Baltic Journal of Health and Physical Activity 2015;7(4):15-27
Journal of Gdansk University of Physical Education and Sport in Gdansk
e-ISSN 2080-9999

ORIGINAL

The efficiency of actions of goalkeepers from sports effective teams in a game of futsal in matches of the final tournament of the World and European Championships in 2012

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background The purpose of the study was to develop a model mapping the efficiency of actions of futsal goalkeepers based on observation of their game in eight matches of the cup finals the World and European Championships in 2012.

Material/Methods Data about the game were recorded on originally developed observation sheets. Activity, effectiveness and reliability of particular offensive and defensive actions aiming at achieving objectives of the game were investigated.

Results It was found that in attack futsal goalkeepers mostly perform actions whose aim is to gain the playfield with the ball by passing it with a foot from the ground and to keep the ball by receiving it from partner. In turn, in defence, they mostly prevent losing goals by pushing the ball.

Conclusions The created models of players' performance should be used to create models shaping the game of players of a lower level of proficiency in order to improve the efficiency of their games as well as to develop individual programs of training for futsal goalkeepers.

Key words futsal, observation games, goalkeeper

article details

Article statistics **Word count:** 3,396; **Tables:** 9; **Figures:** 2; **References:** 69
Received: September 2015; **Accepted:** November 2015; **Published:** December 2015

Full-text PDF: http://www.balticsportscience.com

Indexation: AGRO, Celdes, CNKI Scholar (China National Knowledge Infrastructure), CNPIEC, De Gruyter - IBR (International Bibliography of Reviews of Scholarly Literature in the Humanities and Social Sciences), De Gruyter - IBZ (International Bibliography of Periodical Literature in the Humanities and Social Sciences), DOAJ, EBSCO - Central & Eastern European Academic Source, EBSCO - SPORTDiscus, EBSCO Discovery Service, Google Scholar, Index Copernicus, J-Gate, Naviga (Softweco, Primo Central (ExLibris), ProQuest - Family Health, ProQuest - Health & Medical Complete, ProQuest - Illustrata: Health Sciences, ProQuest - Nursing & Allied Health Source, Summon (Serials Solutions/ProQuest, TDOne (TDNet), Ulrich's Periodicals Directory/ulrichsweb, WorldCat (OCLC)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest: Authors have declared that no competing interest exists.

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INTRODUCTION

Identification of the efficiency of action is essential in the process of rationalising training in team sports games. The description and classification of actions of players' at different positions allows increasing their effectiveness in the game through mapping actions considered to be efficient and reducing the use of inefficient ones [1, 2].

To observe the different players' actions in team sports games, various research tools are applied, but observation sheets are specially recognised by both theoreticians and practitioners [2, 3]. Research on the efficiency of actions in football with a use of observation sheets has had a few dozen years' tradition [2, 4, 5, 6, 7, 8, 9], but they usually overlook an analysis of the efficiency of goalkeepers' actions. Efficiency of goalkeepers' actions was studies, among others by: Szwarc [10], Bergier [11], Bergier and Syryjczyk [12,13], Stuła [14], Kapera [15,16], Syryjczyk [17,18], Bergier and Soroka [19], Jakubiszyn and Duda [20]. They have used different test procedures that prevent detailed comparative analyses. The method proposed by Szwarc and Chamera [21], created on the basis of a praxeological theoretical interpretation, allows for a comprehensive evaluation of the efficiency of offensive and defensive actions of goalkeepers of 11-member teams. On its basis an analysis of goalkeepers' game during the World the European Championships in 2008–2012 was carried out [22, 23, 24, 25, 26]. In addition, the literature survey shows that the most common direction for research on goalkeepers' actions are analyses of the efficiency of their actions in situations of defending penalty kicks [27, 28].

