

## EUROPEAN FOOTBALL CHAMPIONSHIP 2020/2021: ANALYSIS OF GOALS SCORED AND EVALUATION OF STATISTICALLY PARAMETERS IN MATCHES<sup>1</sup>

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**Abstract:** The aim of the study was to analyse the characteristics of goals scored in the tournament in terms of a specific way of evaluation. Based on a sample of 51 matches and the participation of 24 national teams, this study is based on the personal observation of the researcher, that is, the analysis was based on watching the matches live via domestic cable channels, as well as on the UEFA official YouTube channel. A two-way analysis of variance between groups was used to process one part of the data. A total of 142 goals were scored. The fixed factor showed the highest prevalence of goals scored in the period of 45-60 minutes (30), while the fixed factors included the types of attacks and the number of goals scored: (80) continuous attacks (mean value = 53.7 minutes), (13) fast attacks (59.5 minutes), (14) counter-attacks (55.7 minutes) and (35) set plays or interruptions (51.8 minutes). One final touch was evaluated (80 or 65.6%), as well as two touches (17 or 13.9%). The highest number of hits (37) was achieved with the inside of the foot (mean value = 53.5 minutes) compared to (27) when hitting the ball with the header (54.4 minutes) and (21) when kicking the ball with the middle part of the foot ridge (49.5 minutes). Most goals were scored with the right foot (66 or 46.5 %), i.e. (90) goals were scored within sixteen meters (outside the box) (54.1 minutes). The first goal provided value (33 or 64.7 %) of the final victory in the match. The obtained results point out to the coaches that they should focus on quick attacks and counter-attacks that consequently lead to scoring goals. Attention must also be paid to more ball strikes with the outside of the foot and the outside part of the foot ridge.

**Keywords:** *football performance indicators, technical elements, tactical elements, goal, video analysis*

### 1. INTRODUCTION

Scoring a goal in football is the most important determinant of offensive action success, although it only represents 1 % of ball possessions in professional competitions (Tenga et al., 2010). Among numerous technical and tactical aspects of players' behaviour, goals are studied the most. It is true that a goal is the key of success for teams (Cachay & Thiel, 2000) and therefore its analysis in all matches in a big soccer tournament (European Championship, World cup) allows for multiple assessments.

Alberti et al. (2013) indicate that a significantly higher frequency of goals scored was recorded in the second half, with the highest rate in the final 15-minute periods of the game during major European football championships.

Feedback is one of the most important factors in improving the performance of football players. Coaches used to give feedback based on their subjective observations. Coaches' subjective observations may or may not be accurate, i.e. they are quite unreliable. This was supported by a study (Hughes & Franks, 2004) where it was found

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that the percentage of coaches who were correct in their assessment after the game was less than 45 percent during the 45 minutes of a soccer match. This is because human memory has limitations according to which we cannot remember the entire event during the match.

Football technique is the skill or ability of a player to perform simple and rational, free and easy, fast, safe and efficient movements with the ball in various, purposeful movements and in the most complex conditions (Aleksić & Janković, 2006). In short, technique should be understood as the effectiveness of the soccer player's actions on the pitch.

Tactical knowledge not only facilitates the processing of information, but enables targeted and expedient adaptation of the players' potential reactions in the surrounding and immediate conditions of the game (Ali, 2011).

Attack is the backbone of the football game. The basic goal of the football game is victory, and it is achieved with the maximum use of attack. In the modern practice of the football game, the means by which attack actions are carried out include: quick attack, counter-attack and combined attack (Savić, 2011).

The aim of this study was to analyze the characteristics of goals scored at the last European Football Championship 2020/2021, and also to evaluate the selected statistical parameters during the matches of the competition. In particular, the mean time of scored goals was examined depending on different observed fixed factors. The general hypothesis of the study is that more goals were scored in the second half than in the first and overtime periods. The special hypotheses of the study are that the most represented type of attack actions were continuous and quick attacks, then that there were most right-footed shooters, as well as that the space within 16 meters was the most represented when scoring goals. Likewise, it is assumed that during the set interactions between different variables and game periods, scored goals come approximately in the middle of minute divisions. And the last hypothesis would be that the winning teams have the best statistical parameters in the matches.

## 2. METHOD

### 2.1. Subjects

Fifty-one (51) matches were studied with the participation of 24 national teams (group phase and elimination phase of the competition). The reason for choosing the 2020/2021 European Football Championship was the participation of elite national teams (Italy, Switzerland, Turkey, Wales, Denmark, Finland, Belgium, Russia, Austria, North Macedonia, Holland, Ukraine, England, Croatia, Scotland, Czech Republic, Poland, Slovakia, Spain, Sweden, Hungary, Portugal, France and Germany).

