



Analysis of the Smash Technique in Volleyball Athletes at ABT Club, Air Beliti Village

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Abstract:

Background: The volleyball smash is a complex technique requiring coordination, timing, and movement accuracy.

Aims: This study aimed to describe open-spike difficulties and their causal factors among athletes at ABT Club, Air Beliti Village.

Methods: A descriptive qualitative design was used with 10 male athletes and one supporting coach. Data were collected through direct observation, structured interviews, and documentation, then analyzed through data reduction, data presentation, and conclusion drawing and verification. Credibility was strengthened through technique triangulation.

Results: The most consistent difficulties occurred during preparation and ball contact, particularly approach-step control, excessive approach speed, insufficient jump height, body position relative to the net, arm-swing coordination, hitting-hand position, and ball-contact accuracy. Landing was generally adequate.

Conclusion: The findings indicate an interconnected sequence of technical difficulties and provide a practical basis for targeted coaching. The biomechanical interpretation is supported by previous literature, while direct kinematic measurement remains a recommendation for future research.

Keywords: ABT Club; Athlete; Hard Hit; Smash Technique; Volleyball

1. INTRODUCTION

Sport is an activity involving body movement that is performed to achieve physical fitness. Competitive sport requires mastery of technical skills, physical condition, tactics, and mental readiness through planned and continuous training. In volleyball, technical ability is an important component because the game is fast-paced and technical errors can affect the continuity of attacks and match outcomes. Basic volleyball techniques include serving, passing, smashing, and blocking. Among these techniques, the smash functions primarily as an attacking action to score points (Oliveira et al., 2020; Fuchs et al., 2019). The smash is a complex movement sequence involving the approach, take-off, jump, arm swing, ball

contact, and landing. Successful spiking is determined not only by hitting strength but also by movement coordination, timing, body position, and the ability to position the ball contact appropriately. In an open spike, the set is relatively high and open, giving the spiker time to perform the approach, jump, and hit. This situation still requires effective coordination so that the contact point is optimal (Fuchs et al., 2019; Fuchs et al., 2020; Gupta et al., 2021).

ABT Club in Air Beliti Village is a volleyball development setting that conducts regular training. Based on the initial observation in this study, the club has adequate athlete resources and training facilities, but errors in smash execution are still observed. The coach also does not yet have a systematic, specific evaluation of each athlete's smash technique. Observed errors include an approach that is too fast, inaccurate steps, insufficient jump height, a body position that is too close to the net, and inaccurate ball contact. These conditions indicate the need for a more focused analysis of the stages of the open spike. The analysis is needed not only to identify the forms of difficulty but also to identify their possible causes so that the findings can support the evaluation of the training program. This study focuses on three stages of the open-spike technique: preparation,

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ball contact, and landing, as well as the factors that cause athletes to experience difficulty at each stage. Research on spike biomechanics emphasizes the importance of coordinated approach and take-off mechanics for effective spike performance (Oliveira et al., 2020; Fuchs et al., 2019; Fuchs et al., 2021).

Based on this description, the study aims to (1) describe the difficulties in the open-spike technique among volleyball athletes at ABT Club, Air Beliti Village, and (2) describe the factors causing athletes' difficulties in performing the open spike. The findings are expected to provide practical information for coaches when determining technical correction materials and designing more targeted training.

2. MATERIAL AND METHOD

This study used a descriptive qualitative method. This approach was selected because the research was intended to obtain an in-depth description of open-spike technical difficulties based on actual field conditions, athletes' experiences, and the coach's explanations. The study was conducted at the ABT Club Volleyball Court, Air Beliti Village, Tuah Negeri District, Musi Rawas Regency, South Sumatra Province, from August 1 to 14, 2026. The research subjects consisted of 10 male athletes of ABT Club in 2026. Participants were selected based on their involvement in training activities and execution of the smash technique. The supporting informant was the ABT Club coach. Primary data were obtained through observation of open-spike performance and interviews, while supporting data were obtained through research documentation.

