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Designing small-sided games for training tactical aspects in soccer: Extrapolating pitch sizes from full-size professional matches

Abstract

The aims of this study were to examine the 1) individual playing area, 2) length and width of the rectangle encompassing the individual playing area and 3) distance between the goalkeepers and their nearest team-mates during professional soccer matches and compare these to previously reported pitch sizes for small-sided games (SSGs). Data were collected from four Spanish La Liga matches of the 2002-03 season, notated post-event using the Amisco® system. The pitch sizes obtained from real matches were smaller and different from those used previously for SSGs. In addition, the current pitch sizes show significant ($P<0.001$) effect of ball location in all variables examined. For example, overall individual playing area ($F [5, 2562]=19.99$, $P<0.001$, $\eta 2=0.04$) varied significantly across six different zones of the pitch. Based on these empirical results, pitch sizes with individual playing areas ranging from 65 m^2 to 110 m^2 and length to width ratio of 1:1 and 1:1.3 are generally recommended for training tactical aspects according to different phases of play. It is possible to design SSGs with a more valid representation of the tactical conditions experienced in full-size matches and their use may improve the training effect of tactical aspects of match performance in soccer.

Keywords: individual playing area, goalkeeper, match analysis, playing tactics, training effect.

Introduction

Small-sided games (SSGs) are a popular training method implemented in soccer at all ages and levels of play throughout the world and form the basis of many soccer development programmes. SSGs represent modified games played on reduced pitch areas, often using adapted rules and involving a smaller number of players than full-size soccer matches (Hill-Haas, Dawson, Impellizzeri, & Coutts, 2011). Reilly (2005) highlighted the value of exercising with the ball, particularly through activity drills in small groups and suggested that preparation for competition is optimised when technical, tactical and physiological requirements are integrated into the planning cycles. SSGs are therefore widely considered to be a suitable tool as physical performance, technical skills and tactical awareness can be developed concurrently.

SSGs were originally used for developing technical and tactical abilities (Rampinini et al., 2007). However, recent studies have primarily focused on demonstrating the suitability of SSGs for physical conditioning (e.g., Hill-Haas, Dawson, Coutts, & Roswell, 2009; Hoff, Wisloff, Engen, Kemi, & Helgerud, 2002) and on analysing the impact of changes in different variables such as pitch size, player number, coach encouragement on physiological responses (e.g., Hill-Haas, Coutts, Rowsell, & Dawson, 2008; Jones & Drust, 2007; Casamichana & Castellano, 2010) as well as on technical requirements (e.g., Kelly & Drust, 2009; Katis & Kellis, 2009). Hence, there is a lack of studies that focus~~es~~ on the tactical aspects of SSGs.

The spatial-temporal demands of the game should become more exigent as the individual playing area decreases as it indicates less time and space for the player to act in a specific playing situation. The relationship between space and time during soccer matches reflects the constant adaptation to constraints due to the confrontation between two opposing teams (Grehaigne, Bouthier, & David, 1997). Since individual playing

area can be considered as a tactical factor that may influence players' decision-making while playing soccer, it should be considered when designing SSGs for tactical conditioning. Further, individual playing area is expected to vary according to the location of the ball on the pitch. This is because different configurations of play which emerge from the continuous interplay of play and counter play produced by the two opposing teams present different spatial-temporal demands specific to pitch location (Grehaigne et al., 1997). According to Bangsbo and Peitersen (2000), build-up play and preventing goal-scoring occur near one's own goal, establishment of play and transition take place in the midfield, and penetration and finishing happen near the opponent's goal. Therefore, it seems that there are specific technical-tactical skills linked to those phases and areas of the pitch.

To our knowledge, the objective criteria for determining individual playing area or length and width of the pitch in SSGs for training tactical aspects have so far not been explored. Even for physiological conditioning, previous studies have not accounted for how they estimated pitch sizes used in their investigations. For example, Rampinini et al. (2007) used the playing areas most frequently prescribed by coaches in different SSGs, while the remaining studies have not provided any justifications for the relation between pitch size and number of players (Table 1). Whereas most implemented longer length than width (i.e., Hill-Haas et al., 2009; Casamichana & Castellano, 2010), others did the opposite (i.e., Rampinini et al., 2007; Willliams & Owen, 2007). Similarly, the objective estimation of the distance between the goalkeeper and the nearest team-mates for the use in SSGs is lacking. The distances normally observed during training sessions with SSGs seem to be shorter and less variant than distances in real matches. This is despite of the demand for specific training exercises to goalkeepers that would mimic game-like situations (De Baranda, Ortega, & Palao, 2008; Di Salvo et al., 2008).

