



## Evaluation of the goal scoring patterns in European Championship in Portugal 2004.

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### Abstract:

*The aim of the present study was to study the characteristics of goal scoring patterns in top leveled soccer matches. The sample the study constituted of 32 games of the European Championship (Euro 2004). Cross tabulation and chi-square methods were used for the data analysis. The results revealed that more goals were achieved in the second half (57.4%) than in the first half (42.6%,  $p < 0.05$ ). As far as the type of offense concerned, goals achieved through organized offence presented the higher frequency (44.1%) following goals after a set play (35.6%) and counter-attacks (20.3%). Regarding the actions that occurred prior to the goal, long passes presented the higher frequency (34.1%). More specifically, the kind of dead-ball situations was examined, and the conclusion is that corners and free kicks showed bigger frequency of appearance in the game. Finally, regarding the zone of scoring attempt, the following percentages were presented: 44.4% penalty area, 32.2% goal area, and 20.4% outside the penalty area. The results reveal that coaches should focus on train of the dead-ball situations. Also attention must be given to the fatigue that players appear towards the end of a game, which consequently leads to goal scoring by the opponent team, and to its confrontation through training.*

**Key words:** soccer, tactics, goal, video-analysis.

## **1. Introduction**

In competitive sports, and more specifically in soccer, the level of performance is determined by a number of dexterities and abilities that are significantly inter-correlated: Technique (coordination abilities, kinetic skillfulness), tactics (cognitive and planning abilities), psychological factors (motivation, desires, willingness) and finally, fitness (Weineck, 1997). In football, tactics is one of the very important factors that define the outcome of the game and the final result. The subjective element in tactic evaluation is prevalent, since soccer is a complex sport and many external factors influence its progress (Konstantinidou, 2001).

Tactics is the contexture of familiar techniques and normal movements, or otherwise their systematization into forms that their target is to solve various athletic issues that may appear during a game (Kotzamanidis, 1999). Lack of tactics and strategy is one of the basic reasons for of a team's bad performance (Ali, 1998). Low frequency of scoring is one of soccer's characteristics; thus, an objective evaluation of the specific characteristics of scoring that directly determine the factors which ultimately lead to successful attempts and goals is imperative. Great attention has been given to the analysis of goal accomplishment from a tactical point of view, such as the offensive methods used in scoring as well as the number of passes. This kind of analysis is important because it demonstrates the general characteristics of team successful offenses.

During a football match, the coach can become the recipient of a great amount of information; as a result he might not be able to evaluate and objectively exploit all the technique and tactical elements that may come along (Franks and Miller, 1991). An objective record of team behavior and a collection of the important information can be achieved with the method of observation (Armatas, Giannakos, Ampatis and Sileloglou, 2005).

The analysis of a match provides the capability of defining the tactical elements of under examination team. Goal scoring, which is the climax and the target of any offense, is one of the most important variables (Michailidis, Michailidis, Papaiakevou and Papaiakevou, 2004). However, the analysis of the effort prior to a goal is extremely valuable to coaches and researchers (Garganta, Maia and Basto, 1997).

Despite the fact that there is ample amount of studies that have examined the characteristics of goals that have been achieved in many tournaments (Olsen, 1998; Jinshan, Xiaoke, Yamanaka and Matsumoto, 1993; Garganta et al., 1997; Michailidis

et al., 2004), the need for constant record and evaluation of football characteristics is prevalent since it presents continuous evolvement and change as far as the mode of the game is concerned. Additionally, the information collected from researchers through these studies, and is transferred to coaches and players, is very important for the design of the training, the choice of the appropriate tactic and its application in the game.

The purpose of this study was to record and evaluate the characteristics of goal scoring patterns in the European Championship conducted in Portugal in 2004. Sub-targets were to record: a) the exact time of goal scoring (first and second half of the game), b) the kind of offense through which the goal was scored, c) the way that the goal was scored, d) the actions prior to the goal, e) the frequency of set plays and f) the area from which the goal was scored.

## **2. Methods**

### ***Subjects:***

Thirty two (32) games of 16 teams from all phases from the tournament were studied. The reason for the selection of this tournament was the participation of top national European teams (Portugal, Greece, Spain, Russia, France, UK, Croatia, Switzerland, Denmark, Italy, Bulgaria, Czech Republic, Nederland, Germany, Latvia).

