THE EFFICIENCY MODEL OF SOCCER PLAYER'S ACTIONS IN COOPERATION WITH OTHER TEAM PLAYERS AT THE FIFA WORLD CUP

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ABSTRACT

Purpose. The purpose of this paper is to present a simple, table-graphic model of one-to-one play in soccer based on observation of cooperation of top soccer players. **Basic procedures.** The research material consisted of audio-visual recordings from six soccer matches played by the three top teams of the 2006 World Cup finals. The data concering one-to-one plays was entered on a special form. Offensive and defensive actions were assessed with reference to the implementation of the game's objectives and players' position in the field zones. **Main findings.** It has been proven that elite soccer players are most effective at intercepting the ball down the field and in other zones of the pitch. They are also very active in breaking their opponents' offensive actions in midfield. **Conclusions.** The models reflecting elite soccer players' efficiency in one-to-one play should constitute important references for the training of novice soccer players.

Key words: soccer, efficiency, one-to-one play, model

Introduction

A sport team game consists of a struggle between players from two opposing teams, who try to secure a point lead following the rules of the game. The struggle consisting of players' actions is a process of incessant arrangement of relationships between team mates, opponents and other persons involved in competition.

The essence of team play is the interdependence of actions of all the players. The degree of this interdependence varies and is contingent on the complexity of situations during the game. The players' actions during a team game can be divided into those enabling achievement of the game's objectives (individual actions on the ball indirectly dependent on team mates; and team actions directly dependent on team mates) and those facilitating achievement of these objectives (organizational and socio-emotional facilitation) [1].

The player's individual actions with the ball against a single opponent or individual actions without the ball against an opponent in possession of the ball, which are relatively independent of the player's team mates, can be called a one-to-one play.

One-to-one play is direct interaction of two players from the opposing teams aimed at attainment of contradictory goals according to the rules of the game. One-to-one play in attack is a total of actions and reactions of a player with the ball taken against a single opponent, aimed to score a point (goal), create a goal scoring opportunity, control the field of play and/or retain possession of the ball. One-to-one play in defense consists of actions of a player against one opponent in possession of the ball aimed at interception of the ball, breaking his movement or blocking the movement of the ball [2].

The above definitions of one-to-one play do not cover struggle to take control of a loose ball, i.e. actions of two opponents to take control of the ball, or combined actions, i.e. actions commencing with a player in possession of the ball engaging in one-to-one play and then switching to cooperation with another team player, e.g. passing the ball.

The results of one-to-one play should be assessed positively or negatively in terms of attainment of the aims of the game in attack or defense. On the other hand, a player's habitual behavior in unexpected situations of struggle for a loose ball should be marked positively regardless of the results of his actions. The player's readiness and actions to take possession of a loose ball (taken without setting a definite goal and course of action) are qualities by themselves as they facilitate the synergic effects of actions of the entire team. Possible assessment can be willingness (positive assessment) or

unwillingness (negative assessment) to undertake such actions [3].

Praxeology of sport play deals with a multiplicity of its components represented as a system of sets: efficiency criteria[1], players' patterns of behavior and actions, changing situations during competition, aims pursued by players, players' performance, ontogenetic dispositions to play, and relationships within and between individual sets. Such a system is, in fact, a theoretical model of play enabling a detailed and ordered presentation of qualitative and quantitative characteristics (models) of the game components [4].

Praxeological models are constructed to understand the principles of sport play and to improve players' actions. According to Panfil, the praxeological models enable:

- improvement of actions during play by referring to objective models;
- improvement of effectiveness in play by imitating model performances;
- economization of players' actions through limitation of ineffective actions and thus elimination of the costly "trial and error" method [4, p. 151].

Designing praxeological models requires multiple and reliable, objective observations of top class players in real competition. The assessment of individual actions performed by players must take into consideration the changing situations during play (stage and aim of the game; place, way, time and conditions of action). The ordering and valuation of observed actions according to the accepted rules allow distinction of situation patterns, i.e. representation models. The representation models can then be used to create design models which can facilitate players' actions by demonstrating classified types of situations and their solutions.