Indoor soccer (futsal) significantly differs from traditional football. Differences result from separate rules of the game and are determined by the competitive environment. Hence intensive research on knowing the game has been conducted for several years. Somatic determinants [29, 30, 31, 32, 33], physiological-motor [34, 35, 36, 37, 38, 39, 40, 41], psychological [42, 43, 44, 45, 46] as well as technical and tactical performance [47, 48, 49, 50, 51] have already been studied. The efficiency futsal players' game has been studied, among others by Silva et al. [29], Panfil and Paluszek [52], Szwarc [2], Irokawa et al. [53], Leite [54], as well as Aires [55], Da Silva et al. [56], Buraczewski [57], Travasson [58], Vilar [59], Gomez [60], Noel [61], Lapresa et al. [62] and Sarmento et al. [63].

A detailed survey of the literature shows that detailed models of goalkeepers' efficient actions in the game of futsal have not been developed yet. Thus, in this paper, an attempt has been made to develop a model of an efficient action of a futsal goalkeeper based on observations of matches of the final tournaments of the World and European Championships in 2012. The following research questions have been posed:

1. What kinds of actions are most often performed by goalkeepers from sports efficient teams in the game of futsal in attack and in defence?

2. What is the activity, efficiency and reliability of individual and team actions of top-skilled futsal goalkeepers in terms of realised by them objectives of the game?

MATERIAL AND METHOD

This study used the method of observation. The analysis was made with a use of video footage recorded on a DVD, where during a multiple replay of a game situation the tested action was observed. Data about the game were recorded on a special originally developed observation sheet meeting scientific requirements (intra-rater reliability at the level of 1.00 (95% Cl 1.00-1.00) and inter-rater reliability – 0.99 (95% CI 0.99-1.00) [64]. The game of goalkeepers from teams competing in 8 matches of the final tournaments played from the semi-finals to the finals during the World and the European Championships in 2012 (Tab. 1).

Table 1. A list of analysed matches of the World and the European Championships

No.	Match	Stage of competition	Final result of the match	Examined goalkeepers
1.	Italy – Spain	Semi-final	1-4	S. Mammarella / J. Juanjo
2.	Brazil – Columbia	Semi-final	3-1	M. Tiago / J. Lozano
3.	Italy – Columbia	Match for the 3rd place	3-0	S. Mammarella / J. Lozano
4.	Spain – Brazil	Final	2-3 in extra time	J. Juanjo / M. Tiago
5.	Croatia – Russia	Semi-final	2-4	I. Jukić / L.P. Gustawo
6.	Spain – Italy	Semi-final	1-0	L. Amado / S. Mammarella
7.	Croatia – Italy	Match for the 3rd place	1-3	I. Jukić / S. Mammarella
8.	Russia – Spain	Final	1-3 in extra time	L. P. Gustawo / L. Amado

* Items 1-4, matches of the Futsal World Championships 2012, items 5-8, matches of the Futsal European Championships 2012

Activity, effectiveness and reliability of goalkeepers' actions in terms of objectives of the game were investigated. In attacking the efficiency of actions aiming at keeping the ball, gaining the playfield with the ball, creating situations to score and scoring a goal were estimated, while in defence the efficiency of actions against losing a goal and against creating a situation to score was evaluated.

RESULTS

OFFENSIVE ACTIONS

The data presented in Table 2 show that in the competition of the best futsal goalkeepers participating in the World and the European Championships in 2012 actions gaining the playfield (70% of all actions) and actions to keep the ball (24%) dominated. Actions creating situations to score and scoring a goal were much fewer (4% and 2% of all actions, respectively).

Table 2. A model mapping the efficiency of actions among the examined futsal goalkeepers

Indicator / Type of action	Number of actions	Number of efficient actions	Reliability of actions [%]	Percentage of all actions [%]	Mean number of actions in a match
Keeping the ball	218	212	97	24	13.63
Gaining the playfield	637	546	86	70	39.81
Creating situations to score	37	17	46	4	2.31
Scoring a goal	15	1	7	2	0.94

The examined goalkeepers were the most efficient in keeping the ball (an average of 14 actions in one match, with 97% reliability) and in gaining the playfield with the ball (an average of 40 actions in one match, with 86% reliability). Less frequently they performed actions aimed at creating a situation to score and scoring a goal (2 and 1 action in a match with 46% and 7% reliability, respectively).