### ***Study Design - Instrumentation***

The football games were videotaped and digitized with the help of a Sony video SLV-SE 210D, an AMD-XP PC professional 1333 GHz and a television capture board for PC (PCTV, Pinnacle Systems GmbH, Braunschweig, Germany). The study was based on the researcher's personal observation who recorded the characteristics of the goals scored. The Sportscout video-analysis program for PC was used for the data recording. The videotaped game, with the help of a fixed observation and recording protocol is a multi-search tool. This way the researcher has the ability to register all the actions he believes are important for the study, and then analyze them with the help of a PC (Tsamourtzis, Sfigos and Tsimpiris, 2001).

The analysis method assisted in observing: 1) the frequency of goal scoring per 45 minutes (first and second half), 2) the kind of offense through which the goal was scored (organized offense, counter-attack, set plays), 3) the actions prior to the goal

(long pass, combination play, individual action, direct shot, own goal), 4) the set plays (corner-kick, free kick, penalty, throw-in), 5) the area from which the goal was scored (goal area, penalty area, outside the penalty area). The observation of the chosen football games, was conducted in the department of Technical and Tactical Analysis in the Laboratory of Sports Performance and Coaching.

### ***Data Analysis***

All data were analyzed using the statistical package for PC SPSS 12.0. Cross-tabulation analysis was used for the analysis of the features. Chi-square analysis was used to determine the statistically significant differences and the level of significance was set at  $p < 0.05$ .

### **3. Results**

Figure one exhibits the frequency of goal scoring as this is examined in a time-basis of half-games. There is statistically significant difference in goals scored in the second half compared to the ones scored in the first half ( $\chi^2=4.38$ ,  $p < 0.05$ ).

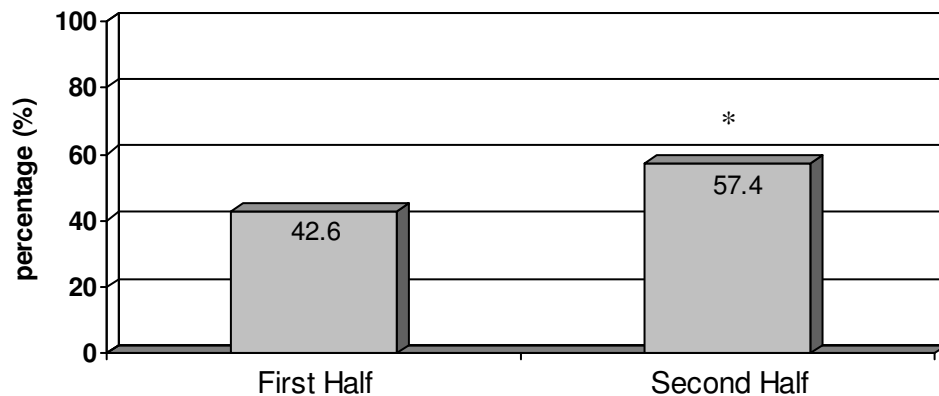


Figure 1. Frequency of goal scoring / 45 min.

After examination of the type of offense during which a goal was scored, it was observed that 44.1% of the goals were scored after an organized offensive move, 20.3% after a counter-attack, and the remaining 35.6% after a set play (Figure 2). The statistical analysis showed a statistically significant differences between the goals

scored after organized offensive moves and counter-attacks ( $\chi^2=12.97$ ,  $p<0.05$ ) and the ones scored after set plays and counter-attacks ( $\chi^2=5.81$ ,  $p<0.05$ ).

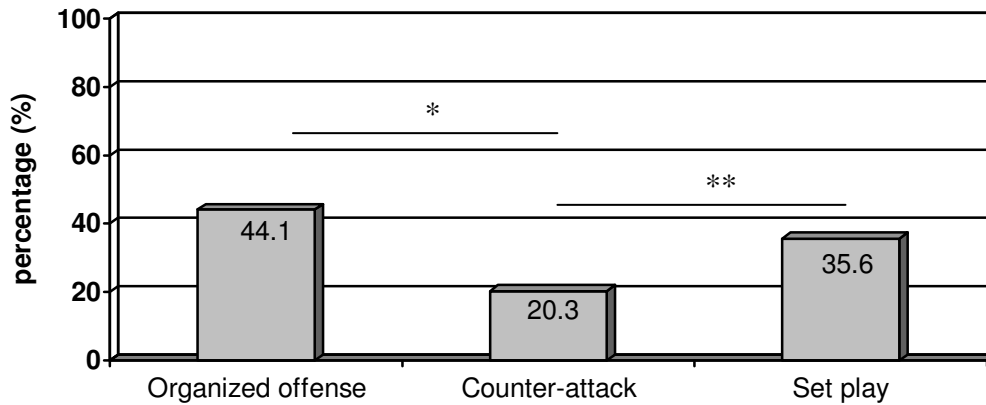


Figure 2. Type of offensive style when goal scored.

