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Technical Action Distribution and Effectiveness in Cerebral Palsy Football: A Notational Analysis of the IFCPF Asia–Oceania Cup

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Abstract

Study purpose. This study aimed to analyze the distribution and effectiveness of technical actions performed by players during CP Football matches using a notational analysis approach.

Materials and methods. The participants were 16 players (*avg. age ± SD, 28.19 ± 5.56*) from the Indonesian National Cerebral Palsy Football team who competed in the IFCPF Asia-Oceania Cup held in Surakarta, Indonesia, from 16–22 November 2025. A total sampling technique was applied. The unit of analysis was not individual players but technical actions occurring during matches. Match videos from four official games (Australia, Japan, Thailand, and Iran) were systematically observed to record four technical actions: passing, ball control, dribbling, and shooting. Each action was classified as successful or unsuccessful and analyzed using descriptive statistics to determine frequency, distribution, and effectiveness.

Results. The results showed that passing was the most dominant technical action with 984 occurrences (44.3%) and a 90.5% success rate, followed by ball control with 847 occurrences (38.1%) and an 89.0% success rate. Dribbling accounted for 271 occurrences (12.2%) with a 67.9% success rate, while shooting was the least frequent action with 123 occurrences (5.5%) and a 35.8% success rate. In addition, most technical actions were predominantly performed using the right foot.

Conclusions. The findings indicate that match performance in CP Football is largely characterized by ball possession and circulation through passing and ball control, while penetrating and finishing actions occur less frequently and with lower effectiveness. Training programs should therefore emphasize passing accuracy, ball control skills, and bilateral technical development to enhance players' performance in competitive matches.

Keywords: CP Football, Notational Analysis, Technical Performance, Football Skills, Match Analysis.

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Introduction

Cerebral Palsy Football (CP Football) is a competitive sport that has developed within the international disability sport system under the governance of the International Federation of Cerebral Palsy Football (IFCPF) (Henriquez et al., 2024). In addition to serving as a medium for rehabilitation and social inclusion for individuals with cerebral palsy, CP Football has evolved into a performance oriented sport that requires optimal technical, tactical, and physical capabilities (Pe et al., 2021). However, the neuromuscular characteristics of athletes with cerebral palsy such as impaired coordination, limited balance, muscle spasticity, and reduced motor control may influence players' ability to execute fundamental football techniques during matches (Umar et al., 2022). Recent studies indicate that these neuromuscular conditions affect players' movement patterns, ball possession effectiveness, and the selection of technical actions performed in dynamic game situations (Henríquez et al., 2024).

From a sport science perspective, research examining match performance in disability sports remains relatively limited compared with studies conducted in non-disability sports (Younus, 2025). Most existing research in CP Football has focused primarily on aspects of functional athlete classification, physical capacity, and physiological responses, as well as external match load indicators such as total distance covered, running speed, and player accelerations (Gamonales et al., 2024; Maggiolo, García-hernández, et al., 2025; Maggiolo, Javaloyes, et al., 2025). Recent systematic and scoping reviews also highlight that the majority of CP Football research still emphasizes physical performance indicators and athlete classification systems, whereas studies specifically analyzing fundamental technical actions based on real match situations remain scarce (Santiago et al., 2024; Bao et al., 2025). This limitation highlights the practical importance of conducting match-based technical analysis in CP Football. Without objective data derived from real competition, training programs may not accurately reflect the actual technical demands of the game. As a result, there is a risk that technical development strategies remain generalized and less effective in improving match performance.

In contrast, within the context of conventional football, match-based performance analysis has long been recognized as an essential approach for understanding game characteristics and identifying athletes' training needs. Match based technical analysis enables researchers and coaches to identify patterns of play, the dominance of specific technical actions, and the technical demands that emerge during competition (Jan et al., 2025). Previous studies have demonstrated that the frequency and distribution of fundamental techniques such as passing, ball control, dribbling, and shooting can provide an objective overview of the technical demands of the game and serve as a foundation for designing more specific training programs (Clemente, 2016; Sarmento et al., 2018). Nevertheless, this match-based technical analysis approach has not yet been widely applied systematically within the context of CP Football, particularly at the national team level.

Athlete performance in CP Football results from a complex interaction between technical ability, neuromuscular conditions, and the dynamic demands of match situations (Henríquez et al., 2024). Official matches involve time pressure, interactions with opponents, and high levels of game intensity, thereby representing the most authentic context for evaluating athletes' performance compared with controlled training environments (Umar et al., 2022). Consequently, match performance analysis is considered a relevant approach for objectively understanding the technical characteristics of CP Football gameplay (Gamonales et al., 2024; Maggiolo, Javaloyes, et al., 2025).

