



# Scanning Differences between Small-Sided and Full-Sized Games in Elite Youth Footballers

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**Abstract:** The aim of this study was to compare the scanning activity of elite youth footballers across 7v7, 9v9 and 11v11 game formats. The participants were outfield under 12 footballers (N = 60) born between 1st September 2011 and 31st August 2012 from a Premier League category 1 football academy in the UK. Observational analysis on scan frequency as well as critical scan frequency, the scan situation, the play type and technical action outcomes from the scan were all undertaken. As game formats decreased in player number and pitch size, scanning activity increased. Positional, situational and technical action scanning differences were found between game formats. The most meaningful differences in scan activity across game formats were highlighted during defensive actions and between positions. This study is the first known to explore scanning differences between small-sided and full-sized games, with results suggesting small-sided games may not replicate the scanning situations found in full-sized games. Until further research is conducted, coaches should be aware that small-sided games may influence skill transfer.

**Keywords:** Visual Perception, Practice, Training, Development, Skill Acquisition, Ecological Dynamics

## 1. Introduction

Over recent years, small-sided games (SSG) have become an attractive option for player development in football (soccer) because they increase technical actions. Technical actions are the fundamental movements and skills executed by players to interact with the football and influence play (e.g., passing, dribbling, tackling) and are a central measure of player and team performance (Hughes & Franks, 2004). SSG in football are modified game formats played on smaller pitches with less players than full-sized games (FSG), which aim to represent the fundamental demands of the sport while increasing efficiency of training through higher technical skill and tactical decision-making interactions (Sarmiento *et al.*, 2018). Sgrò *et al.* (2018) reported players in SSG to have enhanced opportunities to engage in more possession-based actions (e.g., passing, dribbling and shooting), but less out of possession actions (e.g., blocks and interceptions). In the Clemente *et al.* (2020a) review of SSG, technical actions (e.g., passes, receptions, involvements, and dribbles) increased when game formats reduced in player number and pitch size.

Increased possession based technical actions are seen with reduced players regardless of pitch size differences, suggesting player number being the more impactful variation in SSG (Aslan, 2013). Despite observing increased technical actions when player numbers reduce, the difference between SSG formats at lower player numbers (e.g., 3v3 compared to 6v6) can be modest, suggesting closer relationships in technical actions between SSG formats than between SSG and FSG (Clemente *et al.*, 2019). However, as SSG player numbers increase (e.g., from 5v5 to 8v8), greater changes in technical actions become apparent (García-Angulo *et al.*, 2020). In direct comparisons between SSG (e.g., 4v4) and FSG, the higher interactions between players in SSG have been found to produce more duels and turn overs in possession, which create less success in some technical actions, such as passing, suggesting different situations may exist in the execution of technical actions within SSG and FSG (Dellal *et al.*, 2012). However, with clearly identified increases in technical action opportunities, SSG may benefit developing footballers through exposing players to higher frequencies of the

fundamental technical actions required in FSG (Teoldo da Costa & de Freitas Silvino, 2023).

The physiological impact of SSG have also been examined. As player numbers and pitch sizes reduce, exercise intensity increases with a decrease on movement distances (Hill-Haas *et al.*, 2011). When SSG are manipulated to decrease player number but increase pitch size, internal (e.g., heart rates, rates of perceived exertion) and external (e.g., total distance, high speed running) loads have been reported to increase without variations to high intensity movement, number of passes, or dribbles (Clemente *et al.*, 2023). Thus, SSG can produce an intensity 'overload' to enhance the physiological characteristics of footballers, but the types of movements and perceptual activities can be different to those experienced in FSG with further variations also existing between player positions and additional coaching methods applied (Beato *et al.*, 2023).

With the advantages of increased technical actions and physiological load in SSG, manipulations have been proposed to develop training activities that further mimic FSG (Clemente *et al.*, 2020b). However, one aspect of FSG replication utilizing SSG that has received no previous research attention is the scanning differences between the formats. While prior studies have extensively examined the technical and physiological effects of SSG, scanning has been largely overlooked due to a predominant focus on in-possession actions rather than the cognitive-perceptual demands of the game. This oversight likely arises from the focus on physical and technical metrics, which are not only easily measurable but also strongly correlated with key performance indicators in soccer, leaving perceptual skills like scanning underexplored. Scanning is visual field searching to identify relevant objects and defined in football as "a player's active head movement where the face (and hence, the eyes) is temporarily directed away from the ball, with the assumed intention of gathering information about teammates and/or opponents, to prepare for subsequently engaging with the ball" (Jordet *et al.*, 2020). Scanning ability can impact skill execution and decision making, with higher level players displaying higher scanning frequencies (scans per second) to provide richer spatiotemporal information (Aksum *et al.*, 2021a). As scanning collects information regarding teammate, opposition and ball location within the boundaries of the pitch, scanning in SSG may cause different search strategies compared in FSG.

