

Review Article

Offensive Patterns Analysis of Thai Nation Team in Volleyball Women's Nations League 2022

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Abstract

Effective offensive patterns are crucial for volleyball athletes, enabling quick and forceful attacks to strategically place the ball and impact the game. This study aimed to analyze the offensive strategies and outcomes of the Thai national team during the 2022 Women's Volleyball Nations League (VNL), comparing them with the opposing teams. Using a specific match model from the 13 matches and 51 sets held between May 31 and July 14, 2022, a total of 3,151 attack results were examined. Results were reported through means, standard deviations, percentages, and independent sample t-test statistical analysis for inter-group differences. The findings revealed that the Thai team predominantly utilized the curve ball spike (C) as the most aggressive offensive pattern (10.31 ± 3.43), constituting 37.44% per match. The team's offensive performance showed a high score for successful attacks (ACE) at 35.08 ± 10.75 , equivalent to 28.79% per match. Comparative analysis indicated statistically significant differences in three offensive patterns at a 0.05 significance level. Notably, the Thai team excelled in the 3-meter ball spike (3M) at 24.38 ± 8.00 (20.01% per match), fast spike (A) at 10.31 ± 3.43 (8.46% per match), and dummy (X) at 6.23 ± 3.81 (5.11% per match). However, there was no statistical difference in attack outcomes between the Thai team and the opponents. The Thai team's preference for the curve ball spike (C) constituted 37.44% per match, with a corresponding 28.79% success rate in attack scores (ACE). Notably, the 3M, A, and X offensive patterns exhibited significant differences between the Thai team and their opponents, while attack results showed no statistical variance.

Keywords

Performance Analysis, Volleyball, Offensive Patterns

1. Introduction

Volleyball is a sport that has gained increasing popularity in Thailand across all genders and age groups. The national-level competitions have been particularly exciting, capturing the attention and enthusiasm of spectators, especially during the offensive and defensive phases of the game. The success of the Thai women's national volleyball team in international competitions has been consistent, placing them prominently on the world stage. As of the latest ranking by the

International Volleyball Federation (FIVB) in 2022, the Thai women's national volleyball team is currently ranked 14th globally and 3rd in Asia [1]. This success is attributed to their continuous achievements in various world-class tournaments. Speaking of international volleyball competitions, there has been an increase in the number of tournaments, including the Southeast Asian Games (SEA Games), Asian Games, Olympic Games, and the World Championship [2]. Additionally,

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the FIVB Volleyball Women's Nations League (VNL) 2022, also known as the Nations League, has gained immense popularity as one of the most prestigious global competitions [3]. This league showcases top teams, providing spectators with the opportunity to witness world-class volleyball techniques. The diverse attacking strategies employed by teams contribute to the allure of the game [4].

In the realm of volleyball, athletes often possess similar skills and capabilities, making it crucial for coaches to explore training methodologies that enhance players' overall performance. The development of training strategies becomes essential for coaches aiming to maximize the potential of volleyball athletes and lead them to victory in competitions [5-7]. In volleyball, individual skills such as receiving, setting, serving, spiking, and blocking play a fundamental role in gaining a competitive edge. Athletes employ various movement and positioning skills [8]. One of the most crucial skills contributing to scoring points and influencing the outcome of volleyball matches is spiking or attacking. The effectiveness of spiking can significantly impact the team's ability to score and add excitement for spectators [9]. Each team's competition involves different dynamics based on their abilities, and players and coaches must study the patterns of attacks, scoring areas, and the opponent team's blocking results. This analysis helps identify suitable techniques and tactics to confront the opposing team [10]. Observing and understanding the patterns and strategies of both one's own team and the opposing team provide valuable insights for adjusting weaknesses and enhancing strengths [11].