Furthermore, neuromuscular limitations experienced by athletes with cerebral palsy often require technical adaptations during gameplay. Previous research indicates that the selection and frequency of fundamental technical actions during matches may differ from patterns observed during training, as players must adapt to the demands of competition and

their individual functional conditions (Henríquez et al., 2024; Santiago et al., 2024). This situation suggests that match-based technical analysis is essential for identifying the contextual characteristics of technical performance in CP Football.

In the Indonesian context, the need for this research becomes more evident due to the limited availability of objective performance data within the national CP Football team. To date, performance evaluation has largely relied on subjective assessments by coaches, with minimal use of systematic match analysis. This condition creates a gap between training design and actual match demands, highlighting the importance of data-driven performance evaluation in this setting. From a practical perspective, the Indonesian National Cerebral Palsy Football Team requires a strong scientific foundation for designing coaching and technical training programs based on actual match demands. The participation of the Indonesian CP Football National Team in official matches held from 16 to 22 November 2025 provided an opportunity to obtain empirical data regarding players' technical behaviors in real competitive situations. Previous studies have shown that the analysis of official matches can provide a more valid representation of performance compared with measurements obtained through field tests or simulated training environments (Maggiolo, García-hernández, et al., 2025). However, to date, no systematically documented data are available regarding the most dominant fundamental techniques used by players of the Indonesian CP Football National Team during official matches.

The absence of such data often results in performance evaluations in CP Football relying heavily on coaches' subjective observations. This condition differs from conventional football, where statistical match analysis has become an integral component of modern performance evaluation systems (Práxedes et al., 2018). Dependence on subjective assessments may lead to training programs that are less specific to the actual technical demands of competition (Gamonales et al., 2024; Bao et al., 2025).

Based on these conditions, a research gap remains regarding the lack of empirical data on the dominant patterns of fundamental technical actions performed during CP Football matches, particularly at the level of the Indonesian national team. The heterogeneous neuromuscular characteristics of athletes with cerebral palsy may influence both the frequency and effectiveness of technical actions during competition (Pena-Gonzales & Ramon, 2023). Nevertheless, studies that systematically analyze players' technical behaviors in real match situations remain very limited. This lack of information may lead to technical training programs that do not fully reflect the actual demands of the game.

The novelty of this study lies in the application of systematic notational analysis to examine the distribution and effectiveness of fundamental technical actions in CP Football based on official international match data. This study focuses specifically on technical performance, including passing, ball control, dribbling, shooting, and tackling, which has received limited attention in previous research that predominantly emphasizes physical and physiological aspects. Therefore, this study aims to analyze the dominance of fundamental football techniques performed during matches by the Indonesian National Cerebral Palsy Football Team using a match performance analysis approach. The analysis was conducted using a notational analysis method based on video recordings of official matches held between 16 and 22 November 2025, focusing on the technical actions of passing, ball control, dribbling, shooting, and tackling. The findings of this study are expected to enrich the literature on performance analysis in disability sports while also providing an empirical foundation for the development of more specific, match-based technical training programs in CP Football.

Materials and methods

Study participants

The participants in this study were athletes of the Indonesian National Cerebral Palsy (CP) Football Team who took part in official matches at the IFCPF Asia–Oceania Cup held on 16–22 November 2025 in Surakarta, Indonesia. A total of 16 players involved in the competition were included in the study and had a mean age of 28.19 ± 5.56 years. Although the athletes served as the study participants, the unit of analysis in this research was not the individual players but rather the technical actions that occurred during the matches, including passing, ball control, dribbling, and shooting. All technical actions performed by the players during the matches were recorded through match video footage and systematically observed to obtain an objective description of the technical performance characteristics of CP Football players in an official competitive setting. The video recordings used in this study were obtained from official match broadcasts and can be accessed through the following links: *link match 1, link match 2, link match 3, link match 4*.

Study organization

This study employed a descriptive quantitative approach with a non-experimental observational design to analyze the technical performance of CP Football players in real match situations without manipulating any variables. Data were collected through video-based match analysis of the Indonesian National Cerebral Palsy Football Team during the IFCPF Asia–Oceania Cup held on 16–22 November 2025. Observations were conducted systematically using the notational analysis method to record every technical action that occurred during the matches, utilizing replay, pause, and slow-motion features to improve the accuracy of data identification. Each technical action was then classified according to categories defined in the observation instrument, namely ball contact, passing, dribbling, and shooting, and evaluated based on success (adequate) and failure (inadequate) criteria according to the predetermined operational definitions, as presented in the research instrument Table 1 (Caso et al., 2025).