A recent study by Hintermann *et al.* (2024) identified scanning differences between U19 elite and grassroots female footballers in 4v4 SSG but did not compare scanning activity across game formats. Similar to previous research, elite players were found to perform more scans prior to first ball contact. Interestingly, there was no difference in scanning frequency during ball possession, which aligns with previous research investigating scanning performance indicators (Pokolm *et al.*, 2022). Thus, it is important to understand if reduced player numbers and pitch sizes can impact scanning activity compared to FSG. There may also be positional differences. Central midfield players have been reported to have the highest scanning frequency in FSG due to their high involvement in game play as they often operate away from pitch boundaries (i.e., can be impacted from all directions) (Aksum *et al.*, 2021b). Whereas players in wider positions near pitch boundaries in FSG undertake less scanning (Jordet *et al.*, 2020). Scanning frequencies in and out of possession have been found to be comparable between players, with less scanning being undertaken during transitional play when attention is focused on the ball (McGuckian *et al.*, 2020). With technical action differences between SSG and FSG, such as less transitions due to decreased interceptions (Sgrò *et al.*, 2018), it is unclear whether scanning out of possession might be appropriately replicated in SSG.

Within youth development, scanning ability is a crucial element of player performance and progression (Ford & Whelan, 2016). For example, successful passing is based on the ability of a player to scan and locate space when they do not have the ball, which decreases opponent pressure when the ball is received, and then locate teammate and opponent positions to complete the passing action (Pokolm, 2021). Because scanning is a fundamental part of technical actions and decision-making (Seifert *et al.*, 2018), scanning ability is appropriately coupled with all skill learning and practice within the training environment. If practice and training design do not appropriately develop scanning ability for full sized competitive games, player performance and development will be impacted (Smith & Bedwell, 2021). Therefore, despite an overall positive stance towards using SSG to promote player development, scanning ability may be adversely affected. There is currently no known research that has explored the scanning differences between game formats that differ in player number and pitch size. To explore whether scanning differences exists between SSG and FSG, the aim of this study was to compare the scanning activity

of elite youth footballers across 7v7, 9v9 and 11v11 game formats. It is hypothesized that scanning frequency and search strategies will differ across game formats, with reduced player numbers and pitch sizes in SSG leading to altered scanning behavior compared to FSG

## 2. Method

### 2.1. Participants

The participants were outfield under 12 footballers (N = 60) born between 1st September 2011 and 31st August 2012 from a category 1 football academy in the UK. The academy was part of an English Premier League Football Club. Player nationalities were British (N=58), Nigerian (N=1) and Russian (N=1). Parental permission was given for their child to be video recorded by the club and for their child to be involved in subsequent data analysis.

### 2.2. Data Collection

Data were collected from 15 U12 matches played across 7v7 (5 matches), 9v9 (5 matches), and 11v11 (5 matches) game formats. Pitch dimensions for the formats were 60x40 yards for 7vs7, 80x50 yards for 9vs9 and 90x60 yards for 11vs11. Permission was gained from opposition teams for matches to be recorded and analysed. Matches were manually recorded by a member of the performance analysis staff on a fixed 4k internet protocol camera approximately 30 metres in height at the halfway line. To ensure comparability across all game formats, only the first 20-minutes of each recorded match was analysed. Natural stoppages in play (e.g., ball going out of play) were included within the 20-minute recording with injury stoppages excluded. Video recordings were imported into Dartfish Version 2024 to tag scanning variables.

### 2.3. Variables

Scanning was defined as a self-initiated head movement in which the player's face is temporarily directed away from the ball, presumably to look for teammates, opponents, the referee, or space (Jordet, 2005). A critical scan was a scan undertaken "within the time span of a teammate passing the ball until its reception" (Pelzl, 2024). Each scan was tagged with a possession situation (scan situation), which included whether the ball was possessed by the participant's team or the opposition team when the scan took place.

