

## **BIOMECHANICAL ANALYSIS OF INDONESIAN FUTSAL KICK IN SCHEMES AT THE 2026 ASIAN CUP IN INDONESIA**

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### **Abstract**

This study investigates the biomechanical factors and tactical efficacy of kick in schemes executed by the Indonesian National Futsal Team during the 2026 AFC Futsal Asian Cup. Utilizing a descriptive quantitative approach, a total of 24 kick in events involving 14 players across two official matches were analyzed using Kinovea software (version 24.1.1) at 60 FPS. The movement analysis was structured into three distinct phases preparation, execution, and follow through examining key kinematic parameters including plant foot stability, body orientation, pelvic rotation, sequential proximal to distal momentum transfer, and ball velocity. Tactical performance was evaluated through opportunity effectiveness and goal conversion metrics. The results revealed a descriptive goal conversion rate of 12.5% (3 out of 24 events resulting in goals). Biomechanically, successful kick in sequences demonstrated that a stable plant foot provides the essential base of support for trunk stabilization and optimal pelvic rotation, enabling an efficient transfer of mechanical energy from the pelvis through the thigh and lower leg to the kicking foot. While these kinematic coordination mechanisms successfully generated high ball velocity and attacking progression, the overall conversion rate indicates that final execution quality, timing, and defensive pressure remain critical variables. Consequently, the findings suggest that optimizing kick in performance requires a synchronized integration of tactical pattern design and precise biomechanical execution.

**Keywords:** biomechanics, futsal, kick in, goal conversion, kinetic chain, movement analysis.

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## **INTRODUCTION**

Futsal is a fast paced and highly dynamic sport that requires players to execute technical and tactical actions quickly and accurately (Debyanto et al., 2022). One situation demanding speed, precision, coordination, and decision making is the kick in. Although formally used to restart play, the tactical function of the kick in in modern futsal has evolved significantly (Aditya et al., 2025; Travassos et al., 2024). Teams often utilize kick ins to maintain possession, build attacks, create scoring opportunities, and exploit weaknesses in the opponent's defensive organization.

The effectiveness of a kick in depends on more than just the accuracy of the initial pass. It is also influenced by the tactical patterns employed, supporting player movement, rotation timing, the

kick in location, the opponent's defensive response, and the quality of the finish (Kusuma Dewa, 2023; Travassos et al., 2024). Kick in schemes can encompass short passes, direct passes into the attacking zone, rotations, overlaps, screening movements, diagonal runs, attacks on the far post (second post), and combinations involving multiple players (Sarmiento et al., 2018). Each pattern demands specific forms of coordination, spatial awareness, timing, body positioning, and movement execution. Consequently, variations in kick in patterns can yield different attacking outcomes (Sarmiento et al., 2018).

Biomechanics provides a crucial theoretical foundation for understanding the execution of the kick in movement. During a kick in, the supporting leg, kicking leg, pelvis, trunk, and upper body function together as a kinetic chain (Hidayat & Rusdiana, 2018). This movement involves the sequential transfer of momentum from proximal body segments to distal ones. The action typically begins with pelvic stabilization or rotation, followed by thigh movement, lower leg extension, and acceleration of the foot toward the ball (Hidayat & Rusdiana, 2018). This proximal to distal sequence enables the player to efficiently generate and transfer mechanical energy upon contact with the ball (Hidayat & Rusdiana, 2018).

The supporting leg plays a crucial role in this process. It provides a stable base, maintains body balance, and influences the direction of the kick (Pratama & Nanda, 2021). The position of the supporting leg relative to the ball affects hip orientation, upper body posture, the swing of the kicking leg, and the point of contact with the ball. Placing the supporting leg too far from or too close to the ball can compromise stability, alter the direction of force generation, and reduce the accuracy of passes or shots. Therefore, executing an effective kick requires coordination among the supporting leg, hips, thighs, lower legs, and feet (Inoue et al., 2014).

Previous research has explained the fundamental principles of body movement mechanics in sports activities (Permana et al., 2026). Another study demonstrated that using varied goal shooting drills significantly improved the shooting accuracy of futsal players (Ahmadi & Sari, 2025). Factors such as joint position, angular velocity, body orientation, force production, and the point of contact with the ball can influence the speed, direction, and accuracy of passes (Ahmad et al., 2024). In this study, biomechanics is used to support the interpretation of how various kick in patterns are executed and why specific patterns can yield more effective attacking outcomes.

