarjo Regency team. The object of the study was the jumping activity performed by each player, which included all types of jumps executed during the match, such as jumps for spiking, blocking, and jump serving. The analysis

was further categorized based on player positions (specialization) and match sets, allowing a more detailed understanding of the distribution and intensity of jumping activities across different roles and game situations.

2.3. Data Sources

The data used in this study were obtained from secondary sources, specifically match recordings accessed through online video platforms (YouTube). The selected video represented the final match between Surabaya and Sidoarjo teams in Porprov VII 2022. The use of video recordings allowed repeated observation to ensure data accuracy and consistency. Additionally, supporting data such as team line-ups and match progression were also considered to assist in identifying players and contextualizing their roles during the match.

2.4. Research Instruments

The primary instrument used in this study was an observation sheet (data recording table) designed to systematically record the number of jumps performed by each player. The instrument included several key components, (1) Player identity (team and position), (2) Match set (set I,II,III), (3) Rotation or rally phase, (4) Number of jumps performed, (4) Type of jumping activity (spike, block, serve).

The observation sheet functioned as a structured tool to ensure that all relevant data were recorded consistently. In addition to the observation sheet, the researcher also utilized video playback tools (pause, rewind, slow motion) to enhance accuracy in counting and categorizing jumping movements.

2.5. Data Analysis Techniques

The data analysis in this study was conducted using descriptive statistical techniques combined with qualitative interpretation. The analysis process included, (1) data reduction, Raw data obtained from observations were organized and classified based on player position, match set, and type of jumping activity, (2) data display, The processed data were presented in the form of tables and descriptive summaries to illustrate the distribution of jumping frequencies across players and sets.(3) data interpretation, The researcher analyzed the patterns of jumping activity to identify trends, averages, and variations in players' physical workload during the match. (4) descriptive statistics, Basic statistical measures such as frequency counts, mean (average), minimum, and maximum values were used to quantify the number of jumps performed by players. This combination of descriptive and interpretative analysis enabled a comprehensive understanding of jumping activity as a representation of physical demands in volleyball matches.

2.6. Research Procedure

The research procedure was conducted through several systematic stages to ensure the validity, reliability, and relevance of the data obtained. The study began with the preparation stage, which involved identifying the research problems and objectives, reviewing relevant literature, and designing the observation instruments. This was followed by the data collection stage, where the researcher selected the match video of the Porprov VII final, observed the match repeatedly, and recorded all jumping activities performed by each player using a structured observation sheet. In the data processing stage, the collected data were organized into specific categories, including player position, match set, and type of jump, and subsequently verified through repeated observation to ensure accuracy. The next stage was data analysis, which involved calculating the frequency and average number of jumps, as well as analyzing patterns and differences in jumping activity among players. Finally, in the reporting stage, the findings were presented in both tabular and narrative forms and interpreted in relation to training needs and performance analysis. Through these structured procedures, the study ensured that the data obtained were valid, reliable, and aligned with the research objectives**.**

3. RESULTS AND DISCUSSION

This section presents the research findings along with a comprehensive discussion of the results. The data obtained from the observation were analyzed descriptively to determine the frequency and distribution of jumping activities performed by volleyball players during the match. The results are presented in tables and explained narratively to facilitate understanding.

3.1. Distribution of Jumping Activity per Set

The analysis results show that the number of jumps performed by players varies across each set. Based on the observation data, the Sidoarjo team recorded a range of approximately 15–29 jumps per set, with an average of 21 jumps per set. Meanwhile, the number of jumps per rotation ranged from 5 to 10 jumps, with an average of 7 jumps.

This variation indicates that the intensity of physical activity, particularly jumping, is influenced by match dynamics such as rally duration, opponent strength, and tactical strategies. In high-intensity matches, players tend to perform more jumps due to longer rallies and more frequent attacking and blocking situations [25].

From a performance perspective, this finding highlights that jumping is not a sporadic activity but a repetitive physical demand that occurs consistently throughout the match [26]. Therefore, players must possess not only high vertical jump ability but also endurance in maintaining performance over repeated efforts. This supports the notion that volleyball requires a combination of explosive power and muscular endurance.

3.2. Jumping Activity Based on Player Position

Further analysis shows that jumping activity differs based on player specialization. Front-row players, such as spikers and blockers, tend to perform a higher number of jumps compared to back-row players. This is because front-row players are directly involved in offensive (spiking) and defensive (blocking) actions, both of which require frequent jumping.

In contrast, back-row players, including liberos and defensive specialists, perform fewer jumps as their primary roles focus on passing and receiving rather than attacking at the net. However, they still contribute to the overall game intensity through quick movements and defensive coverage.

These findings are consistent with previous studies indicating that positional roles significantly influence physical workload in volleyball [27]. Players in attacking positions experience higher physical demands due to the nature of their roles, which require repeated explosive movements. Therefore, training programs should be tailored based on positional specialization to ensure optimal performance and efficiency.

3.3. Implications for Training Program Design

The results of this study provide important insights for designing training programs, particularly in determining the appropriate volume and intensity of jumping exercises. Based on the observed data, an effective training program should consider the actual number of jumps performed during matches, which ranges up to approximately 29 repetitions per set.