### 2.2. Design and Procedures

The European Football Championship 2020/2021 is the sixteenth championship in a row (June 11 - July 11, 2021), which was held in European stadiums across eleven countries and eleven cities. Football matches at the championship were broadcast by Nova S and Sport Klub with the possibility of re-watching and re-analysing the TV footage. The research was based on the personal observation of the researcher who recorded the characteristics of the scored goals, which is partly defined in Table 1. Some of the statistical data, immediately after the matches, were downloaded from the EURO European Championship 2021 page through the options: overview, chronology, line-ups, statistics... The option to replay the scored goals on UEFA's official YouTube channel (UEFA Euro 2020), provided an accurate assessment of the set variables.

**Table 1.** *Definitions of analysed variables*

Continuous attacks	A slower attack with a larger number of participants, when the opponent's defence is numerically overwhelming; the attack usually starts from the attacker's half of the pitch; it can also mean a slower individual penetration towards the goal.
Quick attacks	A quickly executed attack in the opponent's half of the pitch, immediately after the ball has been taken; it is carried out against a formed last line of defence and unformed front line of defence.
Counter-attacks	The fastest possible attack from the attacker's half of the pitch, executed immediately after the ball has been taken away from the opponent; it is carried out against an unformed front line and last line of defence.

Set plays	It includes all types of set plays, i.e., scoring goals after corner kicks, after a direct free kick, after an indirect free kick, after penalties, after saved penalties, and after a side line throw-in.
Middle part of the foot ridge	A kick at shorter, medium or longer distances: a goal scored from close range by means of a “kick from the knee”, but also from a distance of over 20 meters.
Inside of the foot	This kick is performed with a relatively wide and flat hitting surface at shorter distances of 2 to 15 meters.
Outside of the foot	Short sudden kicks to the side up to 10 meters.
Inside part of the foot ridge	The ball is sent through the air in an arching path when scoring goals or kicking with a “spin” with the inner part of the foot on the outer surface of the ball.
Outside part of the foot ridge	A straightforward run-up of 3-4 steps towards the ball and a kick with the outside part of the foot on the inner surface of the ball.
Header	A hit from a standing position: when the ball comes at the height of the player’s head; a hitting movement: the ball moves a little further from the player, so it is necessary to run up towards it; a hit by jumping using both legs: it is not possible to run up towards the ball and there are opposing players in immediate vicinity of the player who scored the goal; a hit by jumping using one leg: when a player is able to make a slightly longer run up towards the ball when scoring a goal; a hit with the lateral part of the head: the player is turned sideways towards the opponent’s goal due to the close proximity of the opponent, he is unable to face the goal. It can also be performed in a fall; a header performed by the top of the head: when a player has his back turned towards the goal or his teammates who stayed behind him, so he passes behind a high ball that came to him from the front.
Special kicks	Volley: kicking the ball in the air with the inside of the foot, and the middle ridge of the foot; “Dropkick”: the shot is made after the ball touches the ground, in a similar way to the volley; Point kicks: the ball is reached at the last moment when taking a shot at the goal from close range; Sole kicks; Lower leg kicks.
Own goal	Scoring an own goal.
Penalty	A direct shot.
Penalty area	It implies a bordered area within 16 m.
Goal area	It implies a bordered goalkeeping area within 5 meters.
Outside penalty area	It includes the bordered area of the football pitch outside 16 meters.

The descriptive observation helped in obtaining the parameters of the type of attack, final contacts when scoring goals, asymmetry, the influence of the first goal on the final result, and relevant indicators in the matches. Also, the analysis method helped in observing the relationship between three variables (two categorical independent variables and one continuous dependent variable).

Dependent variable:

- time of scored goals during each match.

Fixed factor:

- division by game duration: from 1 to 15 minutes, from 16 to 30 minutes, from 31 to half-time, from 45 to 60 minutes, from 61 to 75 minutes, from 76 to the end of the game and extra time.

Fixed factors:

- types of attacks with which goals were scored during the tournament: continuous attacks, quick attacks, counter-attacks and breaks (set plays),
- the way a goal is scored: middle part of the foot ridge, inside of the foot, outside of the foot, inside part of the foot ridge, outside part of the foot ridge, header, special kicks, own goal and penalty, i.e.
- the area from which the goal was scored: the 16-meter area, the goalkeeper’s area and the area outside the 16-meter perimeter.

Observation of football matches and transmission of indicators will enable improvement in the performance of national teams and extract the latest information and innovations at the most important European football tournament.