Scans during the participant's team possessing the ball were recorded as either receiving the ball within 10 seconds of the scan (In Possession Ball Received) or after (In Possession Ball Not Received). All scans were recorded as being performed in or out of play. Out of play was defined by the ball having wholly crossed a pitch boundary line, whether the ball was on the ground or in the air, or if play was stopped by the referee. The final variable recorded was the technical action outcome. Not all scans were tagged with a technical action outcome because scans were conducted without receiving the ball. Scans that led to a technical action were recorded as a participant retaining possession (Retained Ball Possession) or losing ball possession. Three categories for losing ball possession were used, which were based on a participant successfully receiving the ball but then losing possession following subsequent actions, such as dribbling or passing (Lost Possession after Successful Ball Collection), unsuccessfully controlling the ball and losing possession (Lost Possession after Unsuccessful Ball Collection), and the ball not reaching the participant due to an interception or poor pass from a teammate (Lost Possession Ball not Received).

### 2.4. Data Analysis

Descriptive statistics were used to analyse the data. Absolute values were calculated for all scan variables, which included total scans, critical scans, play type, scan situation and technical action outcomes. Scans per second were calculated by dividing the total scans by the total time of all applicable games. For example, total time in seconds for all players across all positions for each game format was 18000 seconds and for position specific analysis, total time was 6000 seconds. Where data was representative of all scans (Scan Situation and In and Out of Play Scans), a percentage of total scans was calculated. Each technical action outcome was calculated as a percentage of the total technical actions recorded. Finally, scans per technical actions were calculated by dividing scans performed before receiving the ball (Team Possession Ball Received) by total technical actions. Interrater reliability was determined using Cohen's kappa. Two raters (the second named author, who undertook all observations, and the lead author) performed scan observations across 60 1-minute time periods. A total of 623 scans (10.5% of total scans) were analysed with one rater identifying 313 scans and the other 310 scans within

the analysed time periods. Level of agreement was deemed to be substantial ( $k = 0.793$ ,  $p < 0.001$ ).

### 3. Results

All participants performed more scans in game formats containing less players and smaller pitch sizes (see table 1). Central Midfield players (CM) performed most scans across all formats (see Figure 1). In the 7v7 game format, participants undertook a total of 2828 scans, which reduced by 34.7% to 1846 in the 9v9 format and by 54.4% to 1289 in 11v11 games. Position specific total scan analysis can be found in tables 2-5. CM recorded the greatest variation with a decrease of 59.3% from 7v7 to 11v11 with Wide Players (WP) having the closest relationship with 9v9 (50.5%) and 11v11 (53.8%) when compared to 7v7. Critical scans reduced as game formats increased in player number, with 9v9 and 11v11 formats creating 53.6% and 69.1% less critical scans respectively. Critical scan frequency differences between the 7v7 format and 9v9 and 11v11 were most pronounced for Central Defenders (CD) and then WP, with less variations for CM and Centre Forwards (CF).

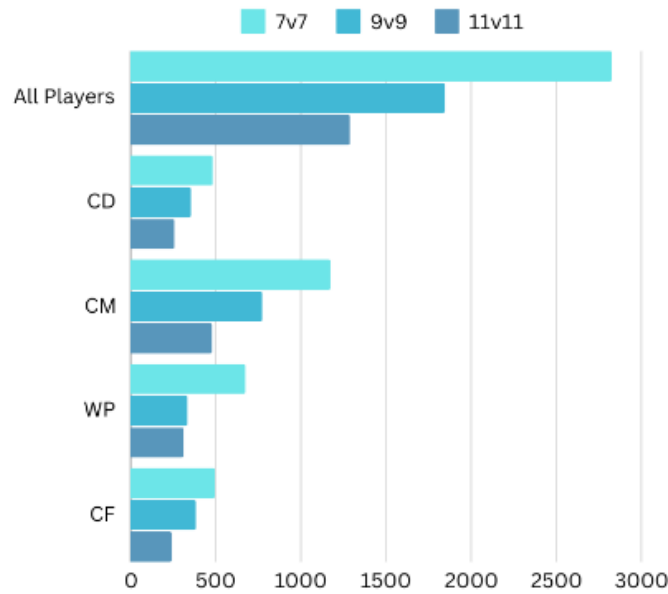
Scans during team possession for all participants, whether receiving the ball or not, decreased as player numbers increased, with most scans being undertaken without receiving the ball.