Efficient spiking involves diverse patterns and techniques, making it a crucial aspect of volleyball gameplay [12, 13]. Coaches and players must focus on developing and refining spiking skills, as they directly impact the team's offensive capabilities. Additionally, the ability to read and anticipate the opponent's defensive strategies is essential for successful spiking. In conclusion, the ability to spike effectively is a key factor in achieving success in volleyball competitions [14]. Studying and adapting to the patterns and strategies of both one's own team and opponents contribute to refining techniques and gaining a competitive advantage in the game. Developing individual skills, particularly in spiking, is integral for players and coaches aiming for excellence in volleyball [15]. The appropriate format of attack in volleyball is crucial for athletes, as it enables quick and powerful offensive plays, allowing precise ball placement without errors. According to research by Rangubhet [16] on the innovation of performance analysis in men's beach volleyball, attacking skills significantly contribute to a team's success, averaging 10.41 attacks per set and 24.12 attacks per match. One key aspect of analyzing the attacking patterns of opposing teams is the ability to predict their capabilities during a match [17]. This information is then used to design suitable training programs for players. Understanding the opponents and ourselves is a strategy that contributes to the success of athletes in sports. Coaches can guide players by analyzing the perfor-

mance of high-ability teams, including their own, and subsequently refining and developing their playing techniques to outshine their competition [18].

As mentioned earlier, the analysis of attacking patterns and the outcomes of attacks is crucial for creating a competitive edge in volleyball matches. Therefore, researchers are interested in studying the analysis of the attacking patterns of the Thai national women's volleyball team in the 2022 Nations League. This study aims to provide valuable information for goal setting, training processes, concepts, techniques, and strategies in future volleyball competitions.

2. Materials and Methods

Research Design:

This research is an analytical study that has received ethical approval from the Research Ethics Committee for Human Research, University of Phayao (UP-HEC 1.1/006/66).

Population and Sample Group:

The sample group for this study consists of matches played by the Thai national women's volleyball team in the 2022 Nations League. The matches were accessed from the official website <https://www.volleyballworld.tv> between May 31 and July 14, 2022. The sample selection was carried out using purposive sampling, involving 13 matches and 51 sets. The data analysis includes a comprehensive examination of 3,151 instances of attacking patterns.

Research Tools:

1. Performance Analysis Computer Program (Focus X2 v1.5):

This computer program is utilized for motion analysis. Specifically, it is employed to analyze the attacking patterns of the Thai national women's volleyball team. The program aids in dissecting and understanding the intricacies of players' movements during matches, providing valuable insights into their attacking strategies.

2. Video Recording Tapes of Matches:

Video recording tapes of matches involving the Thai national women's volleyball team and their opponents in the 2022 Nations League are used. These recordings serve as a critical resource for observing and studying actual gameplay. Coaches and researchers can closely analyze player performances, team dynamics, and opposing strategies, extracting valuable information for further research and training.

Data Collection:

In this research, data collection involves studying video recording tapes of matches played by the Thai national women's volleyball team in the 2022 Nations League. The period covered is from May 31 to July 14, 2022. Researchers created a data recording form, which was validated by five qualified experts, achieving a reliability index of 0.96 concerning the form's alignment with research objectives. The data recorded include attacking patterns and outcomes, totaling 3,151 instances.

Data Analysis Process:

Step 1: Study of Attacking Patterns and Outcomes:

This step involves a thorough examination of attacking patterns and their outcomes in volleyball matches.

Step 2: Data Analysis:

Data analysis includes the use of a predefined data recording form and the creation of a dataset category set. This set is then inputted into the motion analysis computer program (Focus X2 v1.5) for recording and analyzing data. The analysis focuses on various offensive patterns and their results, divided into the following categories:

Offensive Patterns (11 Patterns) [18]:

- 1) C: Curved Front Attack
- 2) C': Curved Back Attack
- 3) Y: Fast Curved Front Attack
- 4) Y': Fast Curved Back Attack
- 5) B: Front Middle Quick Attack
- 6) B': Back Middle Quick Attack
- 7) X: Dummy Attack
- 8) Z: Fast and Far Attack
- 9) A: Fast Front Attack
- 10) A': Fast Back Attack
- 11) 3M: Back-row Attack

