ANALYSIS OF SHOTS ON TARGET AND GOALS SCORED IN SOCCER MATCHES: IMPLICATIONS FOR COACHING AND TRAINING GOALKEEPERS

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ABSTRACT

The aim of this study was to analyse the characteristics and patterns of shots on target and goals scored during the 2012-European Championship. The broadcasted matches were recorded and converted into electronic video files for a computer-based analysis. This quantitative study examined 31 matches of the championship and identified 123 shots on target (which were not goals) and 73 goals scored. The results revealed that 88 (72%) shots on target and 39 (53.4%) goals scored were aimed at the low zones of the goalposts. Goalkeepers blocked 80 shootings (65%) from outside of the penalty area, whilst 65 goals (89%) were scored inside the penalty area. Based on the low zones of the goalposts and shooting angles, 72 shots on target and goals scored were from different angles and 55 were from the same angles. There was a significant difference ($\chi^2=20.61$; $p<0.001$) between the 26 goals from different angles and the 13 goals from the same angles in the low zones of the goalposts. Methodical training programmes for low-flying balls, body movements, decision-making and cooperative defence strategies were recommended for goalkeeper training.

Key words: Soccer; 2012-European Championship; Match analysis; Goalkeeper training.

INTRODUCTION

Soccer is a team sport, which is characterised by flamboyance, teamwork, interaction, physical ability, mental ability and so on. Economically, soccer as a commercial sport is a distinctively lucrative business, which attracts numerous spectators around the world. The quality of soccer matches as a valuable product has been the overriding concerns of not only marketers and soccer fans, but also coaches and players. In relation to the increase and maintenances of the quality of soccer games, some researchers have conducted investigations into the key elements of soccer games and their characteristics. The most common analysis is match analysis such as objective recording and examination of soccer activities and the outcome is a description of playing patterns (Carling *et al.*, 2005).

In soccer matches goals are one of the most important pinnacles to determine the success and failure of soccer teams (Cachay & Thiel, 2000; Michailidis *et al*., 2004; Leite, 2013a, 2013b). Mostly useful goal patterns in tournaments or leagues have been researched, such as (1) to understand trends of performance of modern soccer games and to anticipate the future aspects of soccer performance (Jones *et al.*, 2004); (2) to record relevant variables as the tactics of the game are always changing, enabling those who are interested to follow the changing aspects (Yiannakos & Armatas, 2006); and (3) to transfer knowledge to coaches, players and even researchers, which is very useful for planning, deciding and executing game preparation and training (Garganta *et al.*, 1997). In this respect, there have been several studies that focused on the patterns of goals, timing, tactics, etc., that occur during soccer competitions (Olsen, 1988; Jinshan *et al*., 1993; Garganta *et al*., 1997; Michailidis *et al*., 2004; Yiannakos & Armatas, 2006; Armatas *et al*., 2009; Armatas & Yiannakos, 2010; Leite, 2013a, 2013b; Michailidis *et al*., 2013; Mitrotasios & Armatas, 2014).

By analysing soccer games this study identified other useful facts to consider, which have to date not been covered fully in current literature. A goalkeeper conducts a double function, namely as a first attacker and a last defender, thus playing an important role in characterising the game itself through his/her decisive decision-making and performance (Paz-Franco *et al*., 2014). No one could deny the importance of basic skills and strategies, such as decision-making, motor performance and even cooperative defence in relation to the performance of a goalkeeper. However, goalkeepers have been relatively neglected due to the lack of developing specific training methods for goalkeepers and conducting constant research.

In the literature, some research has been reported about the performance of soccer goalkeepers in game situations, such as penalties and crosses (Wilson *et al*., 2009; Wood & Wilson, 2010; Yoon *et al*., 2012), diving saves and their movements (Spratford *et al*., 2009), the characteristics of the defence intervention of goalkeepers (Sainz de Baranda *et al*., 2008), and their perception and response in general (Knoop *et al*., 2013). Lee *et al*. (2007) addressed what a goalkeeper needs, such as basic skills, cognitive and operational capability and psychological strength to endure pressure during the game.

Coaching and training goalkeepers would need various information sources elicited from the game itself. In this respect, the current study conducted match analyses, especially regarding the combination of shooting areas, shots taken on target and scoring goals and characteristics that have not been fully covered in previously published research. These match analyses could benefit offensive players, as well as defensive players, especially goalkeepers and coaches in terms of specific training content and design, aiming at improving basic defensive skills and adapting to various circumstances (Hughes, 1996; McGarry & Franks, 2000; Savelsbergh *et al*., 2002; Hughes & Franks, 2004). In particular, this study investigated some useful information, such as the heights and directions of goals especially from a training perspective for goalkeepers. The 2012-UEFA European Championship held in Poland and Ukraine was selected as the event and source for the collection and analysis of data.

