

Exploring Defensive Skill Execution in Netball using a Video-Based Checklist

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ABSTRACT

Limited informative feedback on defensive skill execution during real-game situations highlights the need for performance analysis to optimize netball performance. This study aimed to explore the defensive technical skills demonstrated during actual gameplay to gain a deeper understanding of player movements during the defensive phase. A Video-Based Checklist for Defensive Skills (V-bDSC) was developed and required both content verification and usability validation through the analysis of real-game footage. The V-bDSC was concurrently verified and validated by observing and analyzing defensive situations in a 5-minute recorded video of a regional-level netball match. The analysis resulted in the inclusion of seven additional specific defensive skill items in the checklist. The categorization of defensive skill execution into three action groups (Main Defence, Assist Defence 1 and Assist Defence 2) proved appropriate for capturing the complexity of defensive roles. During centre pass defence, Main Defence players predominantly executed the Double Defence skills while Assist Defence 1 players employed Inside and Outside Defensive skills. After the centre pass was completed, Main Defence players frequently applied Marking and Zoning techniques. In contrast, Assist Defence 1 players favoured Off-Ball Marking, Off-Ball Zone and Front Block as primary defensive responses. Although the analysis was limited to a 5-minute video segment, this study provides valuable insights and lays the groundwork for further investigation into defensive skill execution in competitive netball.

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Analysing Performance in Netball

Real-time performance analysis during netball matches has become a crucial source of feedback in the coaching process [1,2]. A variety of methods and tools are employed to analyse netball performance, including local positioning systems, video-based notational analysis system, microtechnology device and associated support systems. The rich data generated through these technologies during match play is essential not only for optimizing performance, monitoring training loads, mitigating injury risk, managing athlete fatigue but also for supporting decision-making during officiating [3-16].

Numerous investigations have been conducted to optimize performance in netball by analyzing various performance domains, ranging from physical fitness profiles and technical skills to tactical perspectives [4-8,10,17-19]. These studies have explored a variety of match-play situations, including centre pass scenarios, passing network, style of play and movement pattern, physical, physiological and positional movement demand, attacking sequences, and tactical behaviors. Several studies have also been conducted in Malaysia focusing on physical profiles and match analysis in netball [20-22]. However, most of these studies focus more on optimizing the attacking phase of gameplay rather than addressing the defensive phase in netball. Though less focus on defensive perspective, related information becomes essential

knowledge in conducting research related to defensive gameplay in netball.

Current research conducted by Coombe et al. on defensive tactical Behaviour indicates that turnovers are often initiated through coordinated movements among defenders [6]. This study emphasizes the importance of the collective movement of players such as defensive unity, dictate movement, delay and disrupt ball off-load may disrupt passing lanes and apply indirect pressure, which can lead to errors by opponents. Feedback from experienced coaches involved in this study noted that understanding tactical plays provides defenders with an advantage, allowing them to manipulate space and anticipate interceptions. Additionally, a study by Hodder et al., which utilized a local positioning system, suggests that defenders can restrict the spatial movement of opponents to limit passing options among their teammates [4]. Furthermore, within the shooting circle, it is recommended that defenders' group together to minimize space, effectively reducing both lateral (side-to-side) and vertical (front- to-back) movement. This approach tightens the space available and decreases the passing and movement options for attackers.

Defensive players play an important role right from the moment the attacking opponent makes a centre pass. According to a study by Pulling et. al., the chosen direction of turn of the receiving player after receiving a centre passing will influence the subsequent possession sequence [23]. Besides blocking attackers from running

or altering the running path to receive centre passes, another defender may create a disrupting, delaying, or disturbing game situation following this turning situation, as it can significantly break down the rhythm of the attack.

The above studies discussed the importance of collective movement in defending the team but provided limited explanation on the execution of individual technical skills. Understanding the execution of individual defending skills, such as marking, off-ball marking, interception, block, and securing defensive rebound, is essential. These skills, when executed with effective timing and situational awareness, can significantly impact an athlete's tactical abilities. While it is possible to develop and train both technical and tactical skills simultaneously, Bompa, & Buzzichelli, acknowledged that technical skills can influence an athlete's tactical capacity [24]. To effectively implement a defensive tactical plan, understanding the technical execution skills of defenders during gameplay is crucial. Therefore, exploring individual defensive technical skills execution in real game situations becomes valuable information in defending the team, even though analysing defensive skill execution is more complex due to the absence of direct ball control.