The praxeological model of sport play includes, in particular, tabular models, mathematical models (indices), graphic model (charts or computer generated models) and simplified reality models (smaller game variants, game parts, game tasks, etc). Simple mathematical models contain the main indices of effectiveness and reliability as well as auxiliary indices of activity, movement and controlling the zones of the field of play [4].

The present paper aims to demonstrate in a table-graphic form a simplified model of one-to-one play in soccer based on observation of cooperation of top soccer players. The following research questions have been posed:

1. What player's actions – indirectly dependent on his team mates – are most frequently performed in one-to-one attack and one-to-one defense plays?
2. What is the activity, effectiveness and reliability of actions of soccer players intending to score a goal, create a goal scoring opportunity, take control of the field of play and keep possession of the ball in one-to-one plays?
3. What is the activity, effectiveness and reliability of actions of soccer players intending to intercept the ball, tackle an opponent and control the field of play in one-to-one plays?
4. What is the activity of soccer players struggling to gain possession of a loose ball?

Material and methods

The research material consisted of audiovisual recordings of six soccer matches played during the 2006 World Cup finals. The games of the three top teams were examined (Tab. 1).

Table. 1. Soccer matches and their results

Competing teams*	Score	Tournament stage
1. **Italy**–Czech Republic	2:0	group stage
2. **Italy**–Ukraine	3:0	quarter-final
3. **France**–Brazil	1:0	quarter-final
4. **France**–Portugal	1:0	semi-final
5. **Germany**–Portugal	3:1	third-place match
6. **Germany**–Sweden	2:0	knockout stage (1/8)

* teams under study in bold

The gathered data concerning one-to-one plays were entered on a special observation form[2]. The analysis was concerned with the efficiency of offensive and defensive actions in one-to-one plays considering the game's objectives (goal scoring, creating a goal scoring

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[1] In praxeological terms, efficiency of action is understood as a total of practical qualities of play, which includes: activity (number of actions performed by players of one team during a match), effectiveness (number of positive actions with reference to the game's aims) and reliability (ratio between the number of effective actions and the number of all actions of one type during the game). Other indices of play efficiency encompass rationality (actions cognitively justified), valuableness (value of assessment of action efficiency) and economy (loss-gain ratio) [4].

[2] Based on earlier studies concerning the objectivity of the proposed method, its reliability amounts to 97% and total accuracy to 95% [3].

opportunity, taking control of the field of play and keeping possession of the ball in attack; interception, tackling, controlling the field of play in defense) and field zones[3] (defense zone (A), midfield (B), attack zone (C)).

The following one-to-one play actions indirectly dependent on team mates were defined:

- keeping possession of the ball – action of the player in possession of the ball against an opponent within 2 m, leading to the former moving parallel to the goal line or towards his own goal or retaining possession of the ball without movement;
- taking control of the field of play – action of the player in possession of the ball against an opponent within 2 m leading to moving the ball towards the opponent's goal;
- creating a goal scoring opportunity – action of the player in possession of the ball against an opponent within 2 m, leading to the possibility of taking a shot at the goal or passing the ball to the striker;
- scoring a goal – action of the player in possession of the ball against an opponent within 2 m, leading to taking a shot or having a temporary freedom of action to perform the shot (against the goalkeeper and against a defender);
- interception – action of a player against the opponent in possession of the ball within 2 m, leading to interception of the ball and undertaking an offensive action;
- tackling – action of a player against the opponent with the ball within 2 m, leading to dispossessing the latter of the ball temporarily (clearing) or permanently (interception);
- controlling the field of play – action of a player against the opponent in possession of the ball within 2 m, leading to the latter moving parallel to the goal line or towards his own goal or retaining possession of the ball without movement, or passing the ball to a team mate.