Position specific analysis showed WP to have less variation between 9v9 and 11v11 formats, with scans during team possession and receiving the ball being the only frequency that increased in 11v11 compared to 9v9. Although total opposition possession scans for all participants decreased as game formats increased in size, opposition possession scans as a percentage of total scans increased, with the exception of WP where 9v9 was higher than 11v11. CD recorded the highest opposition possession scans as a percentage of total scans in 11v11 (56.6%) and CF reported the smallest range between game formats for scans during opposition possession (32-35%).

All participants undertook more scans when the ball was in play compared to out of play across all game formats. As a percentage of total scans, in play and out of play data across positions varied. Technical actions were higher in game formats with less players. Scans per technical action across all positions showed participants in the 7v7 format undertook less scanning when they performed a technical action compared to 9v9 and 11v11 where there was little difference. CD engaged in more technical actions per scan than any other position across all game formats. As a percentage of total technical actions, technical action outcomes varied across all positions and game formats.

**Table 1.** Scanning activity across all participants

	<b>7v7</b>	<b>9v9</b>	<b>11v11</b>
Participants	20	20	20
Total Scans	2828	1846	1289
Scans per Second	0.16	0.1	0.07
Critical Scans	97	45	30
<b>Scan Situation</b>			
Team Possession Ball Received	538 (19%)	234 (13%)	155 (12%)
Team Possession Ball Not Received	1386 (49%)	836 (45%)	513 (40%)
Opposition Possession	904 (32%)	776 (42%)	621 (48%)
<b>Play Type Scans</b>			
Ball In Play Scans	1753 (62%)	1170 (63%)	771 (60%)
Ball Out of Play Scans	1075 (38%)	676 (37%)	518 (40%)
<b>Technical Action Outcomes</b>			
Total Technical Actions	769	282	173
Scans per Technical Action	0.70	0.83	0.90
Retained Ball Possession	534 (70%)	152 (54%)	112 (65%)
Lost Possession after Successful Ball Collection	210 (27%)	91 (32%)	32 (18%)
Lost Possession after Unsuccessful Ball Collection	16 (2%)	29 (10%)	15 (9%)
Lost Possession Ball Not Received	9 (1%)	10 (4%)	14 (8%)



**Figure 1.** Total scans across game formats for different positions (CD = Central Defenders; CM = Central Midfielders; WP = Wide Player; CF = Centre Forward).

**Table 2.** Scanning activity of Central Defender position

<b>Central Defenders</b>	<b>7v7</b>	<b>9v9</b>	<b>11v11</b>
Participants	5	5	5
Total Scans	483	354	258
Scans per Second	0.08	0.06	0.04
Critical Scans	50	18	9
<b>Scan Situation</b>			
Team Possession Ball Received	151 (31%)	78 (22%)	42 (16%)
Team Possession Ball Not Received	168 (35%)	123 (35%)	70 (27%)
Opposition Possession	164 (34%)	153 (43%)	146 (57%)
<b>Play Type Scans</b>			
Ball In Play Scans	269 (56%)	239 (68%)	147 (57%)
Ball Out of Play Scans	214 (44%)	115 (32%)	111 (43%)
<b>Technical Action Outcomes</b>			
Total Technical Actions	182	89	47
Scans per Technical Action	0.83	0.88	0.89
Retained Ball Possession	133 (73%)	58 (65%)	38 (81%)
Lost Possession after Successful Ball Collection	49 (27%)	27 (30%)	9 (19%)
Lost Possession after Unsuccessful Ball Collection	0 (0%)	4 (5%)	0 (0%)
Lost Possession Ball Not Received	0 (0%)	0 (0%)	0 (0%)