Results of the Offensive (7 Aspects) [19]:

- 1) Error: Offensive Errors
- 2) Block Kill: Blocked Offensive
- 3) Continue: Offensive that the Defensive Can Counter-Attack
- 4) Block & Hit: Blocked Offensive Can Be Offensive Again
- 5) Free ball: Offense that the Defensive Side Must Correct
- 6) Touch Ball: Offensive Side that the Defensive Side Cannot Continue to Play
- 7) Ace: Offensive Score

Step 3: Comparison for Identifying Patterns Affecting Points and Errors:

The final step involves comparing and identifying attacking patterns that influence scoring and errors in matches played by the Thai national women's volleyball team and their opponents.

Data Analysis:

The data collected will be subjected to statistical analysis using the Statistical Package for the Social Sciences (SPSS for Windows). The analysis aims to determine the mean and standard deviation of the attacking patterns and outcomes of the Thai national women's volleyball team and their opponents. Additionally, a t-test will be employed to compare the differences in attacking patterns and outcomes between the Thai team and their opponents. The statistical significance will be tested at a significance level of 0.05.

1. Descriptive Statistics:

- 1) Mean (Average): The average values for each attacking pattern and outcome will be calculated for both the Thai

national women's volleyball team and their opponents.

- 2) Standard Deviation: This measure of variability will indicate the extent to which individual data points deviate from the mean.

2. Inferential Statistics - t-test:

- 1) The t-test will be used to assess whether there are statistically significant differences between the attacking patterns and outcomes of the Thai national women's volleyball team and their opponents.
- 2) The test will be conducted at a significance level of 0.05, providing insights into whether any observed differences are likely due to chance or if they are statistically significant.
- 3) The statistical analysis will provide valuable insights into the effectiveness of the attacking patterns employed by the Thai team compared to their opponents in the 2022 Nations League.

3. Results

Part 1: Attack Patterns

From the analysis of the attacking patterns of the Thai national women's volleyball team in the 2022 Nations League with 13 matches and 51 sets played, it is observed that the preferred attacking pattern used by the Thai team during the competition is the C, accounting for 37.44% occurrences per match. Following this, the second most utilized pattern is the C', constituting 22.73% occurrences per match. This information is visually represented in the chart depicted in [Figure 1](#).

Part 2: Impact of Attacks

Upon analyzing the results of the Thai national women's volleyball team's attacking strategies in the 2022 Nations League, comprising 13 matches and 51 sets, it is evident that the most effective attacking outcome is the ability to respond to the opponent's attack (Continue). This occurred at a rate of 33.40 occurrences per match. Following closely is the scoring attack (Ace), accounting for 28.79 occurrences per match. This information is graphically represented in [Figure 2](#).

Part 3: Comparative Analysis of Attack Patterns

In comparing the attacking patterns of the Thai national women's volleyball team and their opponents in the 2022 Nations League, it is observed that both teams employ similar attacking patterns, C, C', A', B, B', Y, Y', and Z. There is no statistically significant difference between the teams in these patterns at a significance level of 0.05.

However, in terms of the attacking patterns of a 3M, A, and X, there is a statistically significant difference between the two teams at a significance level of 0.05. Details of these differences are presented in [Table 1](#).