### 2.3. Statistical Analysis

Initially, a descriptive observation of all variables was carried out, in the form of absolute and relative frequency. Apart from the simultaneous examination of the effect of each independent variable on the dependent vari-

able, while also identifying the possible effect of their interaction, a two-way between-groups analysis of variance was also used. Significance level: 0.05. Relevance intervals: 95.0 %. When significant effects were observed, one-way ANOVA indicated differences between the mean values of the dependent variable in the groups. In significant interactions, Bonferroni's post-hoc test was used. The processing of all data was performed in the IBM SPSS Statistics (IBM Corp., Version 26, Armonk, NY, USA).

### 3. RESULTS

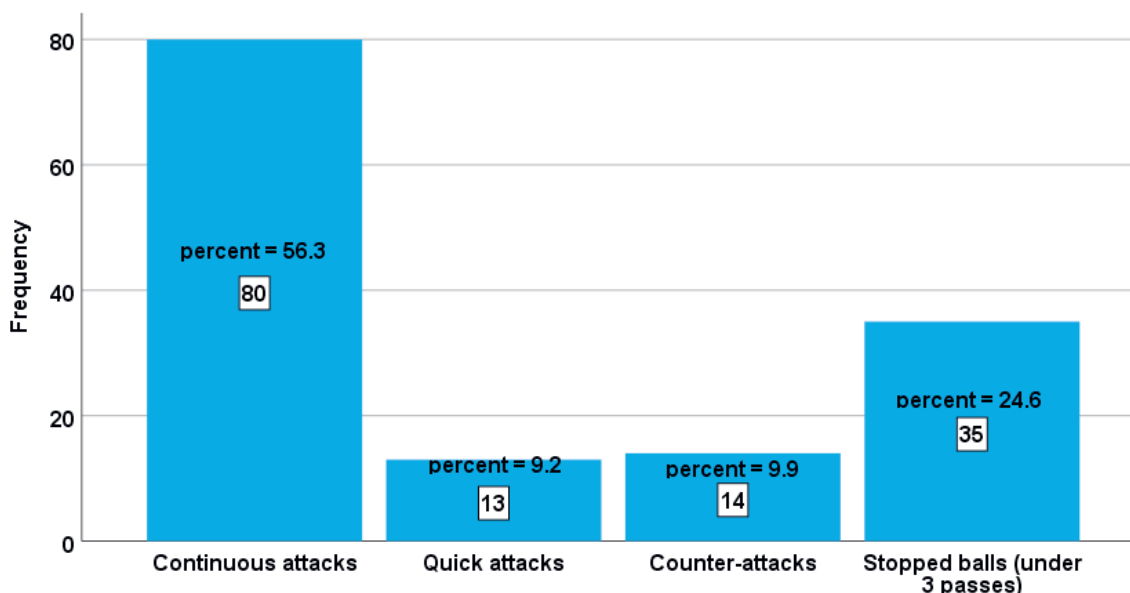
During the tournament, 142 goals were scored (2.79 per match). The analysis of the goals (Table 2) shows mostly similar numerical values or closer similar numerical values, with the exception from 1 to 15 i.e., 16 to 30 minute period as well as extra time periods. The absolute frequency was (N = 13) in the 1-15 minute period of the game, (N = 16) in the 16-30 minute period, (N = 23) in the 31-45+ minute period, (N = 30) in the 45-60 minute, (N = 24) in the 61-75 minute period, (N = 29) in the 76-90+ minute period, and (N = 7) in extra-time periods.

**Table 2.** Descriptive parameters of goals scored

<i>Time of goals scored (in minutes)</i>	<i>Number</i>	<i>%</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>
0-15 minutes	13	9.2	7.9 (8')	4.8	8.0	2	15
16-30 minutes	16	11.3	24.1 (24')	4.5	25.5	17	30
31-45 minutes	23	16.2	40.4 (40')	5.1	42.0	31	48
45 second half-60 minutes	30	21.1	53.9 (54')	4.8	54.5	46	60
61-75 minutes	24	16.9	68.3 (68')	4.2	68.0	61	75
76-90 minutes	29	20.4	84.7 (85')	5.6	84.0	77	95
90 extra time-120 minutes	7	4.9	106.0 (106')	8.8	104.0	95	121
Total	142	100	(55')				