Table 1. Operational definitions of technical actions used in the notational analysis.

Technical Action	Operational Definition	Adequate (Successful)	Inadequate (Unsuccessful)
Ball Contact	Any player contact with the ball, including receiving, controlling, or other touches.	Ball possession is maintained by the player's team or leads to a shot/goal opportunity.	Ball possession is lost to the opponent or the touch does not result in clear control of the ball.
Passing	An intentional action of delivering the ball to a teammate using the foot or other legal body parts.	The pass is successfully received by a teammate.	The pass is intercepted by an opponent, goes out of play, is misdirected, or results in an offside situation.
Shooting	An attempt to kick the ball toward the goal with the intention of scoring.	The shot results in a goal or is directed on target (*on target*).	The shot is off target, blocked by an opponent, or does not reach the goal area.
Dribbling	A player advances the ball through repeated touches while maintaining individual control.	The player retains ball possession after the dribble.	The ball is lost or taken by an opponent during the dribble.

Statistical analysis

The data obtained from the video observation using notational analysis were analyzed using descriptive statistics to describe the distribution of basic technical actions during the matches. Each technical action observed was recorded and tabulated based on the type of technique analyzed, namely passing, ball control, dribbling, and, shooting. The frequency of occurrence for each technique was calculated to identify the distribution pattern of technical actions during the matches. Subsequently, percentage calculations were conducted to determine the most dominant techniques used by the players. The results of the analysis were presented in the form of frequency and percentage distribution tables to facilitate the interpretation of the players' technical performance patterns in CP Football matches. All data processing and statistical calculations were carried out using statistical data processing software, referring to the predetermined operational definitions to ensure the consistency and objectivity of the observation process.

Results

This section presents the findings of the study based on the analysis of technical actions performed by players of the Indonesian National Cerebral Palsy Football Team during matches in the IFCPF Asia–Oceania Cup held in Surakarta, Indonesia. The results are presented in Table 2 and described sequentially to provide a clear overview of the distribution and effectiveness of fundamental technical actions observed during the matches.

Table 2. Overall Distribution and Effectiveness of Technical Actions

Fundamental Technique	Data	vs Australia	vs Japan	vs Thailand	vs Iran	Total
Passing	Total (Successful)	197 (162)	290 (247)	418 (368)	193 (152)	**1,098 (929)**
	% Effectiveness	82%	85%	88%	79%	**84.60%**
Ball Control	Total (Successful)	173 (135)	245 (198)	396 (333)	170 (129)	**984 (795)**
	% Effectiveness	78%	81%	84%	76%	**80.80%**
Dribbling	Total (Successful)	74 (48)	41 (24)	122 (88)	69 (42)	**306 (202)**
	% Effectiveness	65%	58%	72%	61%	**66.00%**
Shooting	Total (Successful)	28 (12)	23 (9)	25 (10)	16 (5)	**92 (36)**
	% Effectiveness	43%	39%	40%	31%	**39.10%**
Total Action		**472**	**599**	**961**	**448**	

The distribution of technical actions performed by the Indonesian National Cerebral Palsy Football Team during the IFCPF Asia–Oceania Cup is presented in Table 2. A total of 2,480 technical actions were recorded across four matches against Australia, Japan, Thailand,

and Iran. Among the observed techniques, passing was the most frequently performed action (1,098), followed by ball control (984), dribbling (306), and shooting (92).

In terms of effectiveness, passing demonstrated the highest success rate (84.60%), followed by ball control (80.80%), dribbling (66.00%), and shooting (39.10%). A comparative analysis across matches revealed that the highest number of technical actions occurred against Thailand (961 actions), indicating a more possession-oriented and dynamic gameplay. In contrast, the lowest number of actions was recorded against Iran (448), suggesting increased opponent pressure and reduced opportunities for ball control. Moreover, technical effectiveness tended to be higher in matches with greater ball possession (e.g., Thailand), while lower effectiveness, particularly in shooting, was observed under more constrained match conditions (e.g., Iran).