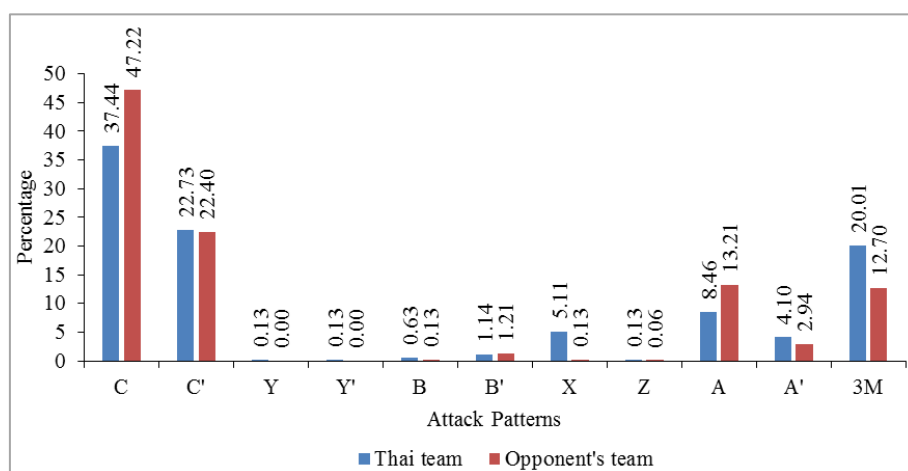


Figure 1. Chart illustrating the percentage distribution of attacking patterns used by the Thai national women's volleyball team and their opponents in the 2022 Nations League across 13 matches and 51 sets.

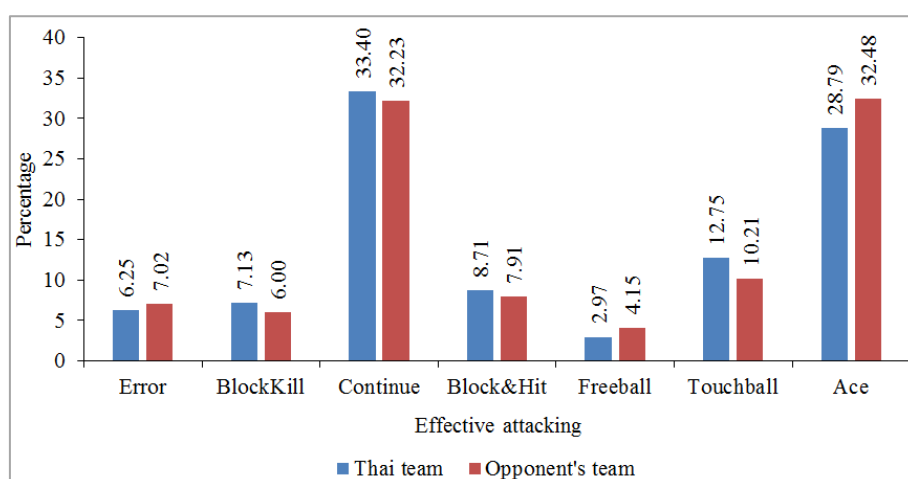


Figure 2. Chart illustrating the percentage distribution of the impact of attacks by the Thai national women's volleyball team and their opponents in the 2022 Nations League across 13 matches and 51 sets.

Table 1. The table compares the average difference in the offensive styles between the Thai national team and their opponent.

Attacking Patterns	Thai National (n=13)		Opponents Team (n=13)		t	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
C	45.62	13.29	56.92	16.61	1.92	0.07
C'	27.69	7.32	27.00	7.83	1.92	0.82
3M	24.38	8.00	15.31	6.30	0.08	0.00*
A	10.31	3.43	15.92	6.10	1.57	0.01*
X	6.23	3.81	0.15	0.55	1.00	0.00*
A'	5.00	3.21	3.54	2.44	1.57	0.20
B'	1.38	2.40	1.46	2.70	1.00	0.94
B	0.77	1.30	0.15	0.55	1.00	0.13
Y	0.15	0.55	0.00	0.00	0.23	0.33

Attacking Patterns	Thai National (n=13)		Opponents Team (n=13)		t	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
Y'	0.15	0.55	0.00	0.00	0.23	0.33
Z	0.15	0.38	0.08	0.28	1.00	0.56

*P<.05

Part 4: Comparative Analysis of Attack Outcomes

In comparing the outcomes of the attacking strategies of the Thai national women's volleyball team and their opponents in the 2022 Nations League, it is found that there is no statistically significant difference at a significance level of 0.05 in the following attack outcomes: the ability to respond to the opponent's attack (Continue), scoring attack (Ace), attack that the receiving team cannot play on (Touch ball), blocked attack that can be played again (Block & Hit), attack that is blocked (Block kill), attacking errors (Error), and attack that the receiving team has to adjust to avoid losing points (Free ball). Detailed information on these comparisons is presented in [Table 2](#).