The research instruments consisted of observation and interview guides developed according to the stages of the open spike: preparation, ball contact, and landing. During preparation, observations covered body position, the swing of both arms, and take-off or jumping. During ball contact, observations covered the position of the hitting hand and the accuracy of ball contact. During landing, observations covered a controlled two-foot landing and the use of the toes as the initial part of the support. Data were collected through observation, structured interviews, and documentation. Observation was used to directly identify technical errors or difficulties. Interviews were used to obtain explanations from athletes and the coach regarding experiences, causes, and attempts at improvement. Documentation was used

as supporting data. Data credibility was examined through technique triangulation by comparing observation, interview, and documentation results. Data were analyzed interactively through three stages: data reduction, data presentation, and conclusion drawing and verification. The collected data were selected according to the research focus and then grouped into categories of difficulty in preparation, ball contact, and landing, together with their causal factors. The data were subsequently presented narratively to identify patterns in the findings, and conclusions were drawn based on relationships among the data sources. This qualitative analytic process is consistent with established approaches to rigorous qualitative analysis (Raskind et al., 2019; Roberts et al., 2019).

3. RESULTS AND DISCUSSION

3.1 Results

The study was conducted from August 1 to 14, 2026 and involved 10 male athletes from ABT Club. Training was conducted three times per week and could increase when competitions were scheduled. The club's training program included physical training and basic techniques such as passing, serving, and smashing. Observations, interviews, and documentation showed that open-spike difficulties occurred mainly during preparation and ball contact, whereas landing could generally be performed adequately. During preparation, athletes had difficulty determining the appropriate steps before take-off. Some athletes used steps that were too long or approached the ball too quickly. These errors caused the body position to become less suitable for take-off and resulted in the athlete being too close to the net. In addition, some athletes did not achieve sufficient jump height, making it difficult to reach the ball at an appropriate contact point. The importance of approach and jump mechanics is supported by biomechanical studies of volleyball spike performance (Oliveira et al., 2020; Fuchs et al., 2019; Gupta et al., 2021).

During ball contact, difficulties were observed in arm-swing coordination and the accuracy of contact with the ball. Limited shoulder flexibility appeared to restrict the speed and range of the arm movement. Some athletes also positioned the hitting hand incorrectly, so ball contact did not occur at the highest point of reach. These findings are consistent with research emphasizing the



contribution of upper-body and whole-body coordination to volleyball attacking actions (Challoumas et al., 2017; Fuchs et al., 2020). During landing, difficulty was not a major problem. In general, athletes were able to land on both feet and attempted to maintain body balance after the hit. Nevertheless, landing ability should be maintained because landing is an important part of the spike movement sequence. Volleyball landing studies indicate that landing mechanics are relevant to movement control and injury prevention (Garcia et al., 2022; Hanzlíková & Hébert-Losier, 2020).

Overall, the causal factors could be grouped as follows: (1) suboptimal movement coordination; (2) an approach to the ball that was too fast; (3) an approach step that was too wide or inaccurate; (4) insufficient jump height; (5) body position that was too close to the net; (6) an inaccurate hitting-hand position; and (7) ball contact occurring below the hitter's shoulder. These findings indicate that technical difficulties do not occur independently but are interconnected within one movement sequence.

3.2 Discussion

The findings show that the main open-spike problems occurred during preparation and ball contact. This supports the view that the spike is a complex movement requiring coordination among movement segments. When the approach is inaccurate, its effects can continue through take-off, jump height, body position in the air, and ultimately ball-contact accuracy. Systematic reviews of spike kinematics similarly identify the interaction of approach, take-off, flight, and hitting mechanics as important components of spike performance (Oliveira et al., 2020; Fuchs et al., 2019). The difficulties during preparation, particularly steps that were too long and an approach that was too fast, indicate that athletes had not consistently controlled the rhythm of the approach. In an open spike, the spiker needs to adjust approach speed and step length to the direction and height of the set. An approach that is too fast may cause the athlete to arrive too close to the ball or net before the optimal contact time. Conversely, insufficient jump height limits the reach to the ball and may result in contact at a less advantageous position. Studies of spike-jump performance and jump training support the importance of approach mechanics and vertical

jump ability (Fuchs et al., 2019; Silva et al., 2019; Ramirez-Campillo et al., 2020).