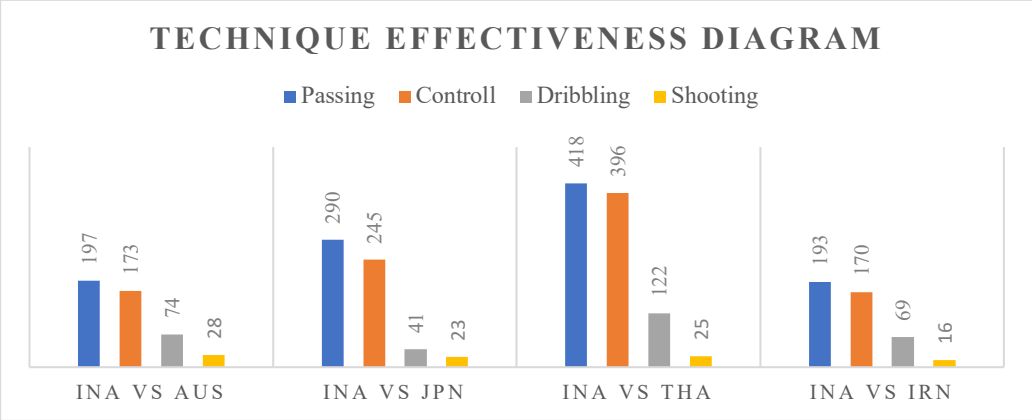

Figure 1. Distribution and effectiveness of fundamental technical actions performed

Figure 1 overall, the findings indicate that passing and ball control were the dominant technical actions both in frequency and effectiveness, while dribbling and shooting occurred less frequently and showed lower effectiveness during the matches.

Table 3. Distribution of Technical Actions Based on Right (R) and Left (L) Foot Usage by Players during matches in the IFCPF Asia–Oceania Cup

Player	Passing (R/L)	Ball Control (R/L)	Dribbling (R/L)	Shooting (R/L)
1	10 / 12	4 / 2	0 / 0	0 / 0
2	45 / 17	42 / 13	5 / 1	0 / 0
3	40 / 0	32 / 0	15 / 0	3 / 0
6	1 / 21	0 / 40	0 / 15	0 / 6
8	103 / 0	78 / 0	19 / 0	6 / 1
9	113 / 13	96 / 11	32 / 7	7 / 1
10	89 / 36	83 / 40	35 / 15	12 / 2
11	127 / 10	104 / 29	48 / 14	4 / 3
12	238 / 16	212 / 15	79 / 10	0 / 0

Table 3 presents the distribution of technical actions based on right and left foot usage by each player during matches in the IFCPF Asia–Oceania Cup. Overall, the majority of players demonstrated a clear dominance of right-foot usage across most technical actions, particularly in passing and ball control. Several players showed a strong preference for the right foot, such as Player 12 (238 right-foot passes vs 16 left-foot passes) and Player 11 (127 vs 10). In contrast, Player 6 demonstrated a clear left-foot dominance, particularly in passing (21 left-foot actions

vs 1 right-foot action) and ball control (40 left-foot actions). These findings indicate noticeable variability in foot preference among players during match play, although right-foot dominance was generally observed across most technical actions.

Discussion

The notational analysis of four matches revealed that the distribution of technical actions was dominated by passing, with a total of 984 actions, representing approximately 44.3% of all recorded technical actions. The second most frequent technique was ball control with 847 actions (38.1%), followed by dribbling with 271 actions (12.2%), and shooting with 123 actions (5.5%). The analysis of success rates also showed clear differences between techniques. Passing demonstrated a success rate of approximately 90.5%, while ball control showed a comparable success rate of 89.0%. In contrast, dribbling presented a lower success rate of 67.9%, and shooting showed the lowest success rate at 35.8%. These patterns indicate that match play was primarily characterized by activities related to ball possession and circulation, whereas actions associated with individual penetration and finishing occurred less frequently and with lower effectiveness. This distribution suggests that match dynamics were largely governed by technical interactions supporting collective ball retention and team organization (Pekas et al., 2019).

A more detailed examination of each match further reveals contextual variations in technical performance. The match against Thailand, which recorded the highest number of total actions (961), was characterized by a more possession oriented style of play, reflected in higher frequencies and effectiveness of passing (88%) and ball control (84%). In contrast, the match against Iran showed the lowest total actions (448), along with reduced effectiveness across several techniques, particularly shooting (31%), suggesting increased defensive pressure and limited attacking opportunities. The match against Japan demonstrated moderate technical distribution but showed lower dribbling effectiveness (58%), indicating possible constraints in individual ball progression. Meanwhile, the match against Australia presented relatively balanced technical patterns, although with slightly lower passing effectiveness (82%) compared with other matches. These variations indicate that technical performance in CP Football is highly dependent on match context, including opponent characteristics and game dynamics.

The predominance of passing highlights the central role of ball distribution in shaping team play structure (Juliarta et al., 2025). Beyond facilitating ball movement, passing serves as a key mechanism for regulating game tempo and creating spatial opportunities within attacking sequences (Faroq et al., 2024). Previous match analysis studies have consistently shown that a high passing frequency is associated with possession-oriented playing styles, in which teams prioritize ball retention to control the rhythm and structure of the game (Coutinho et al., 2022). Within the context of Cerebral Palsy Football, effective passing becomes even more critical, as limitations in motor coordination may compromise movement stability and increase the risk of ball loss during play (Henríquez et al., 2024).