The importance of kick in analysis can be observed in the performance of the Indonesian national futsal team at the 2026 AFC Futsal Asian Cup. In the present observation, 24 kick in events involving 14 Indonesian players from two official matches were selected for analysis. Three of the 24 kick in events resulted in goals, while 21 did not result in goals. Therefore, the descriptive goal conversion rate was 12.5%. Although this percentage provides an overview of goal producing outcomes, the majority of kick in events did not result in goals.

To evaluate kick in performance more comprehensively, this study focuses on two aspects: opportunity effectiveness and goal conversion. Opportunity effectiveness refers to the ability of a kick

in pattern to produce an attacking opportunity, such as maintaining possession, progressing the ball into an advantageous area, creating a final pass, producing a shot, or generating a clear scoring chance. Goal conversion refers to the ability of a kick in sequence to transform an attacking opportunity into a goal. Because a goal cannot be scored directly from a kick in, goal conversion in this study refers to goals resulting from attacking sequences initiated by a kick in.

Opportunity effectiveness can be calculated using the following formula:

$$\text{Opportunity Effectiveness} = \frac{\text{Number of kick-ins producing attacking opportunities}}{\text{Total number of kick-in events}} \times 100\%$$

Goal conversion can be calculated as follows:

$$\text{Goal Conversion} = \frac{\text{Number of goals resulting from kick-in sequences}}{\text{Total number of kick-in events}} \times 100\%$$

Based on the observed data:

$$\text{Goal Conversion} = \frac{3}{24} \times 100\% = 12.5\%$$

The distinction between opportunity effectiveness and goal conversion is important. A kick in pattern may create an attacking opportunity without producing a goal. Conversely, a pattern may produce a limited number of opportunities but demonstrate a higher conversion rate. Therefore, kick in performance should be evaluated according to both the ability to create opportunities and the ability to convert them into goals.

In futsal research, a deep understanding of performance standards and the physical and tactical characteristics of modern players serves as a crucial foundation for match evaluation (Ramadhan et al., 2026). However, previous futsal studies have primarily examined biomechanical characteristics within isolated technical actions, such as shooting and passing (Ahmadi & Sari, 2025; Fasrah et al., 2025; Fitriadi et al., 2026; Hidayat et al., 2025). Furthermore, the performance demands of modern futsal highlight the importance of tactical mastery and high level technical execution during set piece situations (Parulian & Fernando, 2025; Ramadhan et al., 2026). Yet, relatively few studies have investigated the relationships between biomechanical movement characteristics, kick in pattern variations, and attacking outcomes in official matches. Specifically, existing research remains limited in determining whether certain kick in patterns are more effective at creating opportunities and whether such patterns are associated with higher goal conversion rates.

This study offers novelty by combining tactical analysis of kick in patterns, biomechanical movement analysis, opportunity effectiveness, and goal conversion in official match settings. Each kick in was analyzed according to its tactical pattern, movement sequence, location, number of players involved, attacking progression, opportunity created, and final outcome. Based on this framework, the research question of this study was: Is there a correlation between variations in kick in patterns and the effectiveness of attacking opportunities or goal conversion produced by the Indonesian national futsal team.

## METHODS

This study employs a descriptive quantitative approach utilizing biomechanical analysis to examine the kick in technique in futsal matches. This descriptive quantitative research is applied to characterize kick in events, covering movement phases, player positioning, kick distance, rotation time, ball flight duration, and conversion into goals. This approach is considered appropriate as it enables the systematic observation and description of kinematic and tactical characteristics without establishing cause and effect relationships between variables (Karmadi et al., 2023).

A total of 24 kick in events performed by 14 Indonesian players were analyzed from two official matches at the 2026 AFC Futsal Asian Cup. The inclusion criteria were kick in events that were clearly visible in the available match recordings, initiated an attacking sequence, and could be followed until the end of the attacking action. Kick in events were included if they produced an attacking opportunity, a shot on target, or a goal resulting from the subsequent attacking sequence. Events with unclear video quality, incomplete visibility of the kicking action, or unclear final outcomes were excluded. Of the 24 included events, three resulted in goals and 21 did not result in goals; therefore, the descriptive goal conversion rate was 12.5%.