PURPOSE OF THE STUDY

The objectives of this study can be summarised as follows:

(1) To identify shooting areas, shots on target and goals scored which goalkeepers had to deal with during the matches of the Championship;

(2) To reveal where shots were produced and where the balls were targeted in the goal area;

(3) To arrange the patterns in relation to the combination of shooting areas and shots on target and goals scored;

(4) To identify useful implications for goalkeeper coaching and training through the match analysis; and

(5) To record the Championship for future research opportunities, such as accumulating data and comparing the results with other competitions.

METHODOLOGY

Sample

Between 8 June 2012 and 1 July 2012, all matches (N=31) of the 2012-UEFA European Championship were analysed. The games produced 196 shootings (123 shots on target and 73 goals scored), except for 3 penalty-kick goals that were identified in the tournament. For the analysis of the shootings (shots at goal) in this study, the shooting areas were divided into 20 zones (Figure 1) to indicate the spots from which shots at goal were produced. The zones L8, L4, C4, R4 and R8 are on the outskirt of Area Zone and the rest are the goal and penalty area.

L8	L4	C4	R4	R8
L7	L3	C3	R3	R7
L6	L2	C2	R2	R6
L5	L1	C1	R1	R5

L: Left   C: Centre   R: Right
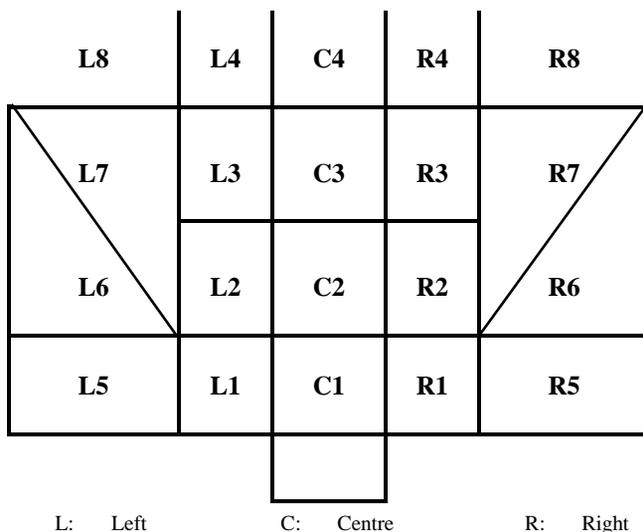
FIGURE 1. **AREA ZONE**

The grid style segmentation was used to secure goal-related basic data for future research. The goal scoring area between the goalposts was divided into 9 goal zones to identify the spot at which the ball found the net. All shots on target and scored goals were identified in one of these 9 goal zones (Figure 2). For the purpose of this study, the total valid shots were separated into shots on target and goals scored. To clarify this terminology, "shots on target" means goalkeepers block shot balls, whilst "goals scored" means goalkeepers missed the shot,

allowing a goal to be scored. The directions (Left, Centre, Right) are positioned in Figure 1 and 2, as the reader would be viewing it, to avoid unnecessary confusion.

Lc	Cc	Rc
Lb	**Cb**	**Rb**
La	**Ca**	**Ra**

L=Left   C=Centre   R=Right

FIGURE 2. **GOAL ZONES**

Procedures

The matches were analysed using video analysis by 3 trained observers. The inter-rater reliability was calculated to guarantee the quality of the results of the observation. A reliability coefficient of 0.95 was attained (intra-class correlation coefficient and Kappa index). The procedure of analysis was applied in 3 distinct stages. Firstly, video captures of shots on target and goals scored were conducted by examining all of the matches of the 2012-European Championship. For this purpose, the complete broadcasted matches were recorded and converted into electronic video files using the SPORT CODE GAMEBREAKER 10.24 software program. In the second stage, the captured data were analysed to identify the pattern of shot locations based on the Area Zone and the spots of each shot on target and goals scored based on the Goal Zone. Lastly, the collected data were coded for statistical analysis.

Analysis of data

For the purpose of this study, descriptive statistics comprising of frequency distribution was used. The statistical data were also presented with Absolute Frequency and Relative Frequency for shots on target, goals scored and the combination of the Area Zone and the Goal Zone. Cross-tabulation analysis was applied to verify any significant differences between variables. For the Chi-Square analysis to determine statistically significant differences, $p<0.05$ was set as the significant level. All data used in this study were analysed by the statistical package, PC SPSS 12.0.

RESULTS

In the 2012-European Championship, 123 shots were on target and blocked by goalkeepers, whilst 73 goals were scored which excluded 3 penalty goals. In terms of the *shots on target*, the analysis revealed that 33 (26.8%) shots targeted the Ra-zone of the Goal Zone, 28 (22.7%) shots were in the Ca-zone and 27 (22%) in the La-zone. The balls targeting the low zones (La, Ca, Ra) of the Goal Zone consisted of 88 (71.5%) out of 123 shots on target. In the middle zones (Lb, Cb, Rb) of the Goal Zone, 14 shots were on target (11.4%), while 21 shots (17.1%)

were targeted at the high zones (Lc, Cc, Rc). A statistically significant difference was found for the low zone (Ra, Ca, La) when compared to the middle zone (Rb, Cb, Lb) and high zone (Rc, Cc, Lc) (χ^2=81.41; p<0.001).