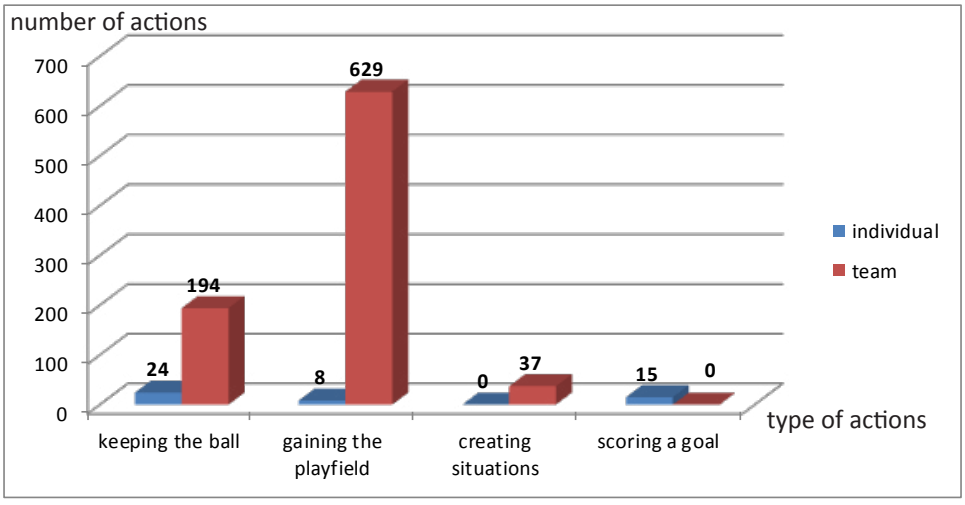

Fig. 1. The number of offensive actions used by the examined goalkeepers in terms of realised by them objectives of the game and ways of acting

It follows from the detailed data showing the number of actions performed during attack in terms of the realised objectives of the game (Table 2 and Figure 1) that cooperation with teammates significantly outnumbered individual actions performed in situations of keeping the ball, gaining the playfield and creating situations to score. Differences in favour of cooperation were: 170, 621 and 37 actions, respectively. While scoring, only individual actions were performed. Goalkeepers usually cooperated during gaining the playfield and keeping the ball, 69% and 21% of all offensive actions taken, respectively. The least often they cooperated during creating a situation to score (4%). The most individual actions were taken while keeping the ball – 3% of all actions. The remaining individual activities of goalkeepers amounted to 3%.

The data contained in Table 3 show that the examined goalkeepers during actions aimed at keeping the ball mostly received the ball passed by a partner (172 actions with 98% reliability) and faked and/or dribbled the ball (21 actions, with 95% reliability). Subjects did not fail while passing the ball, catching the ball after faking or dribbling the ball and while keeping the ball in the game by sliding (16, 2 and 1 action, respectively). They showed the lowest reliability in catching the ball after a teammate had played (6 actions, with 67% reliability).

Table 3. A model mapping the efficiency of actions of the examined goalkeepers in keeping the ball

Performance method \ Forms of the efficiency of actions		Activity	Efficiency	Reliability of actions [%]
Individual	Sliding tackle to keep the ball in the game	1	1	100
	Faking and/or dribbling	21	20	95
	Catching the ball after faking and/or dribbling	2	2	100
	Catching the ball after passing from a partner	6	4	67
Cooperation	Receiving the ball from a partner	172	169	98
	Passing the ball (passing backwards)	16	16	100

It follows from the data presented in Table 4 and Figure 1 that the examined goalkeepers cooperated 629 times while gaining the playfield with the ball and they did so with 86% reliability. They took 8 individual actions while faking and/or dribbling the ball, with 100% reliability. The subjects most often gained the playfield with the ball after passing it with a foot from the ground (372 actions, with 81% reliability). A throw-in by hand was performed 257 times, with 93% reliability.