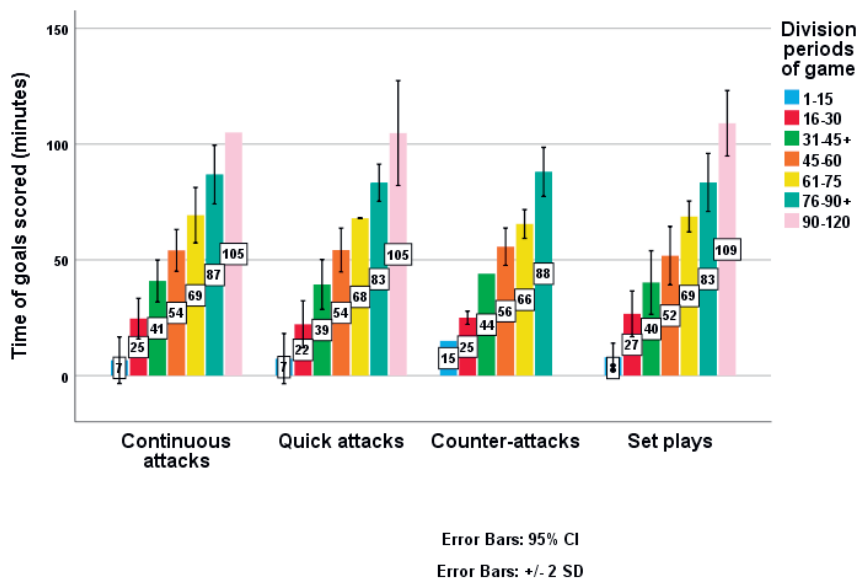
The frequency of the applicability of the types of attacks when scoring goals is presented in Figure 1. The observed results indicate that 80 (56.3%) goals were scored after continuous attacks, 13 (9.2%) after quick attacks, 14 (9.9%) after counter-attacks, and the remaining 35 (24.6%) goals were scored after stopped balls.

**Figure 1.** Types of attacks when scoring goals



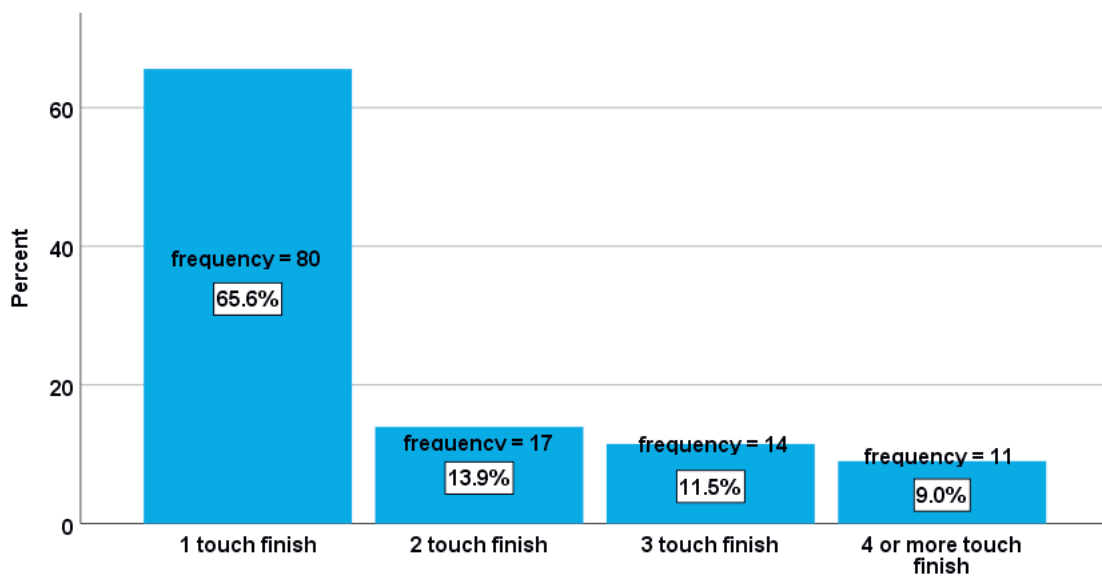
The interaction (Figure 2) effect between “division by periods of the game” and “types of attacks” when scoring goals was not statistically significant ( $F(16, 142) = 0.947, \text{Sig.} = 0.519$ ). A statistically significant main effect of the “division by periods of the game” was found ( $F(6, 142) = 407.359, \text{Sig.} = 0.000$ ). Subsequent comparisons using the one-way ANOVA ( $F(6, 141) = 614.743, \text{Sig.} = 0.000$ ), and Bonferroni’s post hoc test show the mean value of 1-15 minute-period (Mean = 7.9 or 8.3 minutes, Std. Deviation = 4.8) significantly different from 16-30 minute-period (Mean = 24.1, Std. Deviation = 4.5), then from the 31-45+ minute-period (Mean = 40.4, Std. Deviation = 5.1), from the 45-60 minute-period (Mean = 53.9 or 54.3 minutes, Std. Deviation = 4.8), from the 61-75 minute-period (Mean = 68.3, Std. Deviation = 4.2), from the 76-90+ minute-period (Mean = 84.7 or 85.1 minutes, Std. Deviation = 5.6) and from the 90-120 minute-period (Mean = 106.0, Std. Deviation = 8.8). The main effect of the “type of attacks” ( $F(3, 142) = 1.232, \text{Sig.} = 0.301$ ) did not achieve statistical significance.