In relation to the *goals scored*, 14 (19%) goals were identified in the Ra-zone of the Goal Zone, followed by 13 (18%) in the La-zone, 12 (16.4%) in the Ca-zone, 9 (12.3%) in the Rb-zone and 8 (11%) in the Cc-zone. There were 39 goals (53.4%) scored during the 2012-European Championship in the low zones of the Goal Zone (Ra, Ca, La), 16 goals (21.9%) in the middle zones (Lb, Cb, Rb) and 18 goals (24.7%) were in the high zones (Lc, Cc, Rc). There was a statistically significant difference in the low zones (Ra, Ca, La) when compared to the middle zones (Rb, Cb, Lb) and high zones (Rc, Cc, Lc) (χ^2=13.34; p<0.001).

The findings also indicate some patterns of the total number of shots. More specifically, 47 (24%) shots on target and goals scored were founded in Ra of the Goal Zone, 40 (20.4%) in each of the La-zone and the Ca-zone, followed by 22 (11.2%) in the Cc-zone. The total frequency of shots on target and goals scored on the low zones of the Goal Zone was 127 (64.8%), while 30 (15.3%) shots on target and goals scored were identified in the middle zones and 39 (19.9%) were in the high zones of the Goal Zone. There was a statistically significant difference in the low zones (Ra, Ca, La) compared to the middle (Rb, Cb, Lb) and high zones (Rc, Cc, Lc) (χ^2=87.92; p<0.001). Figure 3 summarises the total frequency and patterns of shots on target and goals scored found in the matches played at the European Championship in 2012.
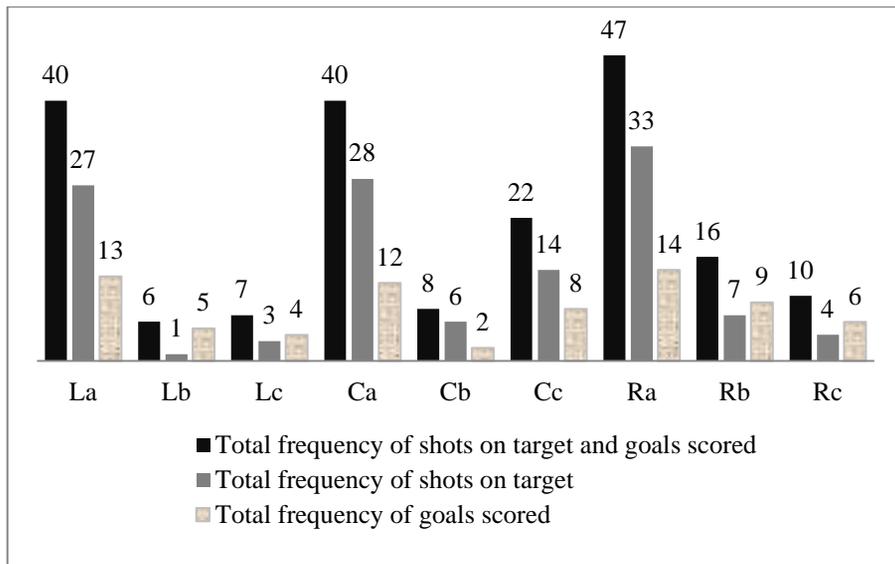
FIGURE 3. **TOTAL FREQUENCY AND PATTERNS OF SHOTS ON TARGET AND GOALS SCORED**

With reference to the *Area Zone*, a total 28 shots on target (22.8%) were identified in C4, followed by 25 (20.3%) in R8, 15 (12.2%) in L8, 7 (5.7%) in L7, 7 (5.7%) in R4 and 6 (4.8%)