Methods

A descriptive study design was employed to explore the frequency and performance outcomes of defensive gameplay by a selected regional-level female netball team. Match footage was recorded using a digital camera positioned on the sideline, level with the centre circle, and elevated from the spectator seating area to capture a full view of the court. Defensive actions and outcomes were analysed using this video footage, which was originally recorded by the team's official and accessed retrospectively with permission for research purposes. The analysis focused on the execution of defensive skills by each team position rather than individual players. In cases where a player was injured or substituted during the match, data collection continued using the replacement player occupying the same position.

Research Procedures

This research consists of two stages. The first stage focuses on developing a video-based checklist for defensive skills. This involves reviewing existing literature on technical defensive variables, engaging in discussions with experienced coaches and players, and analysing video footage of defensive plays to gain insights into techniques used in real-game situations. A pilot study was conducted to evaluate the usability of the checklist by assessing the suitability of its items in relation to defensive movements through video observations of netball games.

In the second stage, the video-based defensive skills checklist is utilized to identify the most frequently executed defensive techniques observed during real-game scenarios. The collected data is then organized into tables to examine the characteristics of these defensive techniques and their effectiveness in preventing offensive players from advancing or scoring. Figure 1 presents the methodological framework of this study.

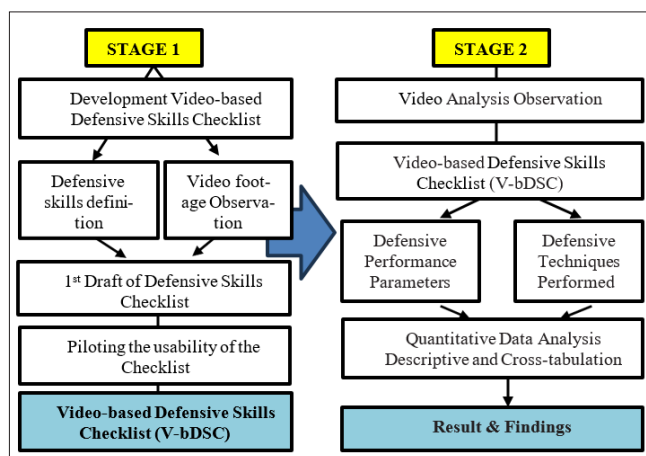


Figure 1: Stage of research related to defensive skills execution

Video Coding Process

When coding from the video, the coder was instructed to capture all possessions during the match and to ensure accuracy. The coder was allowed to play and pause the video to capture all events accurately. The coding for defensive skill execution is based on the definitions provided in Table 1, along with additional specific defensive skill execution derived from this video analysis [25,26].

The video analysis was conducted frame by frame, with a focus on tracking the movement of the ball. The technical skills of defensive players were observed and recorded on the Video-based Defensive Skills Checklist (V-BDSC) sheet based on their actions during the defending phase. The technical skill actions were categorized as follows:

1. **Main Defense Action:** The defender at a minimum distance of 3 feet (0.9 meters) from the landing foot of the opposition player who has the ball during the defending phase.
2. **Assist Defense 1:** The defenders positioned within a triangle movement formation around the ball, which is to be passed by the opponent within a 3- meter radius.
3. **Assist Defense 2:** The defenders positioned within a triangle movement formation around the ball, which is to be passed by the opponent beyond a 3- meter radius.

The 5-minute video footage of a regional-level competition match was analyzed by a national netball player who competes in the professional Malaysia Netball Super League (NSL). The player has extensive experience playing in the defensive position and has prior involvement in video analysis for performance evaluation, although the analysis was conducted manually. The technical skills were coded based on the defensive skills executed by each defensive position during match play as detailed in Table 1.

Table 1: Coded for Defensive Skills Execution

Defensive Skills Execution	Code	Descriptor
Marking	M	The defender is closely guarding a player who has possession of the ball
Off-ball marking	OBM	The defender is closely guarding a player who is not in possession of the ball
Intercept	IC	A defender gains possession by intercepting a pass from an opposing player.
Deflection	D	The defender touches a pass from an opposing player, changing the ball's direction, motion, or speed
Pick-up	PU	The defender picks up a ball that is loose
Forced error	FE	The defending team forces the opposition into making an error
Opposition error	OE	The offensive team makes an unforced error (e.g., break, held ball)
Unknown	UK	Situation is unable to be determined how the defending team gained possession
Defensive rebound	DR	The goalkeeper or goal defender rebounds the ball after a missed shot
Opposition contact	OC	The offensive team player infringes the defending team player resulting in a turnover, as determined by the umpire
Block	B	When a Goal Defence or Goalkeeper deflects a shot that prevents a goal

Source: Mackay, Jones, van Rensburg, Hall, Alexander, Atkinson, & Whitehead, (2023); Bruce, Dwyer, & Fox, (2022).