Ball control emerged as the second most frequent technical action, reflecting the frequent need for players to stabilize the ball before executing subsequent technical decisions. In football performance contexts, effective ball control plays a crucial role in facilitating smooth transitions from ball reception to subsequent actions such as passing or dribbling. Recent research has highlighted the close relationship between ball control performance and motor coordination, particularly in relation to body positioning and interaction with the ball (Pizarro et al., 2019). For athletes with cerebral palsy, this technical component becomes particularly important, as neuromuscular impairments may influence postural stability during ball reception. Consequently, the ability to effectively control the ball contributes significantly to maintaining continuity of possession during match play.

The relatively lower frequency of dribbling suggests that this action was employed

selectively during matches. In football, dribbling typically occurs in specific tactical contexts (Hardinata et al., 2023), such as when players attempt to overcome direct defensive pressure or create positional advantages in one-versus-one situations. The findings of the present study indicate a stronger reliance on ball progression through passing rather than individual ball carrying. This tendency may reflect an adaptive tactical approach in CP Football, where limitations in coordination and balance may affect players' ability to maintain control while moving with the ball. Previous studies have reported that movement coordination and balance constraints can reduce dribbling efficiency in players with cerebral palsy, thereby encouraging strategies based on collective ball movement (Peña-gonzález et al., 2022).

Shooting represented the least frequent technical action observed in this study. This finding suggests that opportunities for finalization were relatively limited compared with the number of actions occurring during the build-up phase of play. In football performance analysis, shooting naturally occurs less frequently because it represents the final stage of attacking sequences. Nevertheless, it remains a critical indicator of offensive effectiveness due to its direct relationship with goal-scoring opportunities. Recent studies in CP Football have similarly reported that most match activities occur during the build-up phase, whereas high-intensity actions associated with finishing appear less frequently during match play (González et al., 2025).

In addition to the distribution of technical actions, the present findings also revealed a clear dominance of right-foot usage across most technical executions. This pattern was particularly evident in passing and ball control, where the majority of players relied more frequently on the right foot than the left. Limb dominance is a well established phenomenon in football and reflects the tendency of individuals to rely on the limb with superior motor control when performing technical skills (Clemente et al., 2021). In the context of Cerebral Palsy Football, such asymmetry may be further influenced by neuromuscular imbalances, which are commonly observed in individuals with cerebral palsy. Differences in muscle strength, coordination, and motor control between the right and left sides of the body may lead players to preferentially utilize the limb that provides greater movement stability during technical execution (Dom et al., 2023).

Overall, the findings of this study suggest that technical performance in CP Football matches is largely characterized by actions supporting ball retention and circulation, particularly through passing and ball control. This pattern emphasizes the importance of collective coordination in constructing attacking phases during match play. Furthermore, the observed dominance of a specific limb indicates technical adaptations related to the neuromuscular characteristics of athletes with cerebral palsy. Accordingly, training programs in CP Football should prioritize the development of ball distribution efficiency, ball control proficiency, and bilateral technical competence, thereby enhancing players' adaptability and technical effectiveness during competitive matches. These findings also suggest that technical performance is not only determined by players' abilities but is strongly influenced by match-specific contexts and opponent characteristics.

Conclusions

This study aimed to analyze the distribution and effectiveness of technical actions performed by players during CP Football matches using a notational analysis approach. The results showed that passing was the most dominant technical action with 984 actions (44.3%) and a 90.5% success rate, followed by ball control with 847 actions (38.1%) and an 89.0% success rate. In contrast, dribbling accounted for 271 actions (12.2%) with a 67.9% success rate, while shooting was the least frequent action with 123 actions (5.5%) and a 35.8% success rate. These findings indicate that match play was largely characterized by phases of ball

possession and circulation, whereas individual penetration and finalization actions occurred less frequently and with lower effectiveness.

In addition, the findings revealed a clear dominance of right-foot usage across most technical actions, particularly in passing and ball control. This pattern suggests the influence of limb dominance and neuromuscular asymmetry, which are commonly observed in athletes with cerebral palsy. Therefore, training programs in CP Football should emphasize the development of passing accuracy, ball control ability, and bilateral technical proficiency, enabling players to improve technical effectiveness and adaptability in competitive match situations.

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Conflict of interest

If the authors have any conflicts of interest to declare.

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