in R7. On the outskirts of the Area Zone (C4, R4, R8, L4, and L8), there were 80 shootings, which is 65% of the total 123 shots on target. Inside the Area Zone, 43 (35%) shots were tried on target. There was a statistically significant difference in shots on target from the outskirt of the Area Zone compared to the rest (χ^2=13.66; p<0.001). Figure 4 illustrates the individual shooting positions in relation to shots on target during the European Championship 2012.
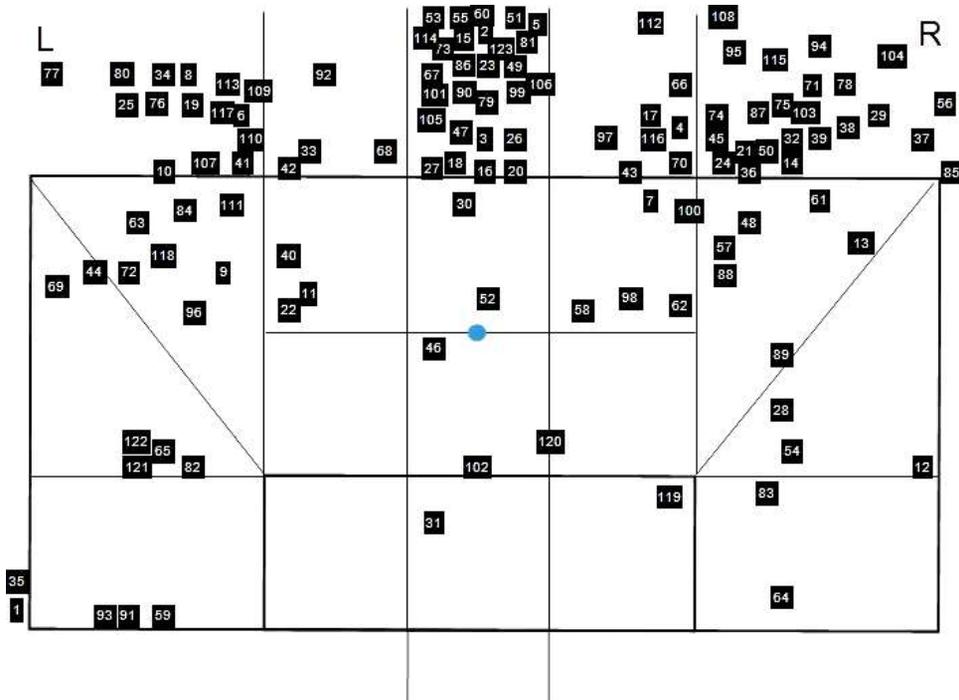
FIGURE 4. INDIVIDUAL SHOOTING POSITIONS IN AREA ZONE WITH SHOTS ON TARGET (not scored)

Concerning the shootings made in C2, 15 goals (20.5%) were scored, while 11 goals (15.1%) were score in C1, followed by 7 (9.6%) in C3 and 5 (6.9%) in L2, L3 and R3. In the goal and penalty area (C1, C2, C3, L1, L2, L3, R1, R2, R3), 65 goals were scored, which was 89% of the total 73 goals. On the outskirts of the Area Zone (C4, R4, R8, L4, L8), 8 goals (11%) were scored. There was a statistically significant difference in goals scored from inside the penalty area of the Area Zone compared to the outskirts area (χ^2=61.49; p<0.001). Figure 5 illustrates the individual shooting positions from which goals were scored during the Championship.
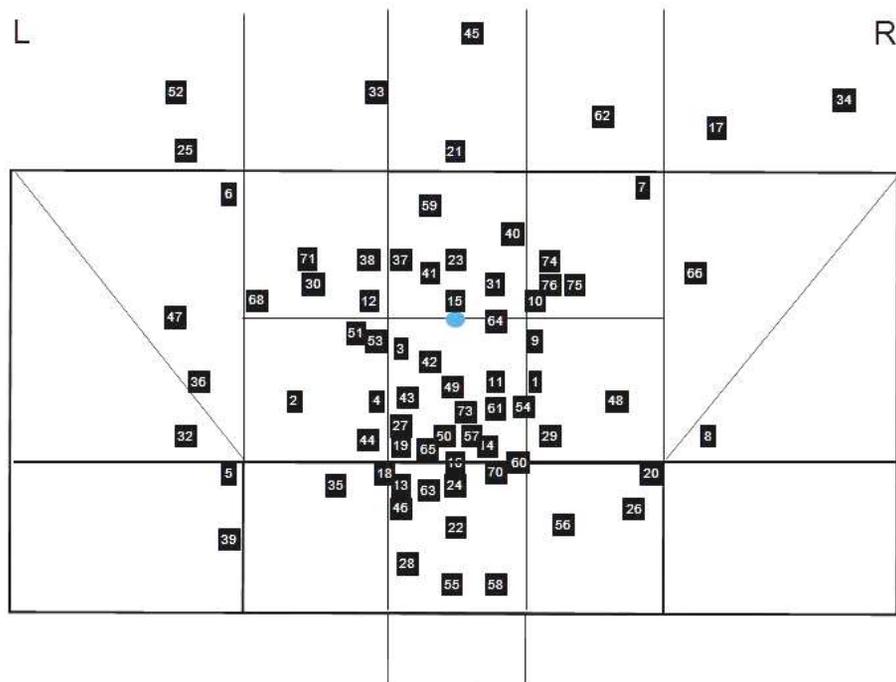
FIGURE 5. **INDIVIDUAL SHOOTING POSITIONS IN AREA ZONE WHEN GOALS SCORED**

Table 1 classifies the total shots on target and goals scored in order to organise the whole configuration of shootings in terms of combinations of the Area Zone and the Goal Zone. Table 1 shows, the number and percentage of the combinations of the Area Zone and *shots on target*; the number and percentage of the combination of the Area Zone and *goals scored*; and the *total* number and percentage of shots on target and goals scored in relation to the Area Zone, which would also be useful for future reference and comparison with other competitions.