Results and discussion

Data from Tab. 2 show that the dominant actions in one-to-one plays during the competition included keep-

Table 2. One-to-one play in attack

Action	Index Number	Percentage
Scoring a goal after one-to-one play against the goalkeeper	10	2.7
Scoring a goal after one-to-one play against a defender	1	0.3
Creating a goal scoring opportunity	30	8.0
Taking control of the field of play	116	30.8
Keeping possession of the ball	219	58.2
Total	376	100.0

ing possession of the ball (58.2%) and taking control of the field of play (30.8%). Creating a goal scoring opportunity amounted to 8% of one-to-one play actions, while scoring a goal to only 3% (including merely one-to-one play action against a defender).

Tabular and graphic models (Tab. 3, Fig. 1) show that the players in the matches examined were most efficient in taking control of the field of play (14.16 actions on average during a game; with 78% reliability). On other hand, keeping possession of the ball (36.50 on average per game) revealed much lower reliability (61%).

In creating goal scoring opportunities the World Cup soccer players displayed 60% reliability (three effective actions out of five situations per game on average); however, in terms of goal scoring their reliability was the lowest and featured 45% (1.83 actions per game).

The activity and effectiveness results of one-to-one play considering the field zones from Tab. 3 lend credence to the observed tendencies among the top World Cup teams. The players' activity in creating goal scoring opportunities and goal scoring was observed only in the attack zone (C). Effective possession of the ball and taking control of the field of play were the dominant actions in midfield (B). Keeping ball possession was also most frequent in the defense zone (A). The players displayed the highest reliability of one-to-one play in taking control of the field of play, which decreased as they moved up the field (attack zone – 87%, midfield – 79%, defense zone – 63%).

Earlier research [5] revealed statistically significant differences in activity and reliability of one-to-one play in attack between winning and losing soccer teams. The former engaged in one-to-one play more frequently and efficiently, especially in the midfield (B) and attack zone (C).

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[3] The defense zone (A) is the area between the player's own goal line, both touchlines and an imaginary 33 m line parallel to the goal line; the attack zone (C) is the area between the opponent's goal line, both touchlines and an imaginary line parallel to the goal line; the area between the attack zone and the defense zone is the midfield (B).

Table 3. Efficiency of one-to-one play in attack considering the game's objectives and field zones

Index / Action	Defense zone (A)			Midfield (B)			Attack zone (C)			Entire pitch		
	A	E	R	A	E	R	A	E	R	A	E	R
Scoring a goal after one-to-one play	0	0	0.00	0	0	0.00	11	5	0.45	11	5	0.45
Creating a goal scoring opportunity	0	0	0.00	0	0	0.00	30	18	0.60	30	18	0.60
Taking control of the field of play	8	7	0.87	62	49	0.79	46	29	0.63	116	85	0.73
Keeping possession of the ball	32	21	0.66	126	81	0.64	61	31	0.51	219	133	0.61

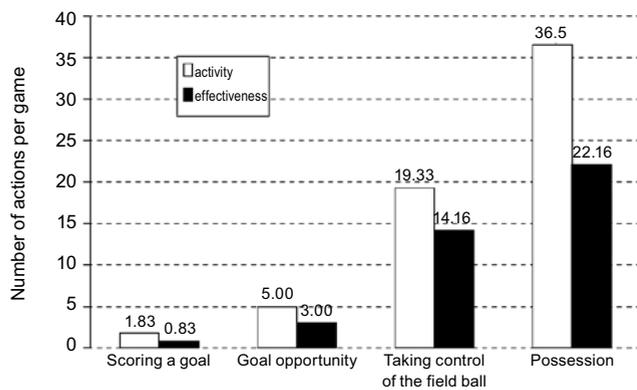A – activity, E – effectiveness, R – reliability