Statistical Analysis

Descriptive analyses were conducted to interpret the video analysis data. The frequency of each type of defensive skill performed by the Main Defense, Assist Defence 1 and Assist Defense 2 was recorded based on each playing position during a single match.

Results

Video-based Defensive Skills Checklist (V-BDSC)

The developed video-based checklist for defensive skills requires content verification and validation of its items and usability through analysis of real-game netball competition video footage. The Video-based Defensive Skills Checklist (V-BDSC) is used concurrently by observing and analyzing the defensive situation in netball competition. Basically, observation of three categories

on defensive technical skill actions (Main Defense Action, Assist Defense 1 and Assist Defense 2) is appropriate to be used in analyzing the technical skills executed by players during defensive situations.

Table 2: Specific types of defensive skills added in the V-bDSC

Defensive Skills Execution	Code	Descriptor
Inside Defensive	CPD1	Defender positioning herself between opponent and the goalpost
Outside Defensive	CPD2	Defender positioning herself on the outer side of opponent
Double Defend	CPD3 / DD	Two defenders marking or pressuring one opponent. (CPD3- during centre pass, DD- during general play)
Not Defensive	CPD4/ ND	When player NOT apply pressure, block or attempt to close space. (CPD4 – during centre pass, ND – during general play)
Off-ball Zone	OBZ	Actively defending a player by zoning the area
Front Block	FB	When a Goal Defence or Goalkeeper blocks in front of opponents
Back Block	BB	When a Goal Defence or Goalkeeper blocks behind of opponents

Furthermore, detailed observation of the defensive gameplay video footage revealed that additional information related to defensive skill items needed to be incorporated into the V-BDSC. There are seven specific types of defensive skills that were added to accommodate defensive skills demonstrated by players, beyond those described in Table 1. The V-BDSC with seven additional specific defensive skills execution was used for further analysis. Table 2 outlines the specific types of defensive skills that were added to the checklist.

Analysis of Performance Parameters and Defensive Technical Skills using Video-Based Defensive Skills Checklist (V-BDSC)

Approximately a 5-minute netball video footage has been analyzed focusing on the defensive situation. The analysis of defensive skills execution was conducted on both teams whenever a defensive situation occurred during the 5-minute gameplay.

Analysis of Performance Parameter

During this 5-minute gameplay, six centre passes were executed resulting in six goals including one turnover goal scored by the opposite team. The time taken from each center passes to a goal ranged between 10 to 58 seconds involving between 3 to 23 passes. Table 3 presents a summary of the 5-minute netball gameplay analysis.

Table 3: Performance parameters of the 5-minute netball gameplay analysis

Score	Center Pass		Duration (sec.)	Defensive Passes	Turnovers		NbA
	Team	Goal			Frequency		
Goal 1	A	Yes (PG)	17	3	No	-	-
Goal 2	B	Yes (PG)	38	3	No	-	-
Goal 3	A	No	30	7	Yes	1	Yes
Goal 4	B	Yes	11	3	No	-	
Goal 5	A	Yes	58	23	Yes	2	Yes
Goal 6	B	Yes	10	3	No	-	

*PG - Penalty Goal

*NbA – Netball Ace

Turnovers occurred at varied frequencies, with a maximum of two turnovers during the gameplay. In addition, the opposing team executed three effective centre pass-to- goal conversions (NBA) by efficiently controlling ball movement within three to four passes following a successful centre pass without losing possession. These NBA situations suggest that defensive skills were not effectively executed.

Analysis of Defensive Technical Skills

The frequency of defensive technical skills was analyzed based on player positioning during the game, categorized as Main Defense (the nearest player to the ball), Assist 1 (players within a 3-meter radius), and Assist 2 (players beyond a 3-meter radius from the ball). The analysis also distinguishes between two situations: the execution of defensive skills during the centre pass and after the centre pass has been executed. Table 4 presents the frequency of defensive skills executed during the opponent team’s centre pass.