During ball contact, limited shoulder flexibility and a slower arm swing may affect the ability to produce an effective hitting movement. The literature on volleyball biomechanics places the arm swing and accurate ball contact among the important components of the spike. When the hand does not reach the appropriate position while the ball is at its highest point, ball direction becomes more difficult to control. This interpretation is consistent with the field finding that some balls hit the net or went outside the court (Challoumas et al., 2017; Oliveira et al., 2020; Fuchs et al., 2020). Contact errors are also associated with body position that is too close to the net and ball contact occurring below the hitter's shoulder. These conditions reduce the available arm-movement space and may limit the athlete's opportunity to direct the ball optimally. Therefore, technical correction should be conducted sequentially, beginning with approach rhythm, final-step placement, take-off, body position in the air, and finally the ball-contact point.

Landing is not a major problem in this group, but it should still be maintained through correct practice. A controlled two-foot landing helps athletes maintain balance after the hit and prepare for subsequent movement. Research on volleyball landing mechanics highlights the importance of appropriate landing strategies and lower-extremity control (Garcia et al., 2022; Sinsurin et al., 2017; Beardt et al., 2018). Practically, the findings can be used by the coach to evaluate training and provide more targeted exercises for the open-spike stages in which athletes experience difficulty. Training should emphasize accurate approach steps, control of approach speed, take-off and jump ability, arm-swing coordination, accurate ball-contact timing, and body position relative to the net. Plyometric and jump-training research in volleyball also indicates that targeted training can improve jump performance, which is relevant to the preparation phase of the spike (Silva et al., 2019; Ramirez-Campillo et al., 2020; Sotiropoulos et al., 2023).

4. CONCLUSION

The study shows that the main technical difficulties in the open spike among athletes at ABT Club, Air Beliti Village, occurred during preparation and ball contact. Observation identified difficulties in approach-step control, excessively fast approach rhythm, insufficient jump height, body position

that was too close to the net, arm-swing coordination, hitting-hand position, and ball-contact accuracy. Landing was not a major difficulty during the observation period. The findings indicate that these problems are interconnected across the movement sequence rather than occurring as isolated errors.

The study contributes a practical qualitative description of how approach and contact difficulties appear in a club-training setting and how they can be interpreted in relation to previous biomechanical research. However, the study did not quantify joint kinematics, jump height, approach velocity, or ball velocity, and the findings are limited to 10 male athletes at one club during the study period. Therefore, the biomechanical relationships discussed should be regarded as interpretations supported by the literature rather than direct biomechanical measurements from this study. Coaches are encouraged to use the findings to structure progressive correction beginning with approach rhythm and step placement, followed by take-off, jump ability, arm-swing coordination, and ball-contact timing. Future studies should combine qualitative observation and interview data with video-based or three-dimensional biomechanical analysis to test these relationships more directly.

The identified causal factors included movement-coordination errors, an excessively fast approach rhythm, body position that was too close to the net, suboptimal jump height, inaccurate hand position, and ball contact below the hitter's shoulder. Coaches are encouraged to provide gradual and continuous corrective training, while athletes should improve training discipline and consistency. Future research could expand the sample or develop the analysis using biomechanical approaches or video-based evaluation.

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6. AUTHOR CONTRIBUTION STATEMENT

All Author was responsible for the conceptualization of the study, data collection, data analysis, manuscript preparation, and article revision.

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