Table 2. The table compares the average difference in the offensive outcome between the Thai national team and their opponent.

Attacks Result	Thai Nation		Opponent Team		t	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
Continue	40.69	10.81	38.85	13.27	0.95	0.35
Ace	35.08	10.75	39.15	8.50	0.74	0.47
Touch ball	15.54	6.28	12.31	4.01	0.39	0.70
Block & Hit	10.62	3.73	9.54	3.67	0.95	0.35
Block kill	8.69	3.45	7.23	4.32	0.68	0.50
Error	7.62	3.55	8.46	2.73	0.68	0.50
Free ball	3.62	2.33	5.00	2.42	0.39	0.70

4. Discussion

1) The attacking strategies employed by the Thai national women's volleyball team in the 2022 Nations League predominantly involve the use of front-row curved ball attacks (C) as the primary approach, followed by back-row curved ball attacks (C'). These patterns are considered fundamental and widely adopted by teams at various levels, aligning with the observations of [20]. The study identifies the most prevalent attacking strategy as forceful front-row curved ball attacks, ranking first among referenced strategies. This is followed by forceful back-row curved ball attacks. The research further reveals that successful teams and those less successful shares a preference for front-row curved ball attacks. It is noteworthy that both front-row and

back-row curved ball attacks are fundamental attacking patterns for every team, and each team must have players proficient in executing these strategies, particularly in the positions highlighted by Sanguanpong [21] emphasizes the role of players in the pivotal positions, often responsible for attacking in the left and right areas near the net. These players tend to be primary scorers for the team. The importance of utilizing both front-row and back-row curved ball attacks is underscored as integral strategies for effective team attacks, aligning with the insights provided by the Department of Physical Education, Ministry of Tourism and Sports [22]. In summary, the attacking patterns observed in the Thai women's volleyball team during the 2022 Nations League highlight the prevalence and effectiveness of front-row and back-row curved ball attacks. These strategies serve as fundamental tactics adopted by successful teams, em-

phasizing the significance of well-executed attacks for superior offensive performance and success in competitive volleyball.

- 2) In the 2022 Nations League, the attacking performance of the Thai national women's volleyball team reveals notable trends. The team exhibits the highest percentage of successful attacks where the opposing side managed to respond (Continue). Conversely, the second-highest percentage is attributed to scoring attacks (Ace). This observation can be attributed to the competitive nature of the tournament, being a Women's Volleyball World Championship qualifier. The athletes' closely matched skills and capabilities contribute to a more continuous and intense competition [23]. These findings align with Suwanno et al. [24] research, emphasizing that, in women's volleyball, the game dynamics differ significantly when attacking. Unlike in men's volleyball, where successful attacks often result in immediate points, women's matches tend to involve more prolonged and strategic gameplay after an attack. Additionally, the research by Rangubhet [25] supports the notion that continuous play is more prevalent than scoring points directly from attacks. The study indicates that the number of continuous plays (sets won 42.00 ± 9.87 times, sets lost 42.45 ± 13.50 times) surpasses both successful and unsuccessful scoring attempts. In summary, the Thai national women's volleyball team's attacking strategy in the 2022 Nations League emphasizes continuous play, with a higher focus on engaging the opponent in prolonged rallies rather than relying solely on scoring directly from attacks. These findings shed light on the nuanced dynamics of women's volleyball matches, where sustained effort and strategic play a crucial role in achieving success [26].
- 3) A statistical comparison of the average usage of attacking patterns by the Thai national women's volleyball team and their opponents in the 2022 Nations League reveals significant differences in three attack patterns per match at a 0.05 statistical significance level. These patterns include the 3-meter spike attack (3m), the quick front attack (A), and the back-row attack (X). The analysis highlights that the most effective attacking patterns in terms of scoring and creating competitive advantages are the 3-meter spike attack (3m), the quick front attack (A), and the back-row attack (X). These attacking strategies pose challenges for opponents in terms of blocking. Success in quick attacks (first and second tempos and second-touch contacts by the setter) contributes to the team's overall efficiency, especially when compared to slower-paced attacks [27]. While both winning and losing teams exhibit similar tendencies and utilize similar attack types, the winning teams have a higher likelihood of success in scoring, particularly in the 11-20% scoring range. This emphasizes the importance of employing fast-paced attacks in women's