As far as the actions that lead the goal are concerned, the analysis presented that 34.1% of the goals were resulted from long passes, 29.3% from combination play, 17.1% from individual actions, 14.6% from direct shots and finally 4.9% from own goals (Figure 3).

A statistical elaboration of the data exhibited an important difference of the percentage of goals scored after a long pass and the percentage of goals scored after individual action ( $\chi^2=7.58$ ,  $p<0.05$ ), direct shots ( $\chi^2=10.32$ ,  $p<0.05$ ) and own goals ( $\chi^2=27.15$ ,  $p<0.01$ ). Furthermore, there is a significant difference between the goals scored after player's combination and the ones scored after individual actions ( $\chi^2=4.17$ ,  $p<0.05$ ), shots ( $\chi^2=6.30$ ,  $p<0.05$ ) and own goals ( $\chi^2=20.99$ ,  $p<0.01$ ).

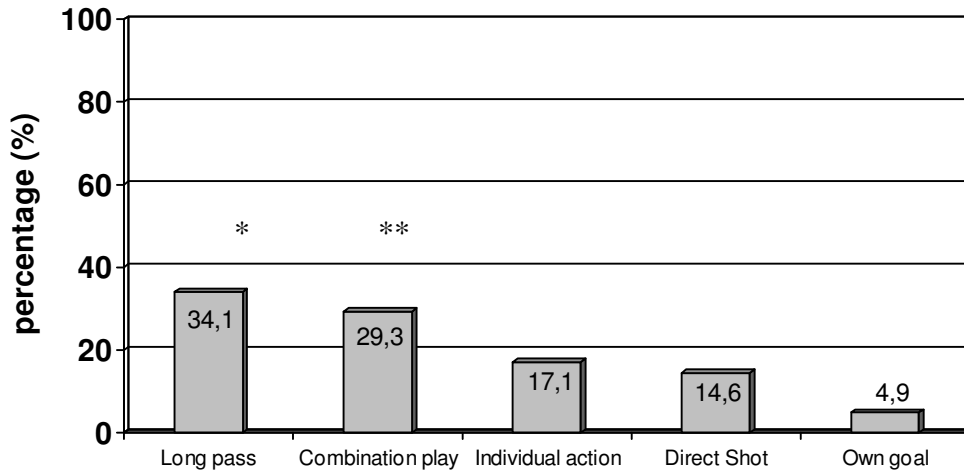


Figure 3. Actions prior to goal scoring

The kind of set play was recorded in reference to the percentage of goals. More specifically, the 40% of the set plays were corner-kicks, 30% were free-kicks (direct or indirect), 25% were penalties and 5% came from throw-in (Figure 4). The statistical analysis presented a significant differences between the goals scored after corner-kick and the ones scored after penalty ( $\chi^2=5.12$ ,  $p<0.05$ ) and throw-in ( $\chi^2=35.12$ ,  $p<.01$ ).

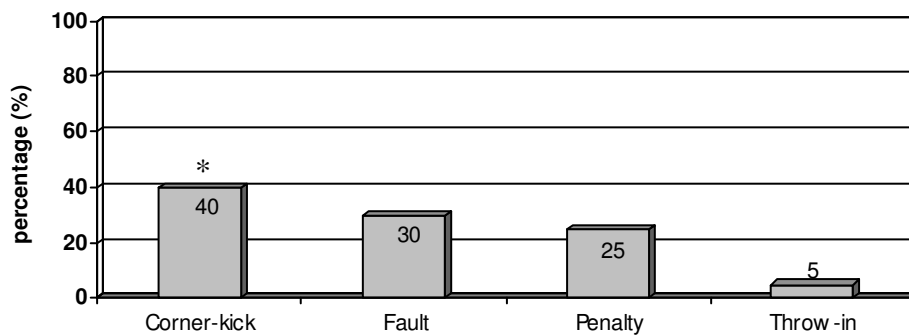


Figure 4. Frequency of set plays types.

The area of the field where the offensive attempt was materialized was recorded. The findings indicate that 44.4% of the goals were scored inside the penalty area, 35.2% inside goal area and 20.4% outside the penalty area (Figure 5). The data analysis showed that there are statistically significant differences between goals scored inside the penalty area and goals scored outside the penalty area ( $\chi^2=13.14$ ,

$p < 0.01$ ), as well as between goals scored inside the goal area and goals scored outside the penalty area ( $\chi^2 = 5.45$ ,  $p < 0.05$ ).