This study focused not only on the detailed distributions of shots on target and goals scored, but also on other features, namely the combination of shooting angles and goal zones. Table 2 simplifies the frequencies of the combination of shots on target and goals scored in relation to the Goal Zone and the angles of shots, which are presented to identify the difference of the goal ratio based on the combination of shooting angles and the Goal Zone. Nine goal zones are combined with 3 angles (L=Left, C=Centre, R=Right) of shots. To avoid any confusion, the combination is arranged as follows, for example, 'L' with 'La' of the Goal Zone signifies that the goals were kicked from left side ('L') toward La-zone, without considering the distance from the shooting position to the goal post. If the combination is L-La, then the combination is considered from the "same angle", whilst combinations like L-Ca and L-Ra, are from "different angles".

TABLE 1. **FREQUENCY OF COMBINATION OF SHOT AREAS, SHOTS ON TARGET AND GOALS SCORED**

Shots made	Goal Zones								
	La	**Lb**	**Lc**	**Ca**	**Cb**	**Cc**	**Ra**	**Rb**	**Rc**
(1) Number of combinations of shot areas - shots on target (blocked goals)	(L4) 1 (L5) 4 (L6) 2 (L7) 4 (L8) 3 (C4) 4 (R3) 1 (R4) 3 (R6) 1 (R8) 4	(L7) 1	(L8) 2 (R8) 1	(L2) 1 (L3) 1 (L4) 1 (L5) 1 (L8) 2 (C2) 1 (C3) 1 (C4) 8 (R1) 1 (R3) 2 (R7) 3 (R8) 6	(L4) 2 (L8) 2 (C4) 1 (R4) 1	(L7) 1 (L8) 1 (C2) 1 (C4) 6 (R3) 1 (R8) 4	(L3) 2 (L4) 1 (L6) 2 (L7) 1 (L8) 2 (C4) 7 (R3) 1 (R4) 3 (R5) 1 (R6) 2 (R7) 3 (R8) 8	(L6) 1 (C2) 1 (C3) 1 (C4) 1 (R5) 1 (R8) 2	(L8) 3 (C4) 1
Frequency of (1)	27 (22.0%)	1 (0.8%)	3 (2.4%)	28 (22.7%)	6 (4.9%)	14 (11.4%)	33 (26.8%)	7 (5.7%)	4 (3.3%)
(2) Number of combination of shot areas - scored goal (Three Penalty-Kicks excluded)	(L2) 1 (L3) 2 (L4) 1 (C2) 2 (C3) 3 (R2) 2 (R3) 2	(L1) 1 (L3) 1 (C1) 2 (R4) 1	(L3) 1 (C1) 1 (C2) 1 (R7) 1	(L1) 1 (L2) 1 (L5) 1 (C1) 3 (C2) 2 (C3) 1 (C4) 1 (R3) 1 (R6) 1	(C2) 2	(L7) 2 (C2) 5 (C4) 1	(L2) 1 (L3) 1 (L5) 1 (L7) 1 (L8) 1 (C1) 2 (C2) 2 (C3) 3 (R3) 1 (R8) 1	(L2) 2 (L6) 1 (C1) 3 (R1) 1 (R2) 1 (R8) 1	(L8) 1 (C2) 1 (R1) 2 (R2) 1 (R3) 1
Frequency of (2)	13 (18.0%)	5 (6.9%)	4 (5.5%)	12 (16.4%)	2 (2.7%)	8 (11.0%)	14 (19.0%)	9 (12.3%)	6 (8.2%)
∑Frequency (3)=(1)+(2)	40 (20.4%)	6 (3.0%)	7 (3.6%)	40 (20.4%)	8 (4.1%)	22 (11.2%)	47 (24.0%)	16 (8.2%)	10 (5.1%)

In terms of (a) from Table 2, the frequencies of some combinations of same angles were higher than the other combinations, for instance, R-Ra (18 shots on target), L-La (14 shots on target), and C-Ca (10 shots on target). However, in terms of (b) the patterns were not consistent. Nevertheless, 7 goals were scored in the combination of C-Ca, followed by 6 goals from C-Cc and 4 goals from L-La and R-Rc. In relation to (c), the frequencies of some of the combinations of *same angles* were higher than the other combinations, for instance, R-Ra (20), L-La (18), C-Ca (17), C-Cc (13). Combinations of *different angles* were identified as R-Ca (14), C-Ra (14) and R-La (13).