The video recordings were analyzed using Kinovea software (version 24.1.1) at a frame rate of 60 frames per second (FPS). Kinovea has been proven valid and reliable for measuring angles and distances in video based motion analysis (Puig Diví et al., 2019). Recording at 60 FPS allowed for a more detailed observation of rapid movements during the kick in. The sagittal plane was used to analyze the movement of the kicking leg, including the backswing, knee extension, ball contact, and follow through. The frontal plane was used to analyze lateral body alignment, plant foot position, hip rotation, player orientation, and the movement of supporting players. The biomechanical parameters observed included plant foot position, kicking foot contact, body orientation, movement coordination, rotation timing, kick distance, ball velocity, and momentum transfer from the hip through the thigh, lower leg, and kicking foot (Baniruddin & Raharja, 2025).

Each kick in movement is analyzed using three consistent phases: the preparation phase, the execution phase, and the follow through phase. The preparation phase encompasses body positioning, placement of the supporting foot, torso orientation, and the initial backswing of the kicking leg. The execution phase includes hip rotation, sequential acceleration of the thigh and lower leg, contact between the kicking foot and the ball, and ball release. The follow through phase covers the continued movement of the kicking leg after contact with the ball, the recovery of balance, and the player's readiness to resume play. This three phase terminology is used consistently throughout the analysis (Ridhani & Ft, n.d., 2026).

## RESULTS AND DISCUSSION

### Results

This study employed a descriptive quantitative design using video based observational analysis. The research examined kick in pattern variation, biomechanical movement characteristics, attacking outcomes, and goal conversion in official matches involving the Indonesian national futsal team at the 2026 AFC Futsal Asian Cup. The unit of analysis was the individual kick in event and the attacking sequence that followed. Each event was analyzed according to its tactical pattern, movement phases, biomechanical characteristics, and final outcome:



Figure 1. Information On Setup And Positioning Prior To Executing The Kick In Scheme.

Note: Shooting distance is 7.57 m. Initial player positions prior to rotation/movement: Player 1 at 4.76 m, Player 2 at 4.73 m, and Player 3 at 1.99 m.



Figure 2. Information On Goal Scoring Execution During The Kick In Scheme.

Note: Shooting distance = 7.57 m; Player coordination: Player 1 (4.76 m), Player 2 (4.73 m), Player 3 (1.99 m); Rotation time = 3.02 s; Ball flight time = 0.52 s.



Figure 3. Setup And Positioning Prior To Executing Another Kick In Scheme.

Note: Shooting distance is 4.65 m. Initial player positions: Player 1 at 1.51 m, Player 2 at 2.44 m.



Figure 4. Goal Scoring Execution From The Kick In Scheme.

Note: Shooting distance = 4.65 m; Player coordination: Player 1 (1.51 m), Player 2 (2.44 m); Rotation time = 2.14 s; Ball flight time = 0.34 s.

### Semi Final Phase

Data gathered from the semi final match against Japan:



Figure 5. Setup And Positioning Prior To Executing The Kick In Scheme Against Japan.

Note: Shooting distance = 10.16 m. Initial positions: Player 1 (14.51 m), Player 2 (1.96 m),

Player 3 (1.01 m).



Figure 6. Goal Scoring Execution From The Kick In Scheme Against Japan.

Note: Shooting distance = 10.16 m; Player positions: Player 1 (14.51 m), Player 2 (1.96 m), Player 3 (1.01 m); Rotation time = 2.83 s; Ball flight time = 0.94 s.



Figure 7. Setup And Positioning Prior To Kick In Execution.

Note: Shooting distance = 10.96 m. Initial positions: Player 1 (2.55 m), Player 2 (5.61 m), Player 3 (1.43 m).



Figure 8. Goal Scoring Execution From The Kick In Scheme.

Note: Shooting distance = 10.96 m; Player positions: Player 1 (2.55 m), Player 2 (5.61 m),

Player 3 (1.43 m); Rotation time = 1.67 s; Ball flight time = 0.73 s.

The sample consisted of 24 kick in events performed by the Indonesian national futsal team. The events involved 14 Indonesian players and were selected from two official matches at the 2026 AFC Futsal Asian Cup. Of the 24 kick in events, three resulted in goals, while 21 did not result in goals. Therefore, the descriptive goal conversion rate was 12.5%.