Figure 1. Graphic model of one-to-one play in attack (average number of actions per game)
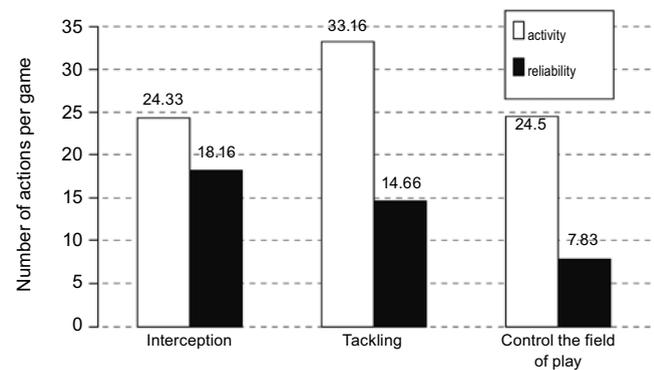

Figure 2. Graphic model of one-to-one play in defense (average number of actions per game)

Tab. 4 presents a model of one-to-one play in defense. It shows that the dominant one-to-one action in defense undertaken by the top teams under study was tackling (40.45%) followed by interception (29.67%) and controlling the field of play (29.88%).

Fig. 2 shows a graphic model of the average number of one-to-one actions in defense. It can be noted that the top soccer players under study tackled their opponents 33 times, and controlled the field of play and intercepted the ball 24 times on average per game. The number of effective actions per game amounted to 14.66, 7.8, and 18.16, respectively.

The data from Tab. 5 show that the players of the top three 2006 World Cup teams achieved the highest reliability of actions in interception (75%), and much lower in tackling (44%) and controlling the field of play (32%). Tab. 5 shows that the players' activity was the highest in midfield (tackling – 120 times, controlling the field of play – 62, ball interception – 58) and that they intercepted the ball in their own defense zone very frequently (60 effective actions out of 69 one-to-one actions). The reliability of their interception was the highest in the defense zone (87%) followed by attack zone (68%) and midfield (62%).

Table 4. One-to-one play in defense

Index / Action	Number	Percentage
Interception	146	29.67
Tackling	199	40.45
Controlling the field of play	147	29.88
Total	492	100.00

The analysis confirmed the tendencies in the play of elite soccer teams observed in earlier research. The top European Championship and World Cup teams are greatly superior to other teams in their one-to-one ball interception activity, effectiveness and reliability in midfield [5].

It should be emphasized that the soccer players under study achieved the lowest results in tackling and controlling the field of play in their attack zone (26% and 36% reliability).

One of the characteristic elements in soccer play is one-to-one struggle to gain possession of a loose ball. Such situations are accidental plays resulting from unintended clearing, rebounding, the ball hitting the referee, corner flag, or goalkeeper's punting downfield.

Table 5. Efficiency of one-to-one play in defense considering the game's objectives and field zones

Index / Action	Defense zone (A)			Midfield (B)			Attack zone (C)			Entire pitch		
	A	E	R	A	E	R	A	E	R	A	E	R
Interception	69	60	0.87	58	36	0.62	13	13	0.68	146	109	0.75
Tackling	60	40	0.66	120	43	0.36	5	19	0.26	199	88	0.44
Controlling the field of play	74	15	0.20	62	28	0.45	4	11	0.36	147	47	0.32

A – activity, E – effectiveness, R – reliability

They involve two opponents who undertake almost simultaneous action to gain possession of the ball.

Fig. 3 shows that the top World Cup soccer players undertook on average 82 one-to-one actions in defense, 63 in attack and 70 actions to gain possession of a loose ball per game. In quantitative terms, the statistics was exemplary. Results of other studies [6–9] show that the number of one-to-one actions undertaken by top soccer players ranged from 200 to 300 per game.