volleyball competitions, where quick actions play a crucial role in achieving success. This finding aligns with Palao [28] research, indicating that fast attacks are a key factor in successful volleyball matches. The research results are consistent with Supamit [29] findings, emphasizing that teams achieving success tend to employ fast-paced attack strategies more frequently. Specifically, when considering the number of scoring attacks based on attack strategies (fast attacks A, B, and X), it becomes evident that fast-paced attack patterns significantly contribute to scoring and overall success in volleyball competitions [30].

- 4) A statistical analysis of the attacking performance of the Thai national women's volleyball team and their opponents in the 2022 Nations League reveals that there is no significant difference in the average attacking outcomes between the two teams at a 0.05 statistical significance level. This observation holds true even in high-stakes games, where closely matched opponents with similar skills, abilities, and experiences [31] create a competitive environment. The findings align with O'Donoghue et al. [32] assertion that volleyball athletes participating in competitions often exhibit comparable skills and abilities. The study emphasizes that the primary objective for each team is to score against their opponents, resulting in no statistically significant differences in the attacking outcomes of the Thai team and their opponents. In essence, the statistical parity in attacking performance suggests that the pressure, both internal and external, faced by the athletes from both teams in closely contested matches nullifies any observable differences in their skill execution during the games [33]. The results emphasize the competitiveness and similarity in skill levels between the Thai team and their opponents in the 2022 Women's Volleyball Nations League.

5. Conclusions

Research Summary:

Preferred Attacking Patterns:

- 1) The curve front attack (C) is the most frequently used attacking pattern, accounting for 37.44% per match.
- 2) The curve back attack (C') is the second most used pattern, accounting for 22.73% per match.
- 3) The team's highest success rate is in attacks that allow for continued play (Continue), with 33.40% per match.

Comparisons of Attacking Patterns:

- 1) The back-row attack (3M) is the most used attacking pattern, with a frequency of 20.01% per match.
- 2) The fast front attack (A) is used less frequently, with 8.46% per match.
- 3) The dummy attack (X) is also less common, with 5.11% per match.

Results of Attacks:

- 1) Scoring attacks (Ace) have an average frequency of

28.79% per match.

- 2) Attacks that the opponent can play on (Touch ball) have an average frequency of 33.40% per match.

Comparisons of Attack Results:

- 1) No statistically significant differences at the 0.05 level were found in the results of all attacking patterns between the Thai national team and their opponents.
- 2) Scoring attacks (Ace), attacks that were blocked but successfully hit back (Block & Hit), attacks that the opponent couldn't play on (Touch ball), block kills, errors, and free ball situations did not show statistically significant differences.

Conclusion:

- 1) Utilizing data on attacking patterns that impact scoring is crucial for training planning.
- 2) Improving skills and adopting suitable techniques to face opponents will be beneficial.
- 3) The information obtained can enhance performance and readiness for future competitions.
- 4) This research can assist managers and athletes in planning effective training sessions and improving future match outcomes in the context of the 2022 Nations League women's volleyball matches.

Author Contributions

Suriyon Luangtrongkit: Conceptualization, Formal Analysis, Investigation, Methodology, Project administration, Writing - original draft, Writing - review & editing

K. Ravivuth Rangubhet: Conceptualization, Investigation, Methodology, Project administration, Writing - original draft

Pitirat Kongtongkum: Conceptualization, Formal Analysis, Supervision, Funding acquisition, Investigation, Writing - original draft, Methodology, Visualization, Project administration, Writing - review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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