**Tabel 1.** Sample Characteristics

| Sample characteristic           | Number |
|---------------------------------|--------|
| Matches analyzed                | 2      |
| Kick in events analyzed         | 24     |
| Players involved                | 14     |
| Kick ins resulting in goals     | 3      |
| Kick ins not resulting in goals | 21     |

The study analyzed 24 kick in events from two official matches involving the Indonesian national futsal team at the 2026 AFC Futsal Asian Cup. A total of 14 players were involved in the observed sequences. Three kick in events resulted in goals, while 21 kick in events did not result in goals..

**Tabel 2.** Frequency of Kick in Results

| Indicator                       | Frequency | Percentage |
|---------------------------------|-----------|------------|
| Kick ins resulting in goals     | 3         | 12,5%      |
| Kick ins not resulting in goals | 21        | 87,5%      |
| Total kick in events            | 24        | 100%       |

## Discussion

The following interpretation explains the observed kick in sequences by linking the tactical data with the biomechanical mechanism of proximal to distal momentum transfer, the role of the plant foot, and the function of the kicking foot during shooting (Shen et al., 2026) The study analyzed 24 kick in events involving 14 Indonesian players from two official matches. Three kick in sequences resulted in goals, producing a descriptive goal conversion rate of 12.5%, while the remaining 21 sequences did not directly produce goals. This result indicates that although kick ins can contribute to goal scoring opportunities, the majority of the observed sequences did not result in goals.

Analysis was conducted using Kinovea version 24.1.1 at 60 FPS. This frame rate allows for detailed observation of rapid movements during the execution of a kick in. The sagittal plane enables analysis of the kicking leg's motion, backswing, ball contact, and follow through, while the frontal plane provides information regarding body alignment, stance leg position, rotation, and the movements of supporting players (Irawan et al., 2024).

Figure 1 shows the preparation phase of the first goal producing kick in. The positioning of Players 1, 2, and 3 indicates that they had created sufficient distance to receive the kick in and initiate the attacking rotation. From a biomechanical perspective, this phase reflects the importance of plant foot stability, trunk alignment, and preparation of the kicking foot before pelvic rotation and leg acceleration occur (Wang et al., 2026). Figure 2 presents the execution of the first goal producing kick in. The ball was released with sufficient velocity after contact, indicating effective transfer of momentum from the pelvis and thigh through the lower leg to the kicking foot. The plant foot stabilized the body, while the kicking foot made contact with the ball and directed it toward the intended target (Berlin, 2011).

Figure 3 illustrates the preparation phase of the second goal producing kick in. The more compact positioning of the players suggests a tactical arrangement that required greater precision. In this phase, correct plant foot placement, body orientation, and positioning of the kicking foot were essential to ensure accurate ball direction and efficient pelvic rotation (Shen et al., 2026). Figure 4 shows the execution of the second goal producing kick in. The shorter execution time indicates faster tactical execution and quicker ball release. The results suggest that effective coordination between the plant foot, pelvic rotation, thigh swing, knee extension, and kicking foot contact enables the executor to deliver the ball rapidly before the defense can reorganize (Chen et al., 2024). The role of upper body motions in stationary ball kicking motion: A systematic review. *Journal of Science in Sport and Exercise*, 1 26.

Figure 5 displays the preparation phase of a kick in executed against Japan in the semi final. The longer shooting distance indicates that this kick in was intended to progress the ball into a more advanced attacking area. Therefore, the executor required greater force production and a more complete proximal to distal momentum transfer to the kicking foot (Hoelbling, 2024). Figure 6 presents the goal scoring execution against Japan. A longer ball flight duration corresponds to a greater kicking distance. This finding indicates that the success of long distance kick ins depends not merely on kicking power, but also on plant foot stability and the temporal alignment of sequential acceleration originating from the pelvis, progressing through the thigh and lower leg, and reaching the kicking foot (Imron et al., 2024).

Figure 7 shows the preparation phase of another kick in sequence. The wider player spacing suggests a pattern designed to stretch the defensive structure and create space for the subsequent attacking action. Correct plant foot alignment, body orientation, and kicking foot positioning were essential to deliver the initial pass accurately over the longer distance (Martin, 2011). Figure 8

illustrates the execution of the kick in that produced a goal. The relatively short execution time indicates rapid decision making and coordinated player movement. From the kinetic chain perspective, the plant foot provided the stable base needed to control balance and direction, while sequential momentum transfer from the pelvis to the kicking foot enabled sufficient ball velocity toward the target (Duane, 2025).