TABLE 2. **FREQUENCY OF SHOTS ON TARGET AND GOALS SCORED AND ANGLES OF SHOTS IN RELATION TO GOAL ZONE**

Shots made	Low Zone			Middle Zone			High Zone		
	La	**Ca**	**Ra**	**Lb**	**Cb**	**Rb**	**Lc**	**Cc**	**Rc**
(a) Frequency of shots on target and the angles of shots	L 14 (11.4%)	L 6 (4.9%)	L 8 (6.5%)	L 1 (0.8%)	L 4 (3.3%)	L 1 (0.8%)	L 2 (1.6%)	L 2 (1.6%)	L 3 (2.4%)
	C 4 (3.3%)	C 10 (8.1%)	C 7 (5.7%)	C 0 (0%)	C 1 (0.8%)	C 3 (2.4%)	C 0 (0%)	C 7 (5.7%)	C 1 (0.8%)
	R 9 (7.3%)	R 12 (9.8%)	R 18 (14.6%)	R 0 (0%)	R 1 (0.8%)	R 3 (2.4%)	R 1 (0.8%)	R 5 (4.1%)	R 0 (0%)
(b) Frequency of scored goals and the angles of shots (Three Penalty-Kicks excluded)	L 4 (5.5%)	L 3 (4.1%)	L 5 (6.8%)	L 2 (2.7%)	L 0 (0%)	L 3 (4.1%)	L 1 (1.4%)	L 2 (2.7%)	L 1 (1.4%)
	C 5 (6.8%)	C 7 (9.6%)	C 7 (9.6%)	C 2 (2.7%)	C 2 (2.7%)	C 3 (4.1%)	C 2 (2.7%)	C 6 (8.2%)	C 1 (1.4%)
	R 4 (5.5%)	R 2 (2.7%)	R 2 (2.7%)	R 1 (1.4%)	R 0 (0%)	R 3 (4.1%)	R 1 (1.4%)	R 0 (0%)	R 4 (5.5%)
(c)= (a)+(b)	L 18 (9.2%)	L 9 (4.6%)	L 13 (6.6%)	L 3 (1.5%)	L 4 (2.0%)	L 4 (2.0%)	L 3 (1.5%)	L 4 (2.0%)	L 4 (2.0%)
	C 9 (4.6%)	C 17 (8.7%)	C 14 (7.1%)	C 2 (1.0%)	C 3 (1.5%)	C 6 (3.1%)	C 2 (1.0%)	C 13 (6.6%)	C 2 (1.0%)
	R 13 (6.6%)	R 14 (7.1%)	R 20 (10.2%)	R 1 (0.5%)	R 1 (0.5%)	R 6 (3.1%)	R 2 (1.0%)	R 5 (2.6%)	R 4 (2.0%)

L = Left angle   C = Centre angle   R = Right angle

Table 2 reorganises the frequencies according to **the low, the middle and the high zones** of the Goal Zone. Of the 196 shots, 20 shots on target and goals scored were taken from the *right side* toward the Goal Zone, 'Ra' (10.2%, R-Ra combination). There were 18 deliveries from the *left side* towards 'La' (9.2%, L-La combination), followed by 17 (8.7%) of the C-Ca combination, 14 (7.1%) for each of the R-Ca and C-Ra combinations and 13 (6.6%) for each of the R-La the C-Cc combinations. Regarding the *low zones* (La, Ca, Ra) of the Goal Zone, 72 shots on target and goals scored were from different angles, whilst 55 were from the same angles. In the *middle zones* (Lb, Cb, Rb) of the Goal Zone, 18 shots on target and goals scored were from different angles, whilst 12 were from the same angles. In relation to the

high zone (Lc, Cc, Rc) of the Goal Zone, 20 shots on target and goals scored were from the same angles and 19 were from different angles. In the case of the *low zones*, there was a statistically significant difference in shots on target and goals scored from the different angles compared to those from the same angles (χ^2=377.59; p<0.001).

Regarding the **shots on target** alone, 18 (14.6%) shots were produced from the right side toward Ra (R-Ra combination) and was followed by 14 (11.4%) shots with the L-La combination, 12 (9.8%) shots with the R-Ca combination, 10 (8.1%) shots with the C-Ca combination, 9 (7.3%) shots with the R-La combination, 8 (6.5%) shots with the L-Ra combination and 7 (5.7%) shots with each of the C-Cc and C-Ra combination. In the combinations from different angles, there were 46 shots on target to the *low zones* (La, Ca, Ra) of the Goal Zone with 42 shots on target from the same angles. For the *middle zones* (Lb, Cb, Rb) of the Goal Zone, 9 shots on target were from different angles and 5 were from the same angles. Further, for the *high zones* (Lc, Cc, Rc) of the Goal Zone, 12 shots on target were from different angles and 9 were from the same angles. In terms of the low zones, there was a statistically significant difference in shots on target from different angles compared to those from the same angles (χ^2=228.99; p<0.001).

In relation to the **goals scored**, 7 goals were scored with the C-Ca (9.6%) and the C-Ra combination (9.6%), 6 goals with the C-Cc combination (8.2%), followed by 5 goals with the C-La (6.8%) and the L-Ra (6.8%) combination, 4 goals with each of the L-La (5.5%), the R-La (5.5%) and the R-Rc (5.5%) combinations. Goals scored from different angles have a distinctive pattern, which could characterise the angles attackers tried to shoot from and the ratio of success. Statistics revealed that 26 goals were scored using different angles, whilst 13 goals were scored using the same angles in relation to the low zones (La, Ca, and Ra) of the Goal Zone. In terms of the middle zone (Lb, Cb and Rb) of the Goal Zone, 9 goals were from different angles and 7 goals were from the same angles. In addition, 11 goals were from the same angles and 7 goals were from different angles in relation to the high zones (Lc, Cc and Rc) of the Goal Zone. In the case of the low zones, there was a statistically significant difference in goals scored from the different angles compared to those from same angles (χ^2=146.00; p<0.001).