****Table 1 near here****

To obtain a valid representation of the tactical conditions (e.g. individual playing area) experienced in full-size matches in SSGs, it seems necessary to extrapolate pitch sizes from real full-size soccer matches. This will enable the use of SSGs that replicate the tactical requirements of competitive soccer matches and may therefore facilitate further development of tactical factors within the appropriate context of a game.

Therefore, the aims of this study were to examine the 1) individual playing area, 2) length and width of the rectangle encompassing the individual playing area and 3) distance between the goalkeepers and their nearest team-mates according to the position of the ball on the pitch during professional soccer matches and compare these to previously presented data for SSGs.

Methods

Material

Four Spanish league men's matches (1st Spanish Division) involving five different teams were monitored during the 2002-03 season using a multiple-camera match analysis system (Amisco Pro®, version 1.0.2, Nice, France). Of these five teams, one played two times at home and another three times away, leaving the remaining three teams played once at home (two teams) or once away (one team). The match results included draw (one match), one-goal difference (two matches) and two- goals difference (one match).

The length and width of the rectangle that included all outfield players and the distance between the goalkeeper and nearest team-mates were obtained from collected

data by the help of specially developed software (Animation Mode Amisco Pro®, Nice, France). Ethics approval for all experimental procedures was granted by the University of Granada Human Research Ethics Committee. Written permission from Amisco® was obtained before the study began.

****Figure 1 near here****

Procedure

The movements of all 22 players were observed during the entire game duration by means of 8 stable, synchronised cameras positioned at the top of the stadium (sampling frequency 25 Hz). Signals and angles obtained by the encoders were sequentially converted into digital data and were recorded on six computers for post-match analyses. (For previous applications of the Amisco system, see Dellal et al., 2010; Di Salvo et al., 2007; Randers et al., 2010 and Zubillaga et al., 2009).

We conducted a pilot study prior to data collection procedure and based on its results we decided to use data collected every five seconds and only when the ball was in play. This was deemed adequate taken into consideration our study aims as well as the feasibility of the whole procedure. To exclude the influence of set plays on players' positions, we decided to use the data collected from five seconds after the set play was taken. Kick off, throw in, goal kick, free kick, corner kick, and penalty kick were all considered as set plays.

Individual playing area of SSGs can be calculated by dividing the pitch size by the number of participating players (Casamichana & Castellano, 2010; Hill-Hass et al., 2009). In the present study, individual playing area was determined during full-size matches by dividing the area of the rectangle that includes all outfield players (goalkeepers excluded) by twenty (the total number of outfield players). The referred

rectangle was defined as the one composed by two horizontal lines parallel to the touchlines and two vertical lines parallel to the goal lines (Figure 1). The horizontal lines passed by the outfield players nearest the two touchlines, while the vertical lines passed by the outfield players nearest the two goal lines. Depending on the position of the ball, the collected data corresponded to one of the six zones in which Amisco divides the pitch (Figure 1). The team with possession of the ball determined the zone of the ball. Zone 1 was the zone nearest the goal of the team in possession of the ball and zone 6 was the one nearest the opponent's goal.

Statistical analyses

Four separate one-way ANOVA were run on individual playing area, length, width and distance between both defending and attacking goalkeepers and their respective nearest team-mates according to the six pitch zones. When significant effects were found, Games-Howell post-hoc comparisons were applied between individual pairs of pitch zones. All statistical analyses were carried out using IBM SPSS Statistics-v.19.0 for Windows and statistical significance was set at $P<0.05$ for ANOVA analyses and $P<0.01$ for the post-hoc comparisons.