The biomechanical sequence observed in the kick in executions supports the concept of proximal to distal momentum transfer. The movement does not originate from the kicking foot alone; rather, it begins with stabilization of the plant foot and controlled rotation of the pelvis. During the preparation phase, the plant foot stabilizes the body and allows the pelvis to rotate around the supporting leg. This pelvic rotation initiates movement in the thigh, which then accelerates forward. As the thigh approaches its maximum angular velocity and begins to decelerate, its momentum is transferred to the lower leg. The lower leg subsequently accelerates through knee extension, and its momentum is finally transferred to the kicking foot immediately before ball contact (Inoue & Nunome, 2026).

This sequential acceleration enables the kicking foot to reach its highest velocity at the moment of contact with the ball. In practical terms, the pelvis acts as the initial power generator, the thigh transmits and amplifies the movement, the lower leg increases the speed of the swing, and the kicking foot applies the accumulated momentum to the ball. Therefore, ball velocity and passing accuracy in a kick in are not produced by the kicking foot alone, but by the coordinated action of the plant foot, pelvis, thigh, lower leg, and kicking foot (Idrus, 2016).

The plant foot has a central role because it provides the stable base of support for the entire kinetic chain. A stable plant foot controls balance, stabilizes the pelvis and trunk, and allows the kicking leg to swing freely toward the ball (Santana, 2015). It also determines body orientation and the direction of force production. Plant foot position is particularly important because it influences both the accuracy of the initial pass and the subsequent shot. A properly positioned plant foot allows the pelvis and trunk to rotate effectively while the kicking leg moves toward the ball. In contrast, an unstable or incorrectly positioned plant foot may reduce balance, alter the contact point, and decrease movement accuracy. If the plant foot is positioned too far from the ball, the kicking leg may overextend, reducing control at ball impact. Conversely, placing the plant foot too close to the ball restricts pelvic rotation and kicking leg swing. An effective plant foot placement is typically beside and slightly behind the ball, with the toes pointing toward the target (Aji, 2016).

The relatively low goal conversion rate suggests that the success of a kick in is not determined solely by the number of attempts. The final outcome also depends on the tactical pattern, passing accuracy, timing of supporting player movement, defensive pressure, shot accuracy, and the quality of the final action. A kick in may successfully maintain possession or create attacking progression without producing a shot or goal. The findings suggest that successful kick in sequences depend on the interaction between tactical design and biomechanical execution. The preparation phase

establishes body position, the execution phase transfers momentum to the ball, and the follow through phase supports balance recovery and continuation of play.

Opportunity effectiveness and goal conversion represent different aspects of kick in performance. A kick in pattern may generate an attacking opportunity without producing a goal. Conversely, a pattern may produce a limited number of opportunities but demonstrate a higher conversion rate. Therefore, coaches should evaluate not only the number of goals but also the quality of opportunities created by each kick in pattern. However, the 12.5% goal conversion rate should be interpreted as a descriptive result rather than as evidence of a statistically significant correlation. A larger sample involving more matches and kick in events would be required to determine whether variation in kick in patterns is significantly associated with goal conversion. Future research should also compare opportunity effectiveness, shots on target, defensive responses, and biomechanical parameters across a larger number of sequences to provide stronger evidence regarding the relationship between tactical kick in design, biomechanical execution, and goal scoring outcomes.

## CONCLUSION

This study analyzed 24 kick in events involving 14 Indonesian players from two official matches at the 2026 AFC Futsal Asian Cup. Three kick in events resulted in goals and 21 did not, producing a descriptive goal conversion rate of 12.5%. The analysis used Kinovea version 24.1.1 at 60 FPS. The sagittal plane was used to analyze the kicking leg movement, while the frontal plane was used to analyze body alignment, plant foot position, player rotation, and supporting player movement. The movement was divided consistently into the preparation, execution, and follow through phases.

The biomechanical analysis indicated that effective kick in execution involves sequential momentum transfer from the pelvis to the thigh, lower leg, and foot. The plant foot provides stability, supports body balance, and helps control the direction of the kick. The findings suggest that kick in pattern variation and biomechanical execution may contribute to attacking effectiveness and goal production. However, the relatively low goal conversion rate indicates that further improvement is needed in tactical variation, passing accuracy, movement coordination, and finishing quality. Because the sample consisted of 24 kick in events, the results should be interpreted as descriptive and preliminary. A larger sample is needed to determine whether a statistically significant correlation exists between kick in pattern variation, attacking opportunity effectiveness, and goal conversion.

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