Tab. 6 shows the number of one-to-one actions to gain possession of a loose ball. It can be noticed that most often the top soccer players under study undertook such actions in midfield (33.33), and then in their own defense zone (22) and attack zone (14.33). The number of actions to gain possession of a loose ball ranged from 40 (France–Portugal) to 84 (France–Brazil) per game.
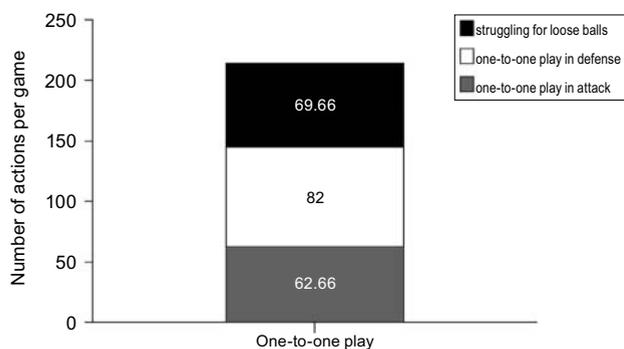
Numerous studies and expert opinions point to the great significance of team work to achieve success in team games. It is often emphasized that modern soccer is dominated by offensive actions consisting of swift play without receiving the ball, involving changing positions and tasks, and controlling the opponent by "playing ball". A modern soccer team which loses the ball, quickly rearranges its defense line and coordinates all the actions to successfully intercept the ball [3].

However, the significance of one-to-one play in soccer must not be sidelined. Following Panfil, "Team building weakens individual actions. This is an adverse influence as it confines the range of means to achieve the game's aims to actions which are directly dependent on team mates. It also lowers the level of players' satisfaction and, in consequence, their motivation to act" [4, p. 75]. Panfil suggests that such influence should be avoided by considering individual aspirations within the indispensable, effective team actions.

The results of the present study indirectly confirm the above observations. Most likely the relative easiness of playing ball in one's own defense zone, forcing the highest activity from the players in midfield and their reduced efficiency in the attack zone results from the way the opposing team's defense is organized (active zone defense, off-sides, double marking, altering defense width and depth).

The above analysis revealed that the players were most effective while intercepting the ball not only in their own defense zone but also in the other zones of the pitch. They were also highly active in breaking the opponent's offensive actions in midfield. In attack, they displayed great efficiency in taking control of the field

Figure 3. Graphic model of the number
of one-to-one actions

Table 6. The number of actions to gain possession of a loose ball

Index / Loose balls	Defense zone (A)	Midfield (B)	Attack zone (C)	Entire pitch
Number of actions	132.00	200.00	86.00	418.00
Arithmetic mean	22.00	33.33	14.33	69.66
The lowest number of actions	15.00	19.00	8.00	40.00
The highest number of actions	35.00	46.00	19.00	84.00

of play and ball possession (mostly in midfield) as well as in creating goal scoring opportunities.

The results of the research show that the elite soccer players were very active in midfield. This partially confirms the well-known rule of soccer: "Who controls the midfield, wins the game."

It should also be noticed that the overall reliability of the teams in one-to-one play (all one-to-one plays regardless of the game's aims, field positions and struggles for loose balls) amounted to 60% in attack and 50% in defense, considering the relative balance between the number of offensive and defensive actions (63 one-to-one plays in attack and 82 one-to-one plays in defense per game on average). It shows that one of the major indicators of soccer play at the highest level can be a high efficiency of one-to-one play actions in attack.

Conclusions

1. The analysis of one-to-one plays in attack in the matches under study revealed a dominance of actions aimed at keeping possession of the ball and taking control of the field of play. They constituted 89% of all the actions and featured 78% and 61% reliability, respectively. Creating goal scoring opportunities and goal scoring were rarer (8% and 3%, respectively) and their reliability was lower (60% and 45%, respectively).

2. In one-to-one plays in defense the soccer players displayed the highest activity (40%) in tackling, followed by interception (30%) and controlling the field of play (30%). The actions of highest reliability included interception (75%), tackling (44%) and controlling the field of play (32%).

3. The top World Cup players engaged in about 70 one-to-one struggles per game to gain possession of a loose ball. In these plays their activity was the highest in midfield.

4. Models reflecting one-to-one actions by top level soccer players should serve as important references in training of novice players.

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