Results

The calculated values of individual playing area ranged between 78.97±15.05 and 93.87±16.25 m² (Table 2). The overall results show that individual playing area ($F [5, 2562]=19.99$, $P<0.001$, $\eta 2=0.04$), length ($F [5, 2562]=98.19$, $P<0.001$, $\eta^2=0.16$) and width ($F [5, 2562]=34.95$, $P<0.001$, $\eta^2=0.06$) of the rectangle varied significantly across different zones of the pitch where the ball was located. Figure 2 shows that individual playing area decreased as the ball approached the central parts of the pitch. As attacking

teams moved with the ball towards these central zones (zones 3 and 4), individual playing area was significantly smaller than in zones 1 and 2. Within the central parts of the pitch, individual playing area was smaller when the ball was played in zone 4 than in zone 3 ($P<0.01$) (Table 2). Individual playing area increased again when attacking teams had possession of the ball in zone 5, although it was not significantly greater than in zones 3 and 4. Finally, when teams attacked in the zone closest to the opposing goal (zone 6), individual playing area increased and was significantly greater than in the rest of the zones.

Figure 2 also shows that the rectangle that included all outfield players became increasingly shorter as the ball was played closer to the central parts of the pitch. Length was greater in zone 1 than in zone 2 ($P<0.001$) and 3 ($P<0.001$) (Table 2). Similarly, length was smaller when the ball was played in zone 2 than in zones 3 and 4. Length in the central parts of the pitch (zones 3 and 4) was significantly smaller than in other areas of the pitch. From zone 4, the length of the rectangle that included all outfield players again increased as the ball was played closer to the opposing goal and was longer in zone 5 than in zones 3 and 4 ($P<0.001$) (Figure 2; Table 2). In the same way, when the ball was played closer to the opposing goal (zone 6), length was greater than in any other zone ($P<0.001$) (Table 2).

Unlike the length of the rectangle, the width increased as the ball was played closer to the central parts of the pitch (Figure 2). When the ball was played close to the goal of the team in possession of the ball (zone 1), the width was significantly smaller than in zones 2, 3, 4 and 5. Likewise, the width was smaller in zone 2 than in zone 3 ($P<0.01$) (Table 2). As the attacking team progressed further into zone 4 towards the opposing goal, the rectangle that included all outfield players narrowed again. Thus, the width in zone 5 was significantly smaller than in zones 3 and 4 ($P<0.001$) (Table 2). The rectangle became even narrower when the ball was played closer to the opposing goal

(zone 6) and was smaller than in zone 5 (P<0.001) (Table 2). However, the length of the rectangle that included all outfield players was greater than the width only when the ball was in zones 1 and 6. In general, Figure 2 shows that the width of the rectangle was always greater than, or at least equal to (in zone 1), the length except only when the ball was in zone 6.

****Table 2 near here****

****Figure 2 near here****

The overall results show that distances between defending (F [5, 2562]=850.82, P<0.001, η^2=0.62) and attacking (F [5, 2562]=561.22, P<0.001, η^2=0.52) goalkeepers and their nearest team-mates varied significantly across different zones of the pitch where the ball was located. Figure 3 shows that both defending and attacking goalkeepers were further apart from their nearest team-mates as the ball approached the opponent's goal. The nearest outfield players moved significantly closer (P<0.001) to their goalkeepers when defending as the opposition advanced from zone 2 to zones 3, 4, 5 and 6 (Table 2). Similarly, the nearest outfield players moved significantly further away (P<0.001) from their goalkeepers when attacking as their teams progressed with the ball from zone 1 to zones 2, 3, 4 and 5 (Table 2).

****Figure 3 near here****

****Table 3 near here****

The comparison between individual matches partly produced match-specific results, though most variables show no difference between matches (Table 3). Only some variables in match 1 (length, width and distance from attacking goalkeeper) and match 3 (width and distance from attacking goalkeeper) were different from variables in all other matches (Table 3). Moreover, no differences were found between matches when the ball was located in zones 1, 5 and 6 for all variables except length (zone 1; $P=0.002$) and distance from attacking goalkeeper (zone 5 and 6; $P<0.001$). But when the ball was located in the central part of the pitch (zones 2, 3 and 4) differences were found between matches in all variables except distance from attacking goalkeeper (zone 2; $P=0.023$).

Discussion

The main findings of this study was that individual playing area ranged between 78.97±15.05 and 93.87±16.25 m² was identified from full-size matches in professional soccer. These values were smaller than most of those used in previous studies on SSGs. Further, all variables examined including individual playing area, length and width of the rectangle encompassing the individual playing area, and distance between the goalkeepers and their nearest team-mates varied significantly according to the position of the ball on the pitch. Thus, these findings show that it is possible to design SSGs with a more valid representation of the tactical conditions experienced in full-size matches and their use may improve the training effect of tactical aspects of match performance in soccer.