Figure 2. Types of attacks, average time of goals scored, and division of game periods



The Figure 3 shows in how many touches the goals were scored during the tournament: one touch finish was observed in 80 goals (65.6%), two touch finish in 17 (13.9%), three touch finish in 14 (11.5%), and four or more touch finish in 11 cases (9.0%).

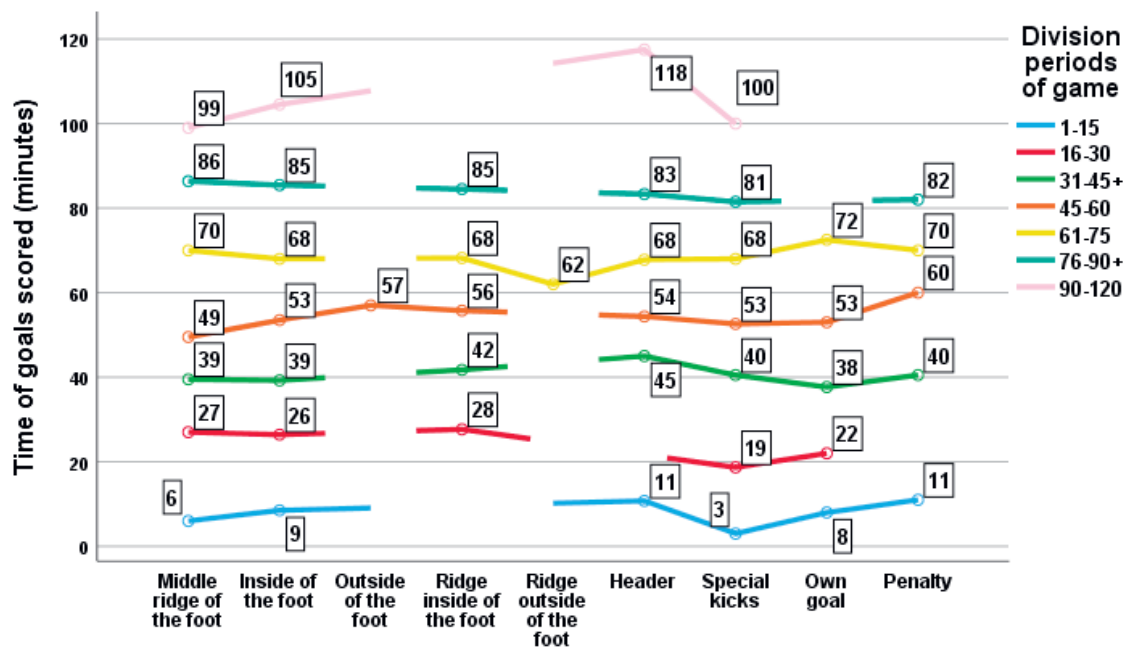
Figure 3. Display of the number of final contacts of players with the ball when scoring goals



The absolute frequency of goals scored were (N = 21) for the kicks with the middle ridge of the foot, (N = 37) for the kicks with the inside of the foot, (N = 1) for the kicks using the outside of the foot, (N = 18) for the kicks with the inside part of the foot ridge, (N = 1) for the kicks using the outside part of the foot ridge, (N = 27) for the headers, (N = 17) for the special kicks, (N = 11) for the own goals, and (N = 9) for the penalties.

The interaction (Figure 4) effect between the “division by periods of the game” and the “ways of scoring goals” was not statistically significant ( $F(29, 142) = 1.015, Sig. = 0.459$ ). A statistically significant main effect of the “division by periods of the game” was found ( $F(6, 142) = 451.452, Sig. = 0.000$ ). Subsequent comparisons using one-way analysis of variance ( $F(6, 141) = 614.743, Sig. = 0.000$ ), and Bonferroni’s post hoc test, show the same statistically significant differences between the mean values of the results in the categorical independent variable the “division by periods of the game”, as in the first observation (Figure 2). The main effect of the “ways of scoring goals” ( $F(8, 142) = 2.085, Sig. = 0.044$ ) did reach statistical significance. However, subsequent comparisons using one-way ANOVA’s ( $F(8, 141) = 1.197, Sig. = 0.306$ ), and Bonferroni’s post hoc test show that the mean value of the kicks using the middle ridge of the foot (Mean = 60.1, Std. Deviation = 32.3) had no significant difference from the kicks with the inside of the foot (Mean = 59.1, Std. Deviation = 25.8), and from the kicks with the outside of the foot (Mean = 57.0), the inside part of the foot ridge (Mean = 54.6, Std. Deviation = 18.7), the outside part of the foot ridge (Mean = 62.0), headers (Mean = 60.8, Std. Deviation = 28.5), special kicks (Mean = 47.4, Std. Deviation = 28.2), own goals (Mean = 37.0, Std. Deviation = 21.5), and penalties (Mean = 51.9, Std. Deviation = 24.1).