Table 4. A model mapping the efficiency of actions of the examined goalkeepers in gaining the playfield with the ball

Performance method \ Forms of the efficiency of actions		Activity	Efficiency	Reliability of actions [%]
Individual	Faking and/or dribbling	8	8	100
Cooperation	Throw-in by hand	257	238	93
	Passing the ball from the ground with a foot	372	300	81

The data presented in Table 5 and Figure 1 show that the examined goalkeepers cooperated only while creating situations to score. They most commonly passed the ball from the ground by foot and threw in the ball by hand (20 and 17 actions, with 35% and 59% reliability, respectively).

Table 5. A model mapping the efficiency of actions of the examined goalkeepers in creating a situation to score

Performance method \ Forms of the efficiency of actions		Activity	Efficiency	Reliability of actions [%]
Cooperation	Throw-in by hand	17	10	59
	Passing the ball from the ground with a foot	20	7	35

The data presented in Table 6 and Figure 1 reveal that the examined goalkeepers of sports effective teams took 15 individual actions whose aim was to score. They did so with a low, 7% reliability. The most commonly they hit the ball from the ground in direct contact with an opponent and without contact with an opponent (6 unsuccessful actions each). Hitting the ball dropped from hand without contact with a rival was applied 3 times, with 34% reliability. It should be added that these actions constituted a small percentage of all offensive actions performed in the observed matches.

Table 6. A model mapping the efficiency of actions of the examined goalkeepers in scoring

Performance method \ Forms of the efficiency of actions			Activity	Efficiency	Reliability of actions [%]
Individual	Without contact with an opponent	Hitting the ball from the ground	6	0	0
		Hitting the ball dropped from hand	3	1	34
	In contact with an opponent	Hitting the ball from the ground	6	0	0

In conclusion, the examined goalkeepers showed the greatest activity in cooperation in trying to gain the playfield with the ball by passing the ball from the ground and by throwing it in by hand (41% and 28% of all offensive actions, respectively). In turn, the least often they cooperated in creating situations to score (4% of all actions). In total, the proportion of individual actions in the observed goalkeepers amounted to 5% of all offensive actions.

DEFENSIVE ACTIONS

The data presented in Table 7 show that the examined futsal goalkeepers performed 434 defensive actions in total. They prevented losing goals more often (295 actions, with 88% reliability) than prevented creating situations to score (139 actions, with 94% reliability). These actions constituted 68% and 32% of all defensive actions, respectively.

Table 7. A model mapping the efficiency of defensive actions of the examined futsal goalkeepers

Preventing \ Indicator	Number of actions	Number of efficient actions	Reliability of actions [%]	Percentage of all actions [%]	Mean number of actions in a match
losing a goal	295	260	88	68	18.44
creating a situation to score	139	131	94	32	8.69

It follows from the data presented in Table 7 that goalkeepers with the highest skills in the game more often acted against losing goals (an average of 18 actions in one match) than against creating a situation to score (an average of 9 actions in one match).