It should be noted that the present study has some limitations which may have influenced the results. The imbalance in the type of away versus home teams, with one team involved in three out of four away matches, and the use of five-second time limit to exclude the influence of the set plays on players' positions may both be considered as

a limitation. Further, the fact that the analysis done in real matches did not include location of goals whereas the pitches of SSGs do can be a limitation of the extrapolation.

The reported differences between individual matches, especially when the ball was located in the middle area of the pitch, suggest that the current results might be team-specific. This may be due to the difference in styles of play used in transition phase and formations of play employed by the involved teams, especially for the midfield players. Consequently, the general practical recommendations derived from these results should be received carefully.

Only 22 of the 60 SSGs used in previous studies presented in Table 1 implemented individual playing areas similar to these values, which is between 63.92 and 110.12 m². Some of the individual playing areas used in previous studies were above current values (e.g., Castagna et al., 2004; Frencken & Lemmink, 2007), whereas others even exceeded this range by two times (Casamichana & Castellano, 2011; Gabbett & Mulvey, 2008; Hoff et al., 2002; Kelly & Drust, 2009; Williams & Owen, 2007). This is probably due to the restricted focus on the physiological conditioning. Over the last decade, one of the main aims of the studies on SSGs has been to demonstrate their suitability in improving players' cardiovascular systems (e.g., Hoff et al., 2002; Little & Williams, 2006; Tessitore et al., 2006; Reilly & White, 2004). Several studies reported that increasing the size of the pitch resulted in higher cardiovascular strain (Aroso et al., 2004; Rampinini et al., 2007; Tessitore et al., 2006). Consequently, players in those SSGs may have performed under less favourable conditions with too much time and space to improve tactical factors.

Further, the current results are in line with anecdotal reports from players and coaches that the spatial-temporal demands of play become more exigent when the ball is in the midfield area. There was a significant overall decrease of individual playing area

when the ball was closer to the central zones of the pitch. According to Bangsbo & Peitersen (2000), different phases of play happen in different parts of the pitch and that midfield area is where the play is established and transitions take place. The smaller space ratios per player when the ball was in zones 3 and 4 could be explained by the significant shortening of the rectangle that included all outfield players. For example, this rectangle was 11.52 metres shorter when the attacking team had the ball in zone 4 than in zone 6. Thus, the advanced position of the back four lines when the ball was in the central parts of the pitch led the 20 outfield players to concentrate in a small area.

It is likely that when the ball was in zones 3 and 4, the defending team advanced all its players behind the ball in order to reduce the distance between their defensive lines. In turn, this defensive positioning reduced the space and time around the ball making it more difficult for the opponents, but easier for the team to regain possession of the ball. Likewise, in the zones close to the goals (1, 2, 5 and 6), the increase in the individual playing area was accompanied by lengthening of the rectangle that included all the outfield players. The fact that the offside rule does not apply in opponent's half may have influenced players in the back four lines of both teams to remain by the halfway line. Hence, when the attacking team had the ball in zones 1 and 2, players in the back four lines of the opposing team may have remained by the halfway line so as to prevent the forwards of the opposing team from receiving the ball behind their backs without being in offside position. Equally, when attacking teams had the ball close to the opponent's goal (zones 5 and 6), at least one of the players of their back four lines may have remained by the halfway line to avoid the same situation in case the opponents regain possession of the ball. This may have caused the block of the 20 outfield players to be longer when the ball was in zones 1, 2, 5 and 6 than when the ball was in zones 3 and 4.

In contrast to the length of the rectangle, the width increased when the ball was closer to the central parts of the pitch. This is understandable considering that when the ball was closer to their own goals (zones 1 and 2), attacking teams often had enough space to build up play as the opponents often choose not to attempt winning the ball up the field (zones 5 and 6). However, as the ball approached the central parts of the pitch (zones 3 and 4), it seems that attacking teams attempted to deal with the high concentration of opposing players by widening out in order to have more space and time to play. Moreover, as attacking teams moved the ball closer to the opponent's goal (zones 5 and 6), they reduced their width as a result of converging into a position closer to the goalmouth. Note that the widening of the rectangle that included all outfield players was proportionally smaller compared to the reduction of its length when the ball was located closer to the central parts of the pitch. In fact, the maximum difference in width was 6.14 metres from zone 3 to zone 6, almost half of the maximum difference in length. This greater shortening than widening of the rectangle accounted for the reduction of the individual playing area when the ball was in the central area of the pitch.