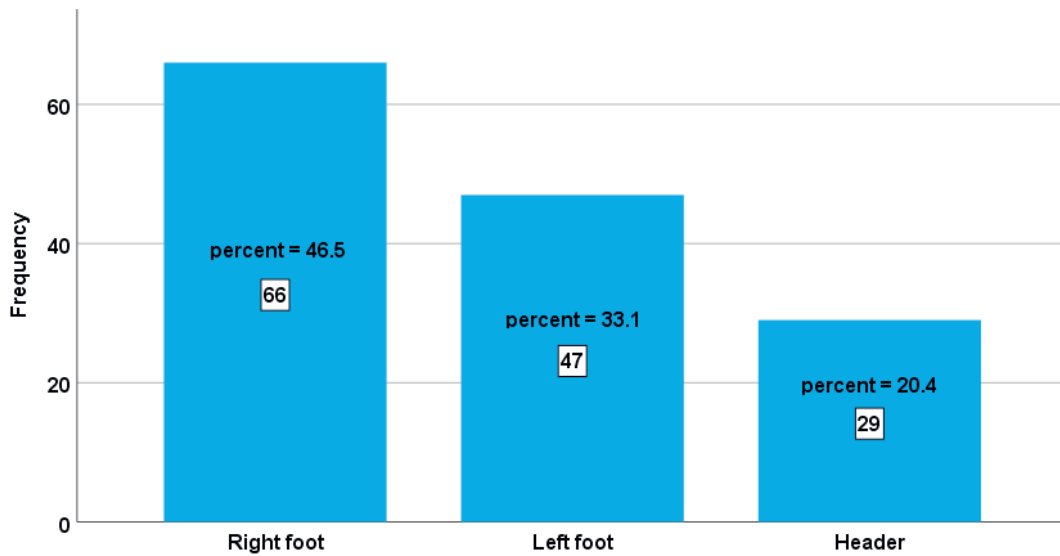
**Figure 4.** Ways of scoring goals (technical elements - kicks per ball), average time of goals scored and division of game periods



Non-estimable means are not plotted

The Figure 5 shows the different ways with goals scored during the tournament: right foot were observed in values (66 or 46.5%), left foot (47 or 33.1%) and header kick (29 or 20.4%).

**Figure 5.** Frequency of asymmetry of goals scored (right - left foot) as well as goals scored with different types of headers



The absolute frequency of goals scored were (N = 90) in the penalty area, (N = 34) for the goal area, and (N = 18) for the outside penalty area.

The interaction (Figure 6) effect between the “division by periods of the game” and “area of materialization” was not statistically significant ( $F(11, 142) = 0.527, Sig. = 0.882$ ). A statistically significant main effect of the “division by periods of the game” was found ( $F(6, 142) = 346.467, Sig. = 0.000$ ). Subsequent comparisons using one-way analysis of variance ( $F(6, 141) = 614.743, Sig. = 0.000$ ), and Bonferroni’s post hoc test, show the same statistically significant differences between the mean values of the results in the categorical independent variable – the “division by periods the game”, as in the first, and second observations (Figures 2 and 4). The main effect of the “area of materialization” ( $F(2, 142) = 1.146, Sig. = 0.321$ ) did not reach statistical significance.