**Table 3.** Scanning activity of Central Midfielder position

<b>Central Midfielders</b>	<b>7v7</b>	<b>9v9</b>	<b>11v11</b>
Participants	5	5	5
Total Scans	1174	774	478
Scans per Second	0.20	0.13	0.08
Critical Scans	14	12	10
<b>Scan Situation</b>			
Team Possession Ball Received	159 (13%)	98 (13%)	61 (13%)
Team Possession Ball Not Received	677 (58%)	359 (46%)	180 (38%)
Opposition Possession	338 (29%)	317 (41%)	237 (49%)
<b>Play Type Scans</b>			
Ball In Play Scans	799 (68%)	521 (67%)	299 (63%)
Ball Out of Play Scans	375 (32%)	253 (33%)	179 (37%)
<b>Technical Action Outcomes</b>			
Total Technical Actions	283	118	68
Scans per Technical Action	0.56	0.83	0.90
Retained Ball Possession	205 (72%)	71 (60%)	50 (73%)
Lost Possession after Successful Ball Collection	76 (27%)	30 (25%)	14 (21%)
Lost Possession after Unsuccessful Ball Collection	2 (1%)	15 (13%)	0 (0.0%)
Lost Possession Ball Not Received	0 (0%)	2 (2%)	4 (6%)

**Table 4.** Scanning activity of Wide Player position

<b>Wide Player</b>	<b>7v7</b>	<b>9v9</b>	<b>11v11</b>
Participants	5	5	5
Total Scans	675	334	312
Scans per Second	0.11	0.06	0.05
Critical Scans	24	6	7
<b>Scan Situation</b>			
Team Possession Ball Received	145 (22%)	21 (6%)	25 (8%)
Team Possession Ball Not Received	286 (42%)	135 (41%)	133 (43%)
Opposition Possession	244 (36%)	178 (53%)	154 (49%)
<b>Play Type Scans</b>			
Ball In Play Scans	405 (60%)	176 (53%)	200 (64%)
Ball Out of Play Scans	270 (40%)	158 (47%)	112 (36%)
<b>Technical Action Outcomes</b>			
Total Technical Actions	195	26	28
Scans per Technical Action	0.74	0.81	0.89
Retained Ball Possession	136 (70%)	9 (34%)	13 (47%)
Lost Possession after Successful Ball Collection	48 (25%)	13 (50%)	2 (7%)
Lost Possession after Unsuccessful Ball Collection	3 (1%)	1 (4%)	9 (32%)
Lost Possession Ball Not Received	8 (4%)	3 (12%)	4 (14%)

**Table 5.** Scanning activity of Centre Forward position

<b>Centre Forward</b>	<b>7v7</b>	<b>9v9</b>	<b>11v11</b>
Participants	5	5	5
Total Scans	496	384	241
Scans per Second	0.08	0.06	0.04
Critical Scans	9	9	4
<b>Scan Situation</b>			
Team Possession Ball Received	83 (17%)	37 (10%)	27 (11%)
Team Possession Ball Not Received	255 (51%)	219 (57%)	130 (54%)
Opposition Possession	158 (32%)	128 (33%)	84 (35%)
<b>Play Type Scans</b>			
Ball In Play Scans	280 (57%)	234 (61%)	125 (52%)
Ball Out of Play Scans	216 (43%)	150 (39%)	116 (48%)
<b>Technical Action Outcomes</b>			
Total Technical Actions	109	49	30
Scans per Technical Action	0.76	0.76	0.90
Retained Ball Possession	60 (55%)	14 (29%)	11 (37%)
Lost Possession after Successful Ball Collection	37 (34%)	21 (43%)	7 (23%)
Lost Possession after Unsuccessful Ball Collection	11 (10%)	9 (18%)	6 (20%)
Lost Possession Ball Not Received	1 (1%)	5 (10%)	6 (20%)

#### 4. Discussion

The aim of this research was to compare the scanning activity of elite youth footballers across 7v7, 9v9 and 11v11 game formats. This is the first known study to assess scanning activity across different game formats where player numbers and pitch sizes differed. The current study reports scanning frequency to markedly increase as game formats become smaller. As technical actions also increased as game formats got smaller, the increased scanning activity could be due to the increase in technical action involvements (Jordet *et al.*, 2020). Higher rates of retained possession were also seen in 7v7 game formats, which suggests greater technical action success. Previous research has shown technical actions to increase when player numbers are reduced, which could explain the reason for higher scanning activity in smaller sided games. For example, Aslan (2013) reported mean ball possessions to increase in a 5v5 game format when compared to 7v7 in both small and large pitch sizes. However, despite the increase, the mean change in ball possessions was modest between formats on both small (45.0 to 47.4) and large (40.5 – 43.5) pitch sizes. Modest differences between the technical

actions in youth players who undertook 3v3 and 6v6 formats was also cited by Clemente *et al.* (2019). Current study results showed a far greater difference in technical actions between game formats.