The current results show further that the distance from both defending and attacking goalkeepers to their nearest team-mates increased significantly as the ball was further away from the goal they defended. These results are as expected because as the attacking team managed to advance the ball closer the opponent's goal, the whole team including the rearmost outfield players had to push forward in order to provide offensive support to their team-mates. The situation is opposite when defending as now the outfield players of the defending team especially those nearest their goalkeeper had to drop backwards towards their own goal in order to reduce space and improve chances of preventing opponents from finishing.

It is important to recognise that the current results may have limited generalizability. Future studies could explore further findings of the present study by comparing between matches involving teams with particular styles of play. For example, a large scale study including home and away matches involving teams that employ direct versus possession styles in transition phase and with particular formations of play would have been appropriate for such investigation at both team and player level.

The benefits of extrapolating pitch sizes for SSGs from full-size matches can be justified when considering training specificity for developing tactical proficiency. In support, Hill-Haas et al. (2011) suggested that SSGs may facilitate the development of tactical awareness within the appropriate context of the game, but its realization depends on game design. There is some empirical evidence showing the effect of the relationship between space and time on soccer match performance (Harris & Reilly, 1988; Seabra & Dantas, 2006; Suzuki & Nishijima, 2004; Tenga, Holme, Ronglan, & Bahr, 2010). Hence, the results of the present study could be used by soccer practitioners to apply individual playing areas in SSGs and specific exercises for goalkeepers that correspond to those found in competition and increase the specificity of their training stimulus to improve tactical performance.

****Table 4 near here****

As shown in Table 4, pitch sizes with relatively larger individual playing areas (90 m^2, range=70-110) are generally recommended for training build-up (zones 1 and 2) and finishing (zone 5 and 6) phases of play, while relatively smaller individual playing areas (80 m^2, range=65-95) for training transition play (zones 3 and 4). At the same time, pitch sizes with longer width than length (L:W=1:1.3) are recommended for training

transition play (zones 3 and 4), while a square pitch (L:W=1:1) for training build-up (zones 1 and 2) and finishing (zone 5 and 6) phases of the play.

For the distance between the goalkeeper and his nearest team-mates according to the location of the ball, regardless whether in attack or defence, the recommended distances include 10 meters (range=5-15) when the ball is located in zone 1, 15 meters (range=10-20) in zone 2, 20 meters (range=15-25) in zone 3, 25 meters (range=20-30) in zone 4, and 30 meters (range=25-35) when the ball is located in zone 5 and 6. For practicing with SSGs, these distances are applied according to the number of players involved in a particular SSG, with the more the number of players the longer the distance from the goal to the nearest end of the pitch. In specific, distances between 5-15 meters are recommended for 2x2 and 3x3, 10-20 meters for 4x4 and 5x5, 15-25 meters for 6x6 and 7x7, 20-30 meters for 8x8 and 9x9, and distances between 25-35 meters are recommended for 10x10. De Barranda, Ortega and Palao (2008) highlighted the importance of creating practice situations in which the goalkeeper must intervene outside the penalty area.

Conclusions

This study demonstrates that SSGs that replicate the tactical aspects of full-size soccer matches can be designed. The resulted pitch sizes are potentially valuable for ensuring training specificity of tactical factors. Thus, it is possible to design SSGs with a more valid representation of the tactical conditions experienced in full-size matches and their use may improve the training effect of tactical aspects of match performance in soccer.

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Table 1. Individual playing area and pitch size of SSGs used in previous studies.