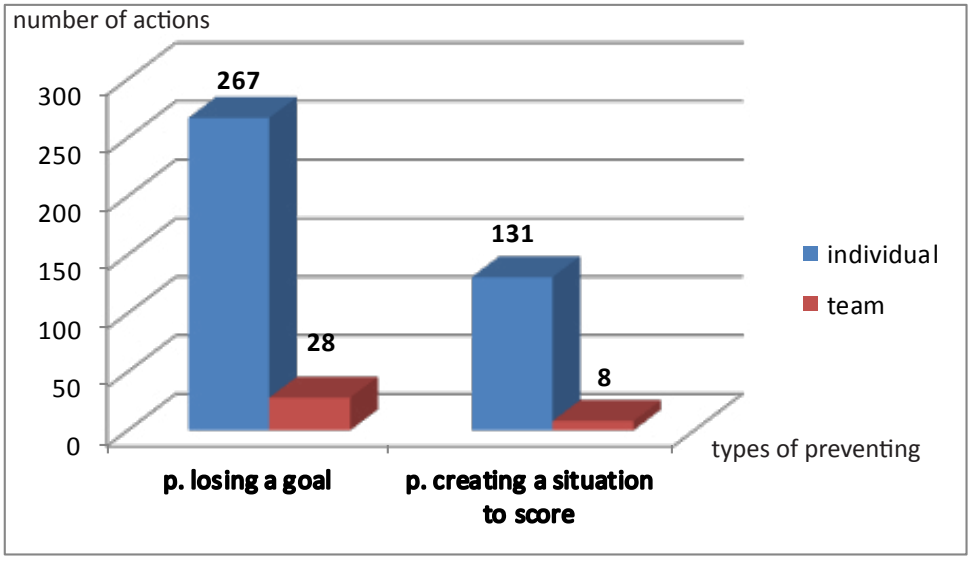

Fig. 2. The number of defensive actions used by the examined futsal goalkeepers in terms of realised by them objectives of the game and ways of acting

The detailed numerical tabular and graphical data on defensive actions (Table 7 and Figure 2) show that individual actions significantly prevailed over those strictly dependent on teammates (398 and 36 actions, which represented 92% and 8% of all performed actions, respectively). Their reliability was 90% and 89%, respectively. The examined goalkeepers most frequently acted against losing goals (267 actions, with 88% reliability) and against creating situations to score (131 actions, with 95% reliability). The number of actions carried out in cooperation with teammates was 28 and 8 actions, respectively, with 93% and 75% reliability.

The data presented in Table 8 suggest that while acting against losing goals the examined goalkeepers most commonly pushed the ball (81 actions, with 90% reliability) and defended without contact with the ball (69 actions, with 83% reliability). Less frequently they caught the ball and intervened with legs (48 and 43 actions, with 96% and 88% reliability, respectively). They did not fail in defence of shots from set-pieces (6 effective actions). They also achieved high reliability during the execution of consequential doubling – an action absolutely dependent on teammates' behaviour (28 actions, with 93% reliability). In turn, they mostly failed in defending the goal in 1x1 situations (14 actions, with 64% reliability).

Table 8. A model mapping the efficiency of the examined goalkeepers' actions against losing a goal

Performance method \ Forms of the efficiency of actions		Activity	Efficiency	Reliability of actions [%]
Individual	Catching the ball	48	46	96
	Pushing	81	73	9
	Defence with legs	43	38	88
	Situational defence	6	5	83
	Defence in a 1x1 situation	14	9	64
	Saving shots after set-pieces	6	6	100
	Saving/intervention without contact with the ball	69	57	83
Cooperation	Consequential doubling	28	26	93

The data presented in Table 9 indicate that among the observed goalkeepers, catching the ball (74 actions, with 96% reliability) and intercepting/clearing the ball without/with falling to the ground outside the penalty area (35 actions, with 91% reliability) dominated during prevention of situations to score. The examined players always effectively punched clear, pushed the ball, intercepted/cleared the ball without/with falling to the ground in the penalty area and intervened without contact with the ball outside the penalty area (4, 3, 8 and 4 actions, respectively). In turn, they failed the most during interventions without contact with the ball in the penalty area and in consequential doubling in cooperation with teammates (4 and 8 actions, respectively, with equal 75% reliability).

Table 9. A model mapping the efficiency of actions against creating situations to score

Performance method \ Forms of the efficiency of actions			Activity	Efficiency	Reliability of actions [%]
Individual	Catching the ball		74	71	96
	Punching clear		4	4	100
	Pushing		3	3	100
	In the penalty area	Intercepting / clearing with/without falling to the ground	8	8	100
		Saving/intervention without contact with the ball	4	3	75
	Outside the penalty area	Intercepting / clearing with/without falling to the ground	35	32	91
		Saving/intervention without contact with the ball	4	4	100
Cooperation	Consequential doubling		8	6	75

In conclusion, the examined futsal goalkeepers of sports effective teams demonstrated the highest activity in the prevention of losing a goal by means of pushing the ball and against creating situations to score by catching the ball (19% and 17% of all defensive actions, respectively). The least often they

conducted actions against creating situations to score by means of pushing the ball (less than 1% of all actions). They cooperated only occasionally in consequential doubling (8% of all actions).