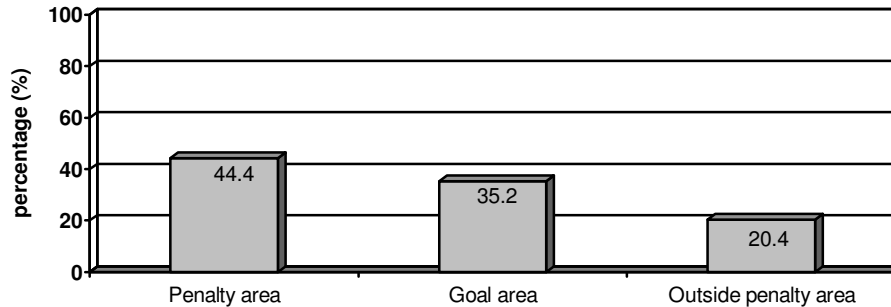


Figure 5. Area of materialization of final attempt.

#### 4. Discussion

The results of many studies indicate that the goal and its characteristics are vital for soccer, since they provide useful data not only for the configuration of team tactics, but also for the development of individual technical and tactical ability of each player (Garganta et al., 1991). According to the above, the constant study of the elements of goal scoring patterns should be an integral part of examination from researchers, so as to reach valuable conclusions and provide ways of confrontation of the offensive tactics by the defense and vice versa.

The results point to the conclusion that the majority of goals are scored in the second half of the match (Figure 1). The review of relevant studies that concentrated on the goal scoring in reference to time of accomplishment (per half time or per 15-min) supports that the frequency of goals scored during a match is time dependent, (Saltas and Ladis, 1992; Abt, Dickson and Mummery, 2002; Bekris, Louvaris, Souglis, Hountis and Siokou, 2005; Sotiropoulos, Mitrotasios and Travlos, 2005) while others purport that there is no immediate correlation between them (Jinshan et al., 1993; Michailidis et al., 2004). According to Reilly (1996), a greater deterioration in physical condition among defenders (thereby providing attackers with an advantage) and lapses in concentration. From a purely physiological perspective there is a strong body of knowledge supporting a reduction in physical condition over the course of a match leading to a state of fatigue and reduced physical performance

(Saltin, 1973; Bangsbo, 1994). Additionally, Reilly (1996) reports that play may become urgent towards the end of play as teams chase a result. Although, “urgent” game is difficult to quantify, it would appear that the players are more willing to take greater risks towards the end of a match in order to effect an outcome (Abt et al., 2002). Finally, it is also possible that the losing team pushes players forward in order to create scoring opportunities, thereby scoring themselves or conceding further goals (Reilly, 1997).

Regarding the type of offense during goals were scored, it was found that organized offensive moves are presented as the majority, while counter-attacks exhibited a lower percentage of appearance (Figure 2). Piecniczk (1983) found that 27% of the goals during the World Cup Tournament in 1982 were scored after a quick offense and 28% through organized offensive actions. Also, according to Dufour (1991) 88% of the goals in the World Cup Tournament in 1990 came from an organized offense and 12% from a strike offense. A more recent study (Armatas, Ampatis and Yiannakos, 2005) found that despite the fact that the frequency of counter-attacks in modern football is rare (4.9%), they are considered to be more effective than organized offense moves; the following percentages are indicative and support such a proposition: 16.9% of counter-attacks lead to a goal whereas only 11.1% of organized offenses are successful.

The effectiveness in the execution of set plays, which are part of a team’s tactics, plays an important role in the final outcome of a game. Bangsbo and Peitersen (2000) point out the magnitude of the dead-ball situations in modern football and report that 20 are estimated to appear, in average, for each team in every match. They also cite three other studies concerning the 1990 and 1994 World Cups and the 1996 European Championship, reporting that the goal scoring patterns in these tournaments was 32%, 25% and 27% respectively. Plenty studies report results that agree with the present study (35.6%), pointing out the proposition that the percentage of goals scored after set plays makes up the 1/3 of the total number of goals scored, irrespective of the tournament (Olsen, 1988; Zempel and Rudolph, 1990; Saltas and Ladis, 1992; Jishan et al., 1993; Fifa, 2002; Pappas, 2002; Vitsikanou, Alexiou, Tsamourtzis, Pilianidis and Tziamourtas 2005; Bekris et al., 2005). There are also reports that have analyzed top leveled games during which even higher percentages of goal scoring from dead-ball situations (45%) were recorded (Piecniczk, 1983; Hughes, 1990).