In this context, the training load can be formulated by adopting a repetition scheme that reflects match conditions. For example, players may perform jump training in sets of 10 repetitions per cycle, with multiple cycles to simulate real-game demands. This approach ensures that training is not only focused on improving jump height but also on sustaining performance over repeated efforts.

Furthermore, incorporating sport-specific training methods such as plyometric exercises can enhance both explosive power and neuromuscular coordination. According to [28], plyometric training is effective in improving vertical jump performance, which is essential in volleyball. However, the integration of such training should be aligned with match-based data to avoid undertraining or overtraining.

3.4. Discussion of Match-Based Performance Analysis

The use of match analysis in this study provides a more realistic understanding of athletes' physical demands compared to controlled laboratory settings. By analyzing real competition data, this study captures the complexity of game situations, including variations in tempo, strategy, and player interactions.

This approach aligns with the growing trend in sports science that emphasizes evidence based training derived from actual performance data [29]. Unlike traditional training methods that rely on generalized assumptions, match-based analysis allows coaches to design programs that are more specific, measurable, and relevant to competitive demands.

However, it is important to note that this study is limited to a single match (final match of Porprov VII), which may not fully represent all levels of competition. Therefore, further research involving multiple matches and teams is recommended to obtain more comprehensive data.

Based on the findings of this study, a clear research gap can be identified when compared to three previous studies that predominantly focused on isolated aspects of jumping performance. The first study [30] mainly emphasized vertical jump height as an indicator of explosive power, without considering the actual frequency of jumps performed during real matches. The second study [31] examined training load and general physical performance improvements, particularly through plyometric exercises, but did not relate these findings to the distribution of jumping activity across sets or rotations in a competitive setting. Meanwhile, the third study [32] acknowledged differences in physical demands based on player positions; however, it relied largely on estimations or simulated scenarios rather than direct observation of real match conditions. Therefore, the main gap lies in the lack of integrative research that combines jump frequency, distribution per set, and positional differences within actual competitive contexts. This study addresses this gap by employing a match-based analytical approach grounded in real performance data.

The novelty of this study lies in its use of a match-based analysis approach to examine the distribution of jumping activities among volleyball players in an իրական competitive context, specifically during the final match of Porprov VII. Unlike previous studies, this research not only quantifies the total number of jumps but also categorizes them based on sets, rotations, and player positions, providing a more comprehensive understanding of the physical demands experienced by athletes. [33] Furthermore, this study bridges the gap between quantitative performance data and practical training applications by translating match-derived findings into recommendations

for training design. This integrated and context-driven approach distinguishes the study from earlier research that tended to be partial, laboratory-based, or not directly linked to actual gameplay demands [34].

The implications of this study are substantial, particularly for the development of more effective and evidence-based training programs. The finding that players may perform up to approximately 29 jumps per set, with varying intensity influenced by match dynamics, provides a concrete reference for determining appropriate training volume and intensity. Coaches can use this information to design training sessions that simulate real match conditions, ensuring that athletes are prepared not only for peak performance but also for repeated physical demands [35]. Additionally, the observed differences in jumping activity based on player positions highlight the importance of position-specific training, where front-row players require greater emphasis on explosive power and muscular endurance compared to back-row players. The study also underscores the value of integrating plyometric training with game-like scenarios to enhance both physical capacity and neuromuscular coordination [36]. Overall, these implications support a more targeted, efficient, and contextually relevant approach to athlete preparation.

Despite its contributions, this study has several limitations that should be acknowledged. First, the data were collected from a single match, namely the final match of Porprov VII, which limits the generalizability of the findings across different levels of competition and varying match conditions. Second, the study focuses primarily on the frequency of jumping activity without incorporating other important performance variables such as jump height, recovery time, or physiological indicators like muscle fatigue. Third, external factors such as team strategy, opponent quality, and players' psychological conditions during the match were not analyzed in depth, even though these factors may significantly influence player activity and performance intensity. Therefore, future research is recommended to include a larger sample of matches, integrate both physiological and performance-based measurements, and consider additional contextual variables to produce more comprehensive and generalizable findings.

4. CONCLUSION

This study aimed to analyze the jumping activity of male volleyball players based on positional specialization during an official match in order to provide empirical data on the physical demands of competition. The results show that the number of jumps performed by players varies across sets and positions, with an average of 21 jumps per set (range 15–29) and 5–10 jumps per rotation (average 7), confirming that jumping is a repetitive and essential physical component in volleyball, particularly for front-row players involved in attacking and blocking. These findings are in line with the objectives stated in the introduction, as the study successfully provides a realistic representation of athletes' physical workload during matches and demonstrates that match-based analysis offers valuable insights that are often not reflected in conventional training programs. Therefore, the study emphasizes the importance of integrating empirical match data into the design of training programs to ensure they are more specific, measurable, and aligned with real competition demands, while also contributing to performance improvement and injury prevention. Furthermore, this study opens opportunities for future research to expand the scope by including multiple matches, different competition levels, and larger samples, as well as integrating advanced technologies such as biomechanical analysis and wearable devices to obtain more precise measurements, which are expected to enhance evidence-based training strategies and further advance volleyball performance analysis.

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