DISCUSSION AND PRACTICAL APPLICATION

This study conducted a statistical analysis on the pattern of shots on target and goals scored during the 2012-UEFA European Championship to understand the scientific reality of the game and to construe some meaningful implications for goalkeeper coaching and training. During the European Championship, whilst 196 shootings were attempted, 73 shots (37%) resulted in goals scored and 123 (63%) shots were blocked. Only 8 goals (11%) were scored from the outskirts of the Area Zone. Understandably, due to the distance, the probability of goals from the outskirts of the Area Zone would decrease significantly. However, 65 goals (89%) out of total 73 goals recorded during the Championship were scored within the goal and penalty area. The match analysis of the 2004-UEFA European Championship in Portugal showed similar patterns with those of the findings of this study, where 76.6% of total goals were scored from the goal and the penalty area during the soccer game (Yiannakos & Armatas, 2006). These results are also similar to those reported by Romero *et al*. (1997) for the 1996-UEFA European Football Championship. Regarding research on the 2012-UEFA

European Championship (Henceforth the Championship), Michailidis *et al*. (2013) and Mitrotasios and Armatas (2014) reported that 92.2% and over 90% of total goals respectively were scored in the goal and penalty area. Different methods of data coding and analysis seem to cause some statistical discrepancies.

In relation to the Goal Zone, 88 shots on target (71.5%) out of a total of 123 shots were targeted on the low zones (La, Ca, Ra) of the Goal Zone during the Championship, while 39 goals (53.4%) out of total 73 scored were also made in the low zones of the Goal Zone. In total, goalkeepers had to deal with 127 shootings (64.7%) out of 196 toward the low zones of the Goal Zone. The findings indicate that most of the shots on target and goals of the Championship were completed from the goal and penalty area, into the low zones of the Goal Zone. Sainz de Baranda *et al*. (2008) reported a similar tendency in the 2002-FIFA World Cup. This implies that football players, especially goalkeepers, and coaches in training sessions have to familiarise themselves with the specific scoring possibilities within these areas (Michailidis *et al*., 2013). In particular, Hoff (2005) and Sainz de Baranda *et al*. (2008) emphasised that strength of the lower body and arm span of a goalkeeper determine the efficacy of his/her physical actions, such as the dive (a parry or a fly). To prepare for situations of maximum intensity, goalkeeper-training sessions need to focus also on actually practising to deal with shootings targeting the low zones of the Goal Zone from close distances.

Whilst some previous studies investigated physical actions of goalkeepers, such as save, foot control, dive, jump, displacement, etc. (Sainz de Baranda *et al*., 2008; Spratford *et al*., 2009; Paz-Franco *et al*., 2014), this study tried to identify the fundamental facts that are relevant to the actions and training of a goalkeeper, which have not been fully covered in previous literature. During the Championship, a total of 72 shots on target and goals were made from different angles, whilst 55 were from the same angles in relation to the low zones of the Goal Zone, with the difference being statistically significant (χ^2=377.59; p<0.001). With regard to the shots on target, the low zones of the Goal Zone and the angles, 46 shots on target were from different angles and 42 shots were from the same angles. It means that goalkeepers had successfully blocked shots from various combinations. However, 26 goals were scored from different angles and 13 goals were from the same angles in relation to the low zone of the Goal Zone, which produced a statistically significant difference between these scores (χ^2=146.00; p<0.001).

In the critical moments during the Championship, the goals scored from different angles would be identified as being more effective for offensive players and more vulnerable for goalkeepers based on the findings. In this respect, Philippaerts *et al.* (2006) reported that lateral saves by a goalkeeper are determined by their technical skill to deal with lower balls and their body strength. Furthermore, many scholars (Hughes, 1996; McGarry & Franks, 2000; Savelsbergh *et al*., 2002; Hughes & Franks, 2004; Paz-Franco *et al*., 2014), have reported that a goalkeeper needs the capacity of circumstantial judgement, adequate body movements and effective cooperative defence to deal with critical moments during the game.

Soccer is a team sport, which needs a holistic approach when training the single individual as an important asset and the team as an effective mechanism. Paz-Franco *et al*. (2014) explained that team sports have to adapt to changing environments, which would be intrinsic

in the nature of team sports like futsal (football indoors) and soccer. Generally, elite soccer players have to have high aerobic endurance fitness to cope with the intense nature of the modern game (McMillan *et al*., 2005). In particular, goalkeepers need not only physical strength, but also the motor skill and some cognitive components, such as understanding the soccer game and reasonable decision-making abilities (Lee *et al*., 2007; Paz-Franco *et al*., 2014). Proper circumstantial judgement by and the technique of a goalkeeper for physical responses, need to be internalised naturally through constant training and education, which could influence his/her game in different ways. According to Knapp (1963), whilst technique means the ability and skill to execute motor components, decision-making in sporting environments represents a reasonable choice of technique in changing circumstances, in which his/her action is located. Decision-making are especially crucial in determining game results and the performance of individual players (Thomas, 1994; Paull & Glencross, 1997; Blomqvist *et al*., 2001; Araujo *et al*., 2006).