An evaluation of under-12 male players by García-Angulo *et al.* (2020) showed 5v5 formats provided more technical actions than 8v8 game formats across all areas measured (e.g., passing, tackles, clearances). The greatest technical action divergence between 8v8 and 5v5 was seen in throw ins where the 8v8 format only produced 49% of thrown ins reported in the 5v5 format, likely due to the smaller pitch size and the ball leaving the field of play more often. The smallest divergence was found in tackles, with the 8v8 format producing 93% of the tackles found in 5v5. Comparatively, the current study reported large differences between technical actions across game formats, with 9v9 and 11v11 providing 37% and 22% of technical actions recorded in 7v7, respectively. Technical action differences could be due to the current study evaluating higher player numbers and pitch sizes (i.e., 9v9 and 11v11), which may not be comparable to research assessing smaller sided games (i.e., 5v5 or 8v8). However, technical actions

increased disproportionately between game formats when compared to total scans, with scan frequencies increasing by 219% from 11v11 to 7v7 and 153% from 9v9 to 7v7 compared to an increase of total technical actions of 445% from 11v11 to 7v7 and 273% from 9v9 to 7v7. Therefore, results suggest scanning activity may not hold a relationship with technical actions.

Scans per technical action were lower in 7v7 (0.70) compared to 9v9 (0.83) and 11v11 (0.09) across all positions, indicating less scanning was undertaken in the smaller sided format when performing technical actions. As scans per technical action increased as game formats increased in size, perhaps SSG closer in player number and pitch size to FSG may better represent FSG scanning requirements. When less scanning activity is undertaken during a technical action, players receive less perceptual information from the environment, which may harm successful skill execution and decision making. Learning and developing skills without the full perceptual information that represents the skill in full sized games can impact the coupling between perception and action (Woods *et al.*, 2020). Skill adaptation is shaped by the information available within the practice environment (Davids *et al.*, 2013). If players consistently train in conditions where scanning demands are reduced, they may develop entrenched perceptual-motor patterns that are ineffective in FSG, leading to difficulties in adapting to the increased spatial and tactical complexities of larger formats (Davids *et al.*, 2012). Consequently, this could create maladaptive scanning behaviors where players fail to engage in adequate exploratory activity, limiting their ability to anticipate and respond effectively to in-game situations. Thus, despite the advantage of more technical actions in SSG, scanning activity seems to be different from FSG and may not fully represent FSG scanning requirements.

Total critical scans increased as game formats reduced, which might suggest better performance with the ball was experienced by participants (McGuckian *et al.*, 2018). However, critical scans as a percentage of total technical actions, found the 7v7 (13%) format provided less critical scans per technical action compared to 9v9 (16%) and 11v11 (17%), suggesting that despite the absolute total increase, critical scanning in SSG is reduced, which supports the decrease in scans per technical action outcome reported in the current study. Explanations for a reduction in critical scans per technical action could be

due to the player to pitch size ratios with larger pitches (e.g., FSG) allowing for more time and space to undertake scanning before receiving the ball (Oh & Joo, 2018).

Due to scanning data being collected continuously during match play, an assessment of in play and out of play scanning activity as a percentage of total scans could be performed, which revealed minimal differences between game formats across all participants. More in play scans were conducted across all formats, which is in line with previous research (e.g., McGuckian *et al.*, 2020). Position-specific in play scans as a percentage of total scans varied and did not hold a relationship between game formats. Although total in play scans increased as game formats reduced in player number, WP undertook more in-play scans in 11v11 than 9v9. Scan situations, when analyzed as a percentage of total scans, showed team possession scanning to increase as player numbers reduced, with opposition possession scanning decreasing. Less scanning undertaken in 7v7 during opposition possession suggests players may be attentionally fixed on the ball when recovering to defensive positions as there are less players on the pitch to be detected.

Ball recovery is a vital component when defending and launching attacks in football, and with less opposition players on the pitch, players in 7v7 may not need to undertake the further scanning required to gather visual information on opposition player locations as they would in FSG and be attentional driven towards the ball (Barreira *et al.*, 2014). Interestingly, SSG have been found to provide players with less defensive actions, such as blocks and interceptions when compared to FSG (Sgrò *et al.*, 2018), which strengthens an argument for SSG not fulfilling the opposition possession scanning activity required for FSG. Positions that require more defensive actions, such as CD (23%), WP (13%) and CM (20%), displayed greater differences between opposition possession scanning as a percentage of all scans between 7v7 and 11v11 game formats compared to CF (3%). Thus, results suggest that SSG may alter the defensive scanning activity required in FSG as less scanning is undertaken when players are engaged in defensive actions during SSG.