Study	Small-sided game	Length x width (m.)	Individual Playing area (m^2)
Hoff et al. (2002)*	5-a-side	50 x 40	250
Aroso, Rebelo, & Gomes-Pereira (2004)	2-a-side	30 x 20	150
	3-a-side	30 x 20	100
	4-a-side	30 x 20	75
Castagna, Belardinelli. & Abt (2004)	5-a-side	40 x 20	80
Tessitore, Meeusen, Piacentini, Demarie, & Capranica (2006)	6-a-side	30 x 40; 50 x 40	100; 166.6
Little & Williams (2006, 2007)*	2-a-side	27.4 x 18.3	250.7
	3-a-side	36.6 x 27.4	250.7
	4-a-side	45.7 x 27.4	208.7
	5-a-side	50.3 x 27.4	172.3
	6-a-side	54.9 x 36.6	200.9
	8-a-side	64 x 41.1	187.9
	5-a-side	54.9 x 32	219.6
	6-a-side	59.4 x 27.4	162.7
Jones & Drust (2007)*	4-a-side	30 x 25	125
	8-a-side	60 x 40	171.4
Rampinini et al. (2007); Coutts, Rampinini, Marcora, Castagna, & Impellizzeri (2009)	3-a-side	12 x 20; 15 x 25; 18 x 30	40; 62.2; 90
	4-a-side	16 x 24; 20 x 30; 24 x 36	48; 75; 108
	5-a-side	20 x 28; 25 x 35; 30 x 42	56; 87.5; 126
	6-a-side	24 x 32; 30 x 40; 36 x 48	64; 100; 144
Williams & Owen (2007)	1-a-side	15 x 20	150
	2-a-side	15 x 20; 20 x 25	75; 125
	3-a-side	15 x 20; 20 x 25; 25 x 30	50; 83.3; 125
	4-a-side	20 x 25; 25 x 30	62.5; 93.7
	5-a-side	25 x 30	75
Frencken & Lemmink (2007)*	5-a-side	35 x 40	175
Gabbett & Mulvey (2008)	3-a-side	50 x 50	416.6
	6-a-side	50 x 50	208.3
Mallo & Navarro (2008)	3-a-side	33 x 20	110
Kelly & Drust (2009)*	5-a-side	30 x 20; 40 x 30; 50 x 40	75; 150; 250
Katis & Kellis (2009)	3-a-side	25 x 15	62.2
	6-a-side	40 x 30	100
Hill-Haas et al. (2008); Hill-Haas et al. (2009)	2-a-side	28 x 21	147
	4-a-side	40 x 30	150
	6-a-side	49 x 37	151
Casamichana & Castellano (2010)*	6-a-side	62 x 44; 50 x 35; 32 x 23	272.8; 175; 73.6
Fanchini et al. (2011)*	4-a-side	37 x 31	191.2
Frencken, Lemmink, Delleman, & Visscher (2011)*	5-a-side	36 x 28	126
Köklü, Asci, Kocak, Alemdaroglu, & Dundar (2011)	1-a-side	6 x 18	54
	2-a-side	12 x 24	72
	3-a-side	18 x 30	90
	4-a-side	24 x 36	108
Sjökvist et al. (2011)	4-a-side	32 x 22.5	90

*SSGs with goalkeepers

Table 2. Individual playing area (in metres^2), length and width of the rectangle covering all outfield players (in metres), and distance from defending and attacking goalkeepers to their respective nearest team-mates (in metres) according to the six zones indicating positions of the ball on the pitch (means±s).

Position of the ball	Individual playing area	Length	Width	Distance from defending goalkeeper	Distance from attacking goalkeeper
Zone 1	87.68±18.91	42.32±5.81	41.32±6.35	29.90±6.56	12.54±7.81
Zone 2	88.65±20.54*	38.95±4.88	45.40±8.46	29.22±5.02*	16.55±5.96
Zone 3	82.23±18.58	34.99±4.37	46.96±8.78	26.29±4.22	22.62±5.46
Zone 4	78.97±15.05	34.49±4.09	45.91±7.59†‡	22.14±4.67	27.56±5.06
Zone 5	84.13±37.90*$^{\dagger\ddagger!}$	39.02±17.01*†	43.31±7.66	15.62±4.57	31.26±5.44
Zone 6	93.87±16.25	46.01±4.25	40.82±6.11*	8.93±5.63	33.07±7.65$^{\#}$

Note: Zone 1 is nearest the goal of the team in possession while Zone 6 is nearest the opponent's goal. There were differences ($P<0.01$ or $P<0.001$) between all positions of the ball except: *No difference to Zone 1; †No difference to Zone 2; ‡No difference to Zone 3; $^{!}$No difference to Zone 4; $^{\#}$No difference to Zone 5.

Table 3. Individual playing area (in metres^2), length and width of the rectangle covering all outfield players (in metres), and distance from defending and attacking goalkeepers to their respective nearest team-mates (in metres) according to the four matches (means±s).