DISCUSSION

The conducted survey of literature of the subject demonstrated that research on the efficiency of the game of futsal is very scarce. Especially with respect to the game of players in the goalkeeper's position [65]. Therefore, the objective of this study was to develop models of futsal goalkeepers' efficiency of actions taking into account the realised by them offensive and defensive objectives of the game. Goalkeepers of the highest level of sports proficiency were studied.

In the structure of the best futsal goalkeepers' game, offensive actions accounted for 67% of all actions undertaken by them. The remaining 33% were defensive actions. This trend has also been noted among goalkeepers of 11-person teams [66,77]. The examined players the most commonly performed actions aimed at gaining the playfield with the ball (48% of all both offensive and defensive actions) and whose purpose was to prevent the loss of a goal (22% of all actions). The observed trend also applies to the game of goalkeepers of 11-person teams, as confirmed by Szwarc et al. [23] and Lipinska's et al. [24] research. The examined players performed the fewest actions, with the simultaneous lowest reliability, in situations aimed at scoring a goal (only 15 actions in total, with 7% reliability). However, it should be noted that these actions are not goalkeepers' speciality. Futsal goalkeepers perform them in situations of a disadvantageous result, mostly in the last minutes of a match while building up a positional attack (creating so-called "zip" in the opponents' defence area). These actions are specific to futsal and do not appear in the game of 11-person teams [24, 25, 26].

The examined futsal goalkeepers showed the highest reliability in keeping the ball (218 actions, with 97% reliability). Their efficiency in preventing a loss of a goal was also very high (88% reliability). The results of this study correspond to Paz-Franco's et al. [67] research, which demonstrated that the reliability of actions against losing a goal among goalkeepers from eight top teams of the first Spanish Division during the King's Cup tournament was 76.5%, and with Da Silva's et al. [56] results, according to which in 23 matches Brazilian goalkeepers prevented losing a goal 332 times with 80% reliability.

While gaining the playfield with the ball, goalkeepers of the highest skills of the game most frequently applied passing the ball with the foot from the ground and throwing-in the ball by hand (28% and 21% of all offensive and defensive actions taken, respectively). This relationship also applies to goalkeepers of 11-person teams. Szwarc et al. [23] and Szwarc and Chamera [25] proved that, among goalkeepers playing in matches of the Champions' League and the European League in the 2012/2013 and 2010/2011 seasons, passing the ball with the foot from the ground and throwing the ball by hand amounted to: 323 and 74 actions and 292 and 60 actions, representing 43% and 10%, and 31% and 6% of all offensive and defensive actions taken by goalkeepers.

It is worth adding that the examined goalkeepers did not fail when passing the ball with the leg, catching the ball after faking or dribbling the ball, and when

sliding to keep the ball in the game in actions to keep the ball and faking and/or dribbling the ball in gaining the playfield with the ball. In defensive actions they showed 100% reliability in saving shots from set-pieces the game, punching clear, pushing the ball, intercepting/clearing the ball with/without falling to the ground in the penalty area and interventions without contact with the ball outside the penalty area. Comparing the game of the examined here futsal goalkeepers and goalkeepers of 11-person football, it is worth noting [24, 68, 69] that futsal players almost 5 times more often than goalkeepers of 11-person football take actions aimed at creating a situation to score.

CONCLUSIONS

In attack futsal players in the goalkeeper position most often perform actions to gain the playfield with the ball and actions to keep the ball (70% and 24% of all offensive actions, respectively), and in defence first and foremost they take actions against losing a goal (68% of all defensive actions) usually by means of pushing the ball.

During attack goalkeepers gain the highest reliability in individual actions: faking and/or dribbling the ball and throwing it in by hand, and in defence while saving the goal after shots from set-pieces of the game.

The created models of the efficiency of actions of futsal players in the goalkeeper position should be used to create models mapping the game of players of a lower level of sports proficiency in order to improve the efficiency of their game as well as to develop individual programs of training for futsal goalkeepers.

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Cite this article as:
Oszmaniec M, Szwarc A. The efficiency of actions of goalkeepers from sports effective teams in a game of futsal in matches of the final tournament of the World and European Championships in 2012. Balt J Health Phys Act. 2015;7(4):15-27.