**Figure 6.** Areas of materialization, average time of goals scored, and division of game periods

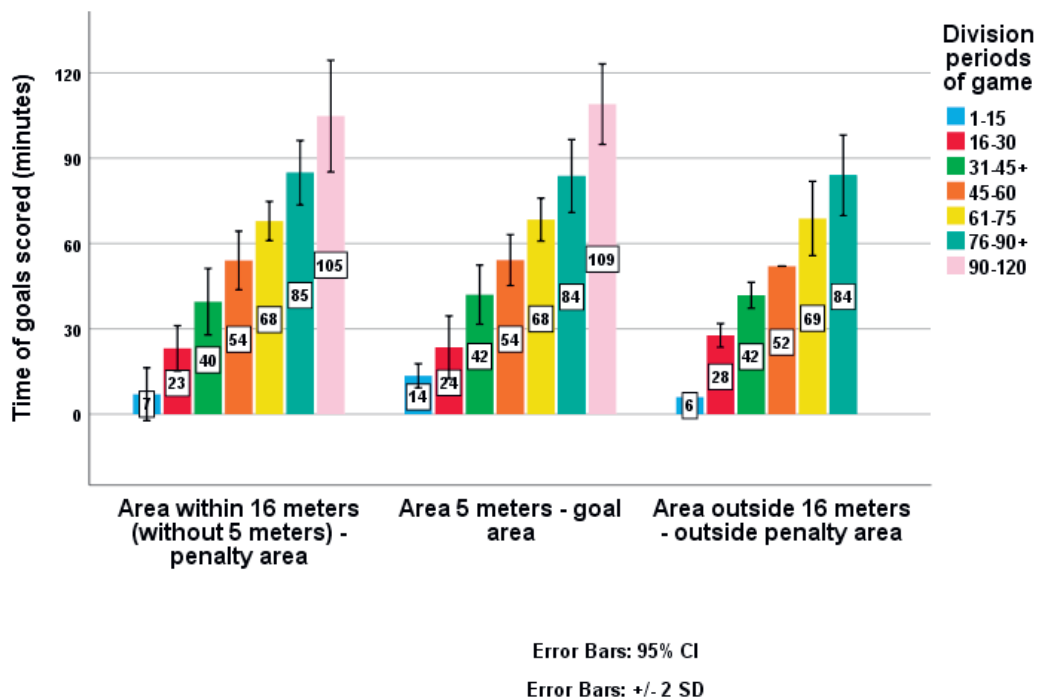
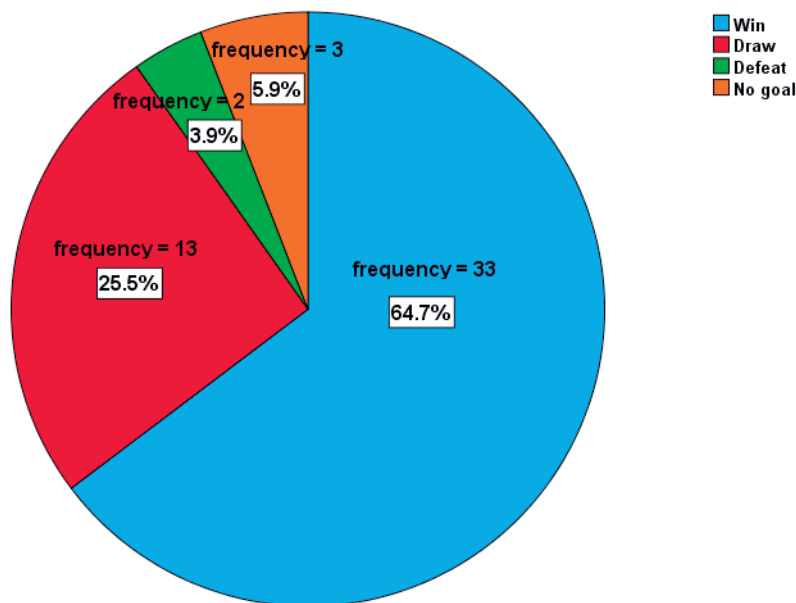


Figure 7 shows the impact of the first goal on the final outcome of the matches during the tournament: the team that scores first won in 33 (64.7%) games, finished with a draw in 13 (25.5%) games, and suffered a defeat in 2 (3.9%) games, whereas there was no goal in 3 (5.9%) games.

**Figure 7.** Influence of first goal scored on final outcome of matches



It is quite obvious that the winning teams were quite dominant in their matches (Table 3), taking into account: total shots (13.1), shots on goal (5.5), ball possession (53.6%), passes (517.0), accuracy of passes (82.5%), offsides (1.8), and corner kicks (5.0).