Further positional differences in scan situations were evident, especially with WP. All positions exhibited linear increases in absolute totals for both team and opposition possession scan situations as game formats reduced in size, except for the WP position. WP undertook most opposition possession

scans and team possession scans without receiving the ball during the 9v9 game format rather than 11v11, highlighting WP as a position where scanning activity varies the most across game formats. The likely reason for WP differences is that less scanning activity is undertaken in wide areas of the pitch near the boundary (Jordet *et al.*, 2020). Interestingly, as a percentage of total scans, CM had the same results for team possession scans and receiving the ball across all game formats (13%), suggesting the 7v7 and 9v9 formats may represent the same situation as 11v11 for CM players who receive the ball from a teammate. Aksum *et al.* (2021b) found CM players to observe, for example, no more than two teammates and three opponents during scanning, which suggests SSG of 7v7 may be appropriate to replicate the in possession scanning activity of FSG for CM. Thus, there exists contextual differences between positions that should be considered when using SSG to replicate scanning activity that is representative of FSG.

## 5. Future Research, Practical Implications and Conclusion

This study reveals that while SSGs boost technical actions, they may not accurately reflect the scanning demands of FSG, potentially leading to maladaptive behaviors. This is because scanning frequency increased in SSGs with fewer players and smaller pitches, even though scans per technical action decreased. This disparity might be attributed to the reduced space and player interactions in SSGs, which may not require the comprehensive visual search necessary in FSG. Replication of FSG scanning in SSG may be appropriate for some positions and actions (e.g., CM receiving the ball) but because positional differences have been reported in the current study, future research should evaluate positional differences further. As the CM displayed comparable team possession scanning activity across game formats, it may be appropriate to rotate developing players into that position. The current study highlights potential defensive scanning activity differences, which should be a focus for future research. The current study assessed elite under-12 male players in 7v7 and 9v9 SSG, and future research should explore scanning activity across smaller SSG (e.g., 3v3 to 6v6 and pitch size variations) and whether age, gender and competition standard differences exist. There may exist a player to pitch size ratio for SSG that better represents the scanning activity of FSG. Consequently, until further research is undertaken, coaches should

acknowledge that SSGs may not fully prepare players for the perceptual complexities of FSG, which may impact skill acquisition and development in youth players.

Given the differences observed between SSGs and FSGs in terms of scanning behaviors, coaches could consider the following strategies to better prepare players for the demands of full-sided games:

- **Adjust Scanning Focus:** While smaller formats increase scanning frequency, the quality (critical scans) is lower. Coaches should integrate drills focusing on quality scanning—tracking opposition and identifying key tactical cues—especially in 7v7.
- **Position-Specific Training:** Tailor scanning drills for specific positions. Wide players should focus on scanning in wider areas, while defenders and midfielders should prioritize team and opposition possession awareness.
- **7v7 for Central Midfielders:** 7v7 formats may be ideal for central midfielders to replicate the in-possession scanning required in full games, especially for receiving and managing possession.
- **Increase Defensive Scanning in Small-Sided Games:** Since defensive scanning drops in 7v7, add drills that require scanning for opposition movements to improve defensive awareness and ball recovery.
- **Use Zoned Areas for Match Simulation:** Coaches should design drills in specific pitch zones (e.g., defensive or attacking thirds) to replicate match-like scanning and decision-making while keeping pitch size and player numbers consistent. This targets specific game demands without the complexity of full-match conditions.

By integrating these strategies into training programs, coaches can better prepare players for the perceptual and decision-making challenges posed by full-sided games, ensuring a more seamless transition from small-sided to full-game formats. This approach will also help mitigate the risk of maladaptive scanning behaviors and support optimal skill acquisition for young players.

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### Author Contribution Statement

The lead author devised the study and undertook the write up. The second author analyzed the data.

### Ethics Approval Statement

The study was approved by the Institutional Review Board (IRB).

### Informed Consent

The consent form was signed before the commencement of the study.

### Conflict of Interest

The authors declare that there was no conflict of interest.

### Does this article pass screening for similarity?

Yes

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