Match	Individual playing area	Length	Width	Distance from defending goalkeeper	Distance from attacking goalkeeper
Match 1	84.12±20.03†‡	38.99±5.29	43.14±8.79	21.81±7.32$^{!}$	22.41±7.88
Match 2	81.38±17.27*	36.86±6.36‡	44.42±7.50$^{!}$	23.09±7.64‡	24.30±8.34$^{!}$
Match 3	86.78±17.15*	37.34±5.48†	46.74±7.86	23.70±8.23†	26.42±8.43
Match 4	84.12±22.91*†‡	37.46±15.06†‡	45.11±8.04†	22.18±8.22*	24.47±8.80†

Note: There were differences (P<0.01 or P<0.001) between all matches except: *No difference to Match 1; †No difference to Match 2; ‡No difference to Match 3; $^{!}$No difference to Match 4.

Table 4. General recommendations for designing SSGs for training tactical aspects in soccer according to the particular phases of play.

Aim of the SSG	Location of the ball on the pitch	Individual playing area (in metres^2)	Length (L) to width (W) ratio	Example of pitch size for 5x5
Build-up play	Zone 1 and 2	90 (range=70-110)	1:1	L x W = 30x30 m Distance from the goal to the nearest pitch end = 15 m
Transition play	Zone 3 and 4	80 (range=65-95)	1:1.3	L x W = 25x30 m Distance from the goal to the nearest pitch end = 15 m
Finishing phase	Zone 5 and 6	90 (range=70-110)	1:1	L x W = 30x30 m Distance from the goal to the nearest pitch end = 15 m

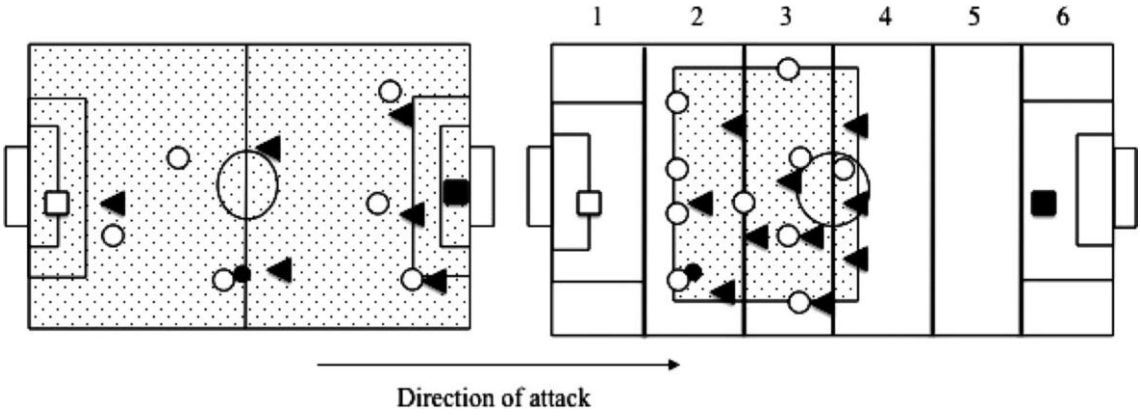

Figure 1. Sketch for illustration of individual playing area in SSGs (left) and full-size matches (right).