**Table 3.** Differences between teams that won, drew and lost in tournament match statistics

Group stage	Winner			Drawer			Loser		
	Mean	Std. Deviation	Median	Mean	Std. Deviation	Median	Mean	Std. Deviation	Median
Total shots	13.1	5.7	13.0	10.9	4.4	11.0	10.4	5.9	8.5
Shots on goal	5.4	2.6	6.0	3.3	1.8	3.5	2.5	2.0	2.0
Ball possession (%)	53.6	11.7	55.0	50.0	21.1	50.0	46.4	11.7	45.0
Passes	517.0	125.8	527.5	479.9	210.0	482.5	440.3	106.4	435.5
Accuracy of passes (%)	82.5	7.9	84.0	81.3	11.5	84.0	80.7	5.2	81.5
Fouls	11.3	2.9	11.5	11.6	3.8	11.5	10.8	3.6	10.0
Yellow cards	0.9	0.8	1.0	1.7	1.3	1.5	1.6	1.1	2.0
Red cards	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0
Offsides	1.8	1.5	2.0	1.3	1.1	1.0	1.5	1.2	1.0
Corner kicks	5.0	2.3	5.0	3.9	3.1	4.0	3.9	3.1	4.0
<i>N = 7</i>									
Knockout phase 90'	Winner			Drawer			Loser		
	Mean	Std. Deviation	Median	Mean	Std. Deviation	Median	Mean	Std. Deviation	Median
Total shots	10.6	4.0	11.0	/	/	/	11.7	5.9	10.0
Shots on goal	4.9	2.4	5.0	/	/	/	2.7	1.8	3.0
Ball possession (%)	48.3	4.8	48.0	/	/	/	51.7	4.8	52.0
Passes	464.7	85.5	445.0	/	/	/	488.4	83.1	451.0



Accuracy of passes (%)	82.3	6.4	83.0	/	/	/	82.1	5.8	83.0
Fouls	10.6	3.6	11.0	/	/	/	10.0	3.1	9.0
Yellow cards	1.1	1.2	1.0	/	/	/	2.0	1.3	2.0
Red cards	0.0	0.0	0.0	/	/	/	0.3	0.5	0.0
Offsides	1.3	0.8	1.0	/	/	/	1.9	1.6	2.0
Corner kicks	4.4	3.0	5.0	/	/	/	4.9	3.2	3.0
<i>N = 8</i>	<i>Winner</i>			<i>Drawer</i>			<i>Loser</i>		
<i>Knockout phase 120'</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Median</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Median</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Median</i>
Total shots	21.3	5.1	21.5	15.3	8.5	14.0	11.8	4.2	12.5
Shots on goal	7.5	3.0	8.0	5.3	2.8	5.0	4.0	2.0	3.0
Ball possession (%)	58.5	7.0	57.0	50.0	18.9	50.0	41.5	7.0	43.0
Passes	761.0	90.6	746.5	629.5	240.9	578.5	555.3	97.0	577.5
Accuracy of passes (%)	87.0	1.4	86.5	82.1	8.1	86.0	81.0	1.4	80.5
Fouls	9.3	1.5	10.0	15.6	2.8	14.5	20.0	6.4	21.5
Yellow cards	1.3	1.0	1.5	2.4	1.5	2.0	2.0	0.8	2.0
Red cards	0.0	0.0	0.0	0.1	0.4	0.0	0.3	0.5	0.0
Offsides	2.5	1.7	3.0	2.9	2.6	1.5	2.8	2.2	2.0
Corner kicks	5.0	2.6	5.0	6.3	3.7	5.5	3.8	2.2	4.0

#### 4. DISCUSSION

The study, which examined the goal scoring patterns in the Euro 2004 championship showed results (organized offense: 44.1 %, counter attacks: 20.3 %, and set plays: 35.6 %) (Yiannakos & Armatas, 2006). However, Piecniczek (1983) found that 27 % of the goals during the 1982 World Cup Tournament were scored after a quick offense and 28 % through organized offensive actions. Findings provide evidence for the importance of practicing set plays because of their potential productivity despite their relatively low occurrence in comparison to open play opportunities.

The observed applicability of different ball kicks when scoring goals is expected, given the available proportion of foot kick surfaces during final realizations. The analysed parameters of the available area in the football pitch (Figure 6) from which goals were scored can be explained by the fact that the advantage in the variable inside the penalty area is understandable, given that players in these situations have a complete perception the goal in front of them as well as a shorter ball flight length when hitting the target compared to the variable outside the penalty area. The 2010 World Cup tournament saw 82.07 % of the goals being scored from the penalty box. This is slightly lower than the 85.7 % for the 2002 World Cup (Njororai, 2004).

#### 5. CONCLUSION

The proposed general hypothesis, as well as a number of special hypotheses, were confirmed by this paper, except for the hypothesis concerning interactions of variables, which was partially confirmed and likewise the hypothesis on match statistics, only in the group phase of the competition. In situational training, more attention should be paid to quick attacks, and counter-attacks in terms of crossovers, empty space in-depth run-ups, and the fastest possible realization of attacks. Exercising the different surfaces of the foot is considered crucial with extra attention given to kicks using the inside and the outside of the foot. However, the times of goals scored by different ways of kicking the ball do not have statistical significance, in contrast to the isolated observation of these technical elements, which is also indicated by the percentage of representation when scoring goals. A new current study (average time of scored goals) certainly provides pragmatic information about the contemporary repercussions of the most important tournament in European football.

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