

## IMPORTANCE OF PENALTY KICKS IN FOOTBALL CONSIDERING FINAL OUTCOME OF THE MATCH AND LEAGUE SYSTEM OF COMPETITION

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### Abstract

Based on 88 matches of 2014/2015 First Croatian football league we established the importance of penalty kicks considering the final outcome of the match and the competition. Using Mann-Whitney test and Pearson correlation coefficient we concluded that penalty kicks as situational efficacy indicators pose a statistically significant difference between the winning and the defeated team ( $p=0,04$ ), and there is a moderate negative relation to final placement in league system of competition ( $r=-0,54$ ). These results show that penalty kicks influence the outcome of the match, and if they are repeated, they have a negative effect on final placement.

**Key words:** penalty kicks, notational analysis, situational efficacy, football, warnings

### Introduction

Matches, team or individual sports or martial arts competitions can be observed as complex dynamic systems in which two opposing entities fight for a win (two teams, two pairs, or two individuals). The performance of these entities and its success are determined by level of abilities, skill, and knowledge of players participating in the result of the competition- victory as the final goal.

In football, this happens in a match. Systemic observation of the football match shows many characteristic events in the play which repeat themselves, are recognizable, and can be noted down. These events and their outcomes show a degree of situational efficacy of players and the team, and the level of their performance.

Analyzing these events can show why a certain team won, or how the final result of the match was achieved. A penalty kick is an event following rule-breaking by a player inside his own penalty area.

Penalty kick can be described in two ways – if a player breaks a rule inside his own penalty (noted to the player breaking the rules), and if a defense player extorts the penalty kick inside his own penalty area (noted to the player affected by it – opposing offense player) (Bašić et al., 2015).

Analyzing the penalty kick parameter we can determine if the mentioned situational efficacy indicator is relevant and related to final outcome of the match and league system of competition.

### Methods

#### Analysis material

Research was done on 88 matches of Max tv First Croatian football league. We analyzed one half-season consisting of 90 matches.

Due to certain technical difficulties, one match was not recorded, and one ended in 3:0 due to rule-breaking.

#### Sample

Entities in this research are teams. First Croatian football league consists of 10 clubs.

#### Variable sample

Matches were described using notated performance indicators (variables) – penalty kicks (Bašić et al., 2015)

#### Data collection

Matches were filmed on HDD/DVD in form of video. Using a special computer tool named Courteye the matches were analyzed and prepared for data analysis. Five notators worked on match analysis.

#### Statistical analysis

To determine reliability of gathered data we used the *intra-observer variability* for differences between different data gathered by the same notator (Hughes et al., 2002, 2003, 2004). For penalty kicks we determined a reliability of 100%. For determining differences between winning and defeated teams, we used Mann-Whitney test and Pearson correlation coefficient to determine the connection between performance indicators and final outcome of the competition.

### Results

Based on analyzed matches we can see the relation between *penalty kicks* as situational efficacy indicators and final placement in league system of competition, and establish if there are any statistically significant differences between winning and defeated teams considering the said parameter.

Table 1. Final placement of teams after the half-season (TEAM), total number of matches played (NM), number of wins (WIN), draws (DRAW) and defeats (LOS), as well as the number of points (PTS), number of points per match (PTS/M) and total number of penalty kicks (N-PK), arithmetic mean of penalty kicks (AM-PK) and correlation coefficient of penalty kicks and final placement (r).

TEAM	NM	WIN	DRA	WIN	LOS	PTS/M	N-PK	AM-PK
Dinamo	17	13	4	0	43	2,53	1	0,06
Rijeka	18	12	3	3	39	2,17	2	0,11
Hajduk	17	8	5	4	29	1,71	0	0,00
Lokomotiv	18	7	4	7	25	1,39	2	0,11
Zagreb	18	6	6	6	24	1,33	6	0,33
Slaven	17	5	5	7	20	1,18	2	0,12
Split	17	3	8	6	17	1,00	1	0,06
Istra 1961	18	3	7	8	16	0,89	2	0,11
Osijek	18	4	3	11	15	0,83	6	0,33
Zadar	18	3	3	12	12	0,67	7	0,39
<b>r=-0,54</b>								

Table 2. Arithmetic mean (AM) and standard deviation (SD) of penalty kicks of winning (WIN) and defeated (LOS) teams, and z-value (z) for determining significance differences and errors (p).

	AM	SD	z	p
WIN	0,06	0,24	-1,99	0,04
LOS	0,28	0,48		

## Discussion and conclusion

Based on results (Table 1 and 2) of correlation coefficient ( $r = -0,54$ ) and difference in arithmetic mean between winning ( $AS = 0,06$ ) and defeated teams ( $AS = 0,28$ ), which is statistically significant ( $p = 0,04$ ), we can conclude that *penalty kicks*, as a situational efficacy indicator, pose a statistically significant difference between winning and defeated teams and show a negative relation to final placement in league system of competition. A penalty kick is defined by football rules and represents a significant scoring opportunity. The efficiency of penalty kicks in this research is 87%, which means that almost every penalty kick resulted in a goal score. So even though a penalty kick is a rare event, it has a significant influence to final outcome of the match and placement in league system of competition. It represents a scoring opportunity and it also shows the quality level of opposing team which, in order to claim penalty kick, had to transfer ball possession through the field and into opponent's penalty area, which

requires a high level of technical and tactical knowledge and skill, and good time and space orientation skills. On the other hand, team having the penalty kick shows a lower level of technical and tactical action in defense phase because certain players (and the team in general) did not react in time using allowed moves (taking over possession of the ball) but instead broke the rules of the football game. Also, due to rule of „last man“ in football, a penalty kick is often followed by another disciplinary measure (yellow or red card) which can be another difficulty for the team having the penalty kick. A penalty kick also has a negative psychological influence to the player causing it, which can lead to further imbalance in the field. Based on results for variable *penalty kicks* we can conclude that it poses a significant difference between winning and defeated teams. Even though a penalty kick is a rare event in the game, teams who cause more penalty kicks will have a lower score in a certain match and a lower placement in the state championship ranking system at the end of the season.

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## VAŽNOST JEDANAESTERACA U NOGOMETU OBZIROM NA KRAJNJI ISHOD UTAKMICE I SUSTAVA LIGE NATJECANJA

### Sažetak

Na temelju 88 utakmica prve Hrvatske nogometne lige sezona 2014/2015 utvrđivana je važnost učinjenih kaznenih udaraca s obzirom na konačan ishod utakmice i natjecanja. Primjenom Mann-Whitneyjevog testa i Pearsonovog koeficijenta korelacije dobiveni su podaci da učinjeni kazneni udarci kao situacijski pokazatelj efikasnosti statistički značajno razlikuje pobjedničke od poraženih ekipa ( $p=0,04$ ), te je umjereno negativno povezan s krajnjim plasmanom u ligaškom sustavu natjecanja ( $r=-0,54$ ). Dobiveni rezultati ukazuju da učinjeni kazneni udarci utječu na tijek igre, odnosno krajnji ishod, te ukoliko se ponavljaju navedeni događaji imaju i negativnu povezanost s krajnjim plasmanom.

**Ključne riječi:** kazneni udarci, notacijska analiza, situacijska efikasnost, nogomet, opomene

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