After a close study of the process that led to goal scoring the findings showed that long passes present a higher percentage of occurrence (34.1%), the combination play and individual actions following with 29.3% and 17.1% respectively. Jishan et al (1993) reached similar conclusions in their study on goal scored after long pass, during the 1990 World Cups games reporting a percentage of 27.8%; Hughes (1990) indicates that in top leveled matches this percentage is 25%. In Greek Championship of the years 1990-91 the percentages recorded were 27% (Saltas and Ladis, 1992). Finally, regarding individual actions the findings of the present study contradict previous analysis that state that the percentage of goal scoring reaches a 22% (Saltas and Ladis, 1992) and 31.6% (Manolopoulos, Komsis, Kazakas, Papadopoulos and Rizos 1999). The decline in this percentage might have been caused by the improvement of the defensive actions of the teams and the contemporary inclination for greater use combination play in the match, quick transfer of the ball, as well as movement in the field without the possession of the ball.

Besides the percentage of goal scoring after a dead-ball situation, the kind of set plays was recorded. Results showed a greater rate of occurrence of goals after corner-kicks, free-kicks and throw-ins (Figure 4). 27% of all the goals in the 1982 World Cup Tournament were a result from corner-kicks, 28% from free-kicks, 37% from penalty and 8% from throw-ins (Jishan et al, 1993). Pappas (2002) in his study on the World Cup of 2002, indicates that 24.4% of the goals resulted from corner-kicks, 39% from free-kicks, 26.8% from penalty and 9.75% from throw-ins. Although the comparison of the studies provides dissimilar results as far as the percentages are concerned, it is evident that corner-kicks and free-kicks produce more goals during a football match.

Concluding, the area where the final effort was materialized was studied, and the findings indicate that the majority of goals were scored inside the penalty area (44%), whereas 35.2% of the goals were scored inside the goal area and 20.4% outside the penalty area. Hunges, Roberson & Nicholson (1988) studied the differences between the “winner” teams and the “loser” teams in the 1986 World Cup, and found that in the winning teams, the players’ goal shots are made inside the penalty area. Olsen (1998) in his study of the 1986 World Cup reaches the same conclusion and points that 90% of goals are scored inside the penalty area. Michailidis et al. (2004), after studying the 2002-03 Champion’s League concluded that 64.4% of goals are scored inside the penalty area while 36.5% from the goal area. Vitsikanou et al. (2005), after

a study of the offensive efforts in 4<sup>th</sup> Women's World Cup, observed that the final offensive actions are expressed inside the penalty area. These conclusions are consistent with the findings of other studies, such as that of Sotiropoulos et al. (2005) that identifies that 81.8% of goals are accomplished through efforts inside the penalty area, and that of Dufour (1993) that proposes that 80% of goals are scored inside the penalty area and 15% inside the goal area. The increased rate of recurrence of offensive actions and goal accomplishment inside the penalty area is justified by the fact that this area is nearer to the goalpost and outside of the goalkeeper's scope (Michailidis et al., 2004).

In sum, the conclusions of this study are twofold. Firstly, imperative is the improvement of physical condition factors and more specifically of players' aerobic abilities and stamina, in order to be able to rise the increased demands of the game especially towards its end, because according to the above analysis this is the time of higher chance for goal scoring or goal prevention. The second proposal is relevant to the game tactics as well as to the configuration of the training. Workout of the set plays is considered crucial with extra attention given to corner-kicks and free-kicks since they create the conditions for 1/3 of goals scored during a football game. It is also important to train players in effective marking of the opponents and avoiding marking from the defenders of the opposite team, in application of methods that assist in making the execution of the dead-ball situations unpredictable to the opponent so as to increase the chances for goal scoring.

Also, increased training time should be devoted to team tactics in order to succeed synchronization of teams movement, as well as to specific training that assists the long pass confrontation. The present study provides information on the conditions met in contemporary football in an important tournament for European soccer. More specifically, it points out both the difficulty exhibited by players to rise up to the expectations until the very end of each game and the preference showed by coaches in organized offensive actions. Coaches try to concentrate in the effective execution of set plays, as these are considered to be a less tiring way of goal scoring; from a tactical point of view, long passes and combination play is preferred. Further detailed research on the final offensive efforts and of the set plays would provide useful data and could be the topic for further study.

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