In a defensive situation, the main duty of a goalkeeper would be clearing a ball outside the goalposts and blocking or holding a ball so that it cannot pass over the goal line. In other words, during the Championship attackers shot balls aiming at lower areas than the knees of goalkeepers. From a relatively close distance, low-flying balls or balls aiming at low zones could be more troublesome than others from the perspective of a goalkeeper. Sainz de Baranda *et al*. (2008) and Spratford *et al*. (2009) stress that shots from a close distance should dominate in training sessions for goalkeepers based on their findings and that previously reported in the literature. Yiannakos and Armatas (2006) argue that the physical abilities and stamina of players have to be improved to dominate the games.

For these reasons, consistent training directed at improving body strength, accurate basic posture, positions and movements in these situations are needed (Hoff, 2005; Philippaerts *et al.*, 2006; Yiannakos & Armatas, 2006; Sainz de Baranda *et al*., 2008), which could also enable goalkeepers to exercise the right decision-making in actual game situations (Thomas, 1994; Paull & Glencross, 1997; Blomqvist *et al*., 2001; Araujo *et al*., 2006). The specific training methods, about posture and position for low-flying balls or balls flying toward low zones from a close distance and at different angles, have to be developed and performed to improve the capacity of the physical skills of goalkeepers and their effective decision-making. Furthermore, the presentation of training sessions should include constant practices aiming for proper adaptation in different circumstances. Goalkeepers have to master basic skills from the early stage of their careers, so that effective decision-making of goalkeepers in various situations can be nurtured.

From the perspective of a goalkeeper, he/she would need the physical capacity for quick movements and bodily instincts to handle shots from different angles from a close distance, which happens in few seconds. However, these abilities cannot be established properly in a short period. Therefore, there have been several reports of the benefits of power endurance, motor skills and cognitive training at youth stages to develop the competence of players (Winkler, 2001; Reilly, 2005; Balčiūnas *et al*., 2006). In this respect, methodical training programmes about basic posture as a preparation and lateral saves, like dive, are constantly practised starting from youth teams to enhance the physical and mental competencies of goalkeepers.

Finally, setting unavoidable situations aside, cooperative defence strategies could reduce attacking options for the opponent (Yoon *et al*., 2012). It means that goalkeepers could increase the possibility of avoiding critical attacking moments from the opponent, such as low-flying balls from inside the penalty area. Although the critical situation cannot be avoided even in cooperative defence, a goalkeeper could respond stably due to the increased predictability resulting from cooperative defence. This can reduce the attacking options of the opponent. In this respect, goalkeeper training to cope with various situations has to be developed in relation to cooperative defence strategies (Sainz de Baranda *et al*., 2008; Yoon *et al*., 2012). This has to be practised constantly and repeatedly so that goalkeepers can engage with quick decision-making and effective motor performance.

CONCLUSIONS

Goalkeepers perform crucial roles in characterising soccer games by their momentary decision-making and motor skills, which have to be inculcated by constant training of basic defensive tactics and practising to adapt to various circumstances. For the fundamental orientation towards goalkeeper coaching and training, this study analysed one major soccer tournament, the 2012-European Championship, to identify meaningful implications in relation to shots on target, goals scored and the related variables. The results showed that 88 shots on target (72%) out of a total of 123 and 39 goals scored (53.4%) out of a total of 73 were aimed at the low zones of the Goal Zone. Goalkeepers blocked 80 shots (65%) from outside the penalty area, whilst 65 goals (89%) were made inside the goal and penalty area, which implies that close-range shots would be more critical in predicting the direction and result of the game than any other factors.

With regard to the combination of the Goal Zone and shooting angles, 72 shots on target and goals scored were from different angles, while 55 shots were from the same angles in relation to the low zones. Significantly, 26 goals were scored through different angles and 13 goals were from the same angles when targeting the low zones of the Goal Zone. Given these results, it can be inferred that attackers are prone to seek their scoring opportunities by aiming their shots on the low zones of the Goal Zone. In addition, goalkeepers in various situations could be vulnerable to shots aimed at the low zones from different angles. In this respect, systemic training methods are required to improve the ability of goalkeepers to deal with the critical situations occurring during soccer games. Based on the findings of this study, practitioners and researchers need to develop goalkeeper-training programmes, which should especially target low-flying balls from a close-distance, along with developing physical strength and decision-making abilities, starting from youth stages. Further research about these topics for different soccer competitions will strengthen and enrich the rationale of the necessity of specific training and systemic training methods for goalkeepers.

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