Table 4: Defensive action of players during centre pass of opponent team

Defensive Skills		Main Defence Action	Assist Defence 1	Assist Defence 2
Inside Defensive	CPD1	-	17	2
Outside Defensive	CPD2	-	8	-
Double Defend	CPD3	6	-	-
Front Block	FB	-	-	1
Behind Block	BB	-	-	3
Off Ball Marking	OBM	-	-	1
Zone	Z	-	-	2
No Defence	ND	-	-	6

During centre pass execution, both Centers, acting as the Main Defense, selected Double Defend (n=6) as their defensive skill to limit the opponents’ movement. In addition, the Assist Defense 1 players, positioned behind the centre pass line, applied Inside Defense (n=17) and Outside Defense (n=8) to restrict their opponents’ movement. Meanwhile, Assist Defense 2 players executed a variety of defensive skills, however, No Defense (n=6) was the most frequently executed action among them.

After the centre pass has been executed, a variety of defensive skills were applied by players across all three defensive categories. The Main Defense Action group most frequently used Marking (n=19) and Zone (n=13) to apply pressure on opponents and influence their decision-making when passing the ball. In contrast, the Assist Defense 1 primarily selected Off Ball Marking (n=68), Off Ball Zone (n=18), and Front Block (n=17) to restrict their opponents, close space and put pressure on ball receivers. Meanwhile, the Assist Defense 2 contributed by using Off Ball Marking (n=16), however this group showed a preference for No Defense (n=83). Table 5 present the other defensive skills executed by the players.

Table 5: Defensive Action of Players After Centre Pass is Executed

Defensive Skills		Main Defence Action	Assist Defence 1	Assist Defence 2
Intercept	IC	-	1	-
Front Block	FB	-	17	-
Behind Block	BB	-	7	2
Off Ball Marking	OBM	1	74	16
Off Ball Zone	OBZ	1	18	4
Zone	Z	13	11	6
Double Defend	DD	1	-	-

Marking	M	23	-	-
Deflection	D	1	1	2
No Defence	ND	4	17	83

Discussion

This study serves as an explorative investigation into the defensive technical skills executed by netball players while defending their court and preventing goals. Based on the analysis of recorded gameplay footage, the Video-Based Defensive Skills Checklist (V-BDSC) was developed as a tool to identify defensive skills during match play. By applying the V-BDSC in video analysis, seven additional specific defensive skills were identified, supplementing those previously reported by Mackay et al. and Bruce et al. [25,26].

In netball, a defensive situation arises when the team is not in possession of the ball. Therefore, categorizing defensive technical skill actions based on three positional roles-Main Defense, Assist Defense 1, and Assist Defense 2-as provided in V- BDSC, is appropriate for understanding how players defend throughout gameplay. The V-BDSC can be applied to analyses defensive skills across both teams during any defensive situation in a match.

Although only 5-minutes of gameplay footage were analyzed, the study yielded significant insights into defensive technical skills. Analysis of performance parameters from centre passes to goal attempts showed that the defending team was able to force turnovers through interceptions, marking, pressuring opponents into errors, or delaying ball movement. However, the opposing team successfully achieved ‘netball ace’ (NBA) sequences-scoring goals within three or four passes following a centre pass without losing possession-demonstrating their tactical efficiency and sharp execution.

This highlights the need for defending teams to carefully examine the elements that contribute to an opponent’s success in achieving NBA. By understanding these patterns, defenders can better disrupt the attacking flow and delay passes toward goal. Scrutinizing the attacking tactics during the opponent’s centre pass provides an opportunity for defenders to implement pre-planned strategies, as this is a relatively predictable (closed skill) situation.

However, once the centre pass is completed, collective defensive efforts particularly between Main Defense and Assist Defense 1-become critical to preventing goals. The results showed that Marking, Off-Ball Marking, and Off-Ball Zone were the most frequently executed defensive skills among these groups. The execution of these defensive skills is essential in netball gameplay [4,27]. Thus, enhancing tactical cohesion and improving the efficiency of collaborative defensive actions across these roles will likely strengthen the overall defensive performance of the team.

Conclusion

In conclusion, a detailed understanding of technical skills in defensive situations is essential, as defensive actions involve complex movements and decision-making processes for players. The developed checklist has provided valuable insights into the execution of defensive skills. Along with ongoing refinement, coaches and elite players can provide feedback that will further enhance the effectiveness and practical application of the checklist.

This study also identified additional specific defensive skills that emerged during the analysis of real gameplay, contributing to a more comprehensive understanding of defensive performance.

Pre-planned defensive techniques, both in terms of skill execution and tactical intent, can be effectively trained and implemented during centre pass defense. While players can perform a variety of defensive skills during a game, certain techniques appear to be more frequently applied than others. In addition, future research that analyses matches across different levels of netball competition may offer deeper insights into the technical and tactical preferences for defensive skill selection.

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