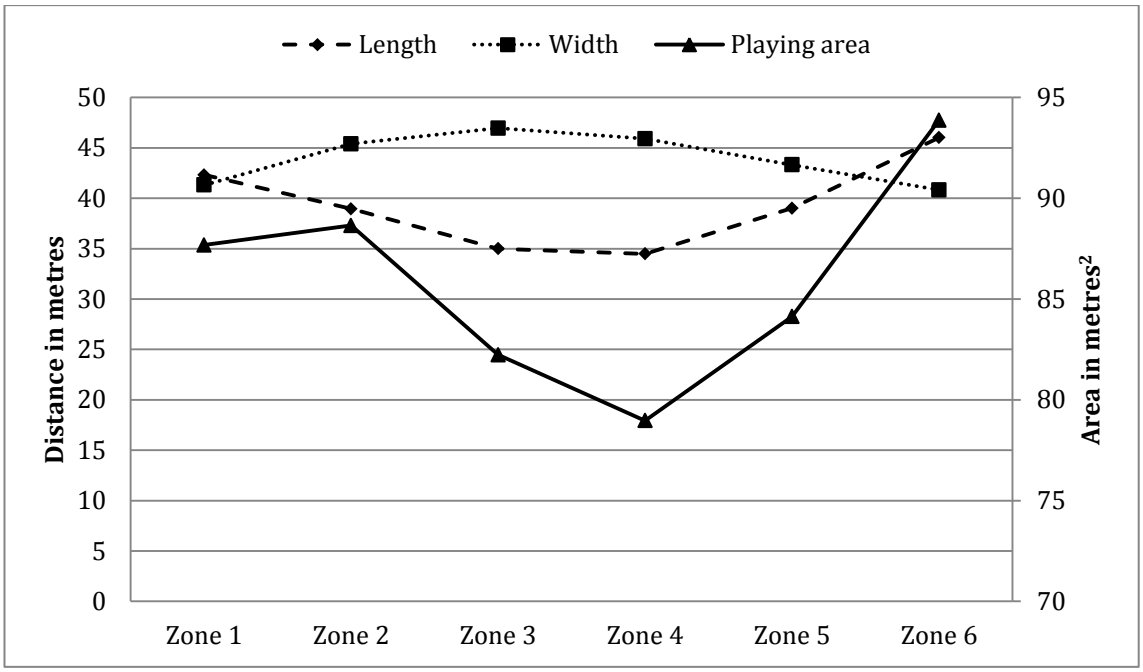

Figure 2. Graphical display for visual comparison of length and width of the rectangle covering all outfield players (in metres) and individual playing area (in metres^2) in different positions of the ball on the pitch.

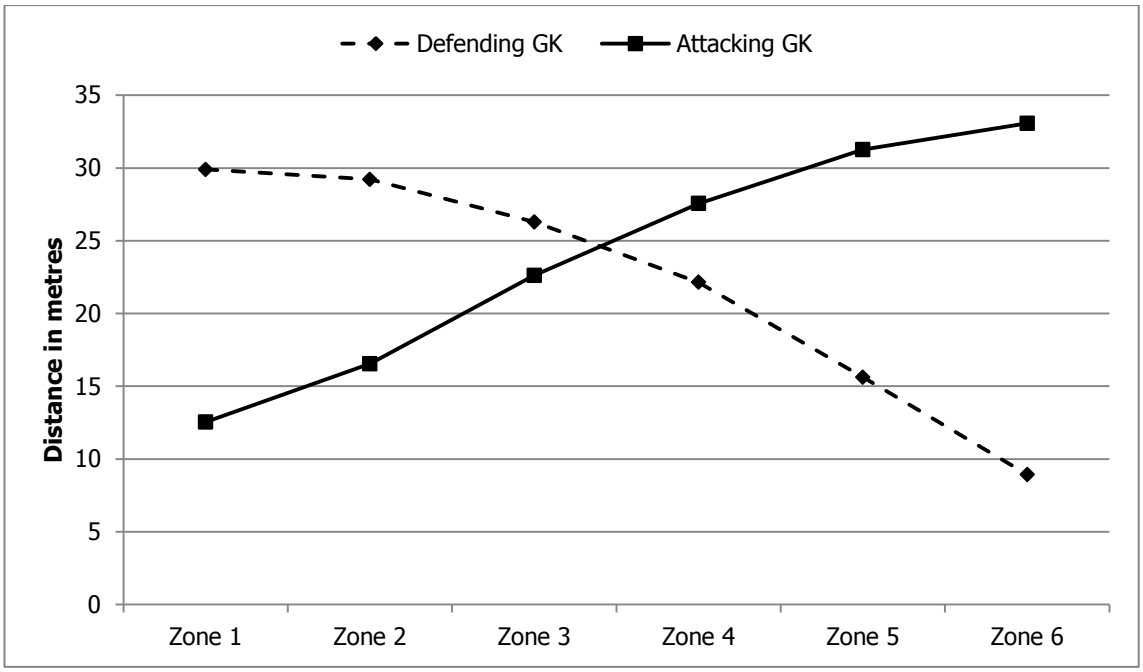

Figure 3. Graphical display for visual comparison of distance from defending and attacking goalkeepers to their respective nearest team-mates (in metres) in different